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DIREZIONE CENTRALE SUPPORTO ALLA PROGRAMMAZIONE E ALLE INFRASTRUTTURE

EUROPEAN METTTES PROJECT

METTTES Technology Offers (TOs) PORTFOLIO

Regional Demand Profiles collection

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Introduction

The METTTES (*More Efficient Transnational Technologies Transfer in the Environmental Sector*) Project is focused specifically on the environmental sector since this is influenced by legislation requirement like no other sector.

METTTES is characterized by a new approach to estimate technological development needs, basing on an analysis of what current or forthcoming EU/national legislation stimulates demand for innovative solutions. This technology demand will be derived at regional level. The regional demand will be analyzed in depth and expressed in a detailed document, Regional Demand Profile (RDP), with high-quality, commercially interesting Technology Requests which address both current and future demand (foresight).

The main objectives are to realize an explicitly demand-oriented approach for searching technology needs, to create an efficient matching between supply and demand and to establish long-term, stable and economically significant transnational agreements.

The first key element is to derive technology demand not from the needs of individual enterprises but to establish technology demand at regional level (bundling) and express this in a Regional Demand Profile. An RDP is a comprehensive analysis and detailed presentation not only of a region's (or country in the case of small countries) current technology demand but also includes forecasts and foresight regarding its future demand.

Thus an RDP addresses the following questions:

· What environmental technology demand will evolve in the region in the next 3-5 years, triggered by legal requirements, new administrative regulations or national environmental policy?

· What supply deficits are there in the region, i.e. for what concrete projects and measures are there no suppliers in the region?

· What players in the region are prepared, as a result of this situation, to enter into technology co-operation agreements with foreign suppliers, under what conditions and what preferences?

In practice, the technology demands are generated mostly by SMEs which must comply with the environmental legislation. Thus any analysis of technology demand as in METTTES must automatically take into consideration the situation of SMEs in the regions. It will be the duty of those compiling RDPs to ensure that the technology demand topics are SME-oriented.

The RDPs developed will include at least 5 high-quality, commercially interesting and concrete technology requests (TRs) which address both current and future demand.

In this document are presented, for each RDP, technological solutions which have been identified, assessed and collated in a Technological Offer Portfolio. Potential donors and recipients, following intensive preparation, exchange of information and pre-qualification, were brought together at tailor-made matching events in the demand regions. These encompass have foreseen presentations of the demand, e.g. by regional decision makers, and convincing technological solutions and have brought high-potential technology providers from throughout Europe.

RDP for Region of Northern Hungary "Water quality and Wastewater Treatment"

1. Abstract

A Regional Development Profile (RDP) for the Region of Northern Hungary in the field of water and wastewater treatment has been compiled by BME.

Area of the region is 13,430 km², with a population of about 1,270,000. About 95% of the region is provided with drinking water system, but about 30% of the supplied area needs water quality improvement. Water monitoring (raw water) should be developed in the whole region. About 50% of the households are connected to sewerage systems, this rate should be increased to 84% by 2015according to the related national program. Canalization, building new wastewater treatment plants and in several cases extension of capacities and/or increasing efficiency in the existing plants are needed. Treatment of sewage sludge has to be improved or solved in the region.

This RDP is focusing on water quality improvement and treatment of municipal wastewater, however, the requested technologies can be applied also in industrial plants. Legal basis of the development outlined in this RDP: EU and national (harmonized with EU) legislation and Act of Accession of the ten New Member States to the Union.

The Act of Accession provided grace periods to the new member states for the fulfillment of several requirements of the EU legislation (derogations). In this profile derogations given to Hungary in the field of water and wastewater treatment were first of all surveyed.

Concrete demands for the region are given in the technology request profiles included in the RDP[1]. Deadline for implementation: the outlined in the concrete TRs have to be put into operation by 31 December 2010. The technical field of the Regional Demand Profile (RDP): Water quality improvement, wastewater treatment (with special regards to the treatment of municipal wastewater).

[1] Although the above technology requests were elaborated for the Region of Northern Hungary, from the point of view of technology the same or similar problems are to be solved in other regions of the country.

2. Overview of Technology Requests (TRs)

TR No.	Company description	Request brief
01	An Hungarian organization in the field of water and wastewater treatment	Water monitoring system for drinking water technology
02	An Hungarian organization in the field of water and wastewater treatment	Removal of solid and colloidal dispersed particles from raw water for drinking water
03	An Hungarian organization in the field of water and wastewater treatment	Removal of lump particles from surface water to produce water
04	An Hungarian organization in the field of water and wastewater treatment	Separate removal of ammonia or arsenic and boron or nitrites from raw water for drinking water
05	An Hungarian organization in the field of water and wastewater treatment	Removal of microorganism from raw water to obtain drinking water
06	An Hungarian organization in the field of water and wastewater treatment	Collection of municipal wastewater in hilly areas with significant difference in ground level
07	An Hungarian organization in the field of water and wastewater treatment	Decrease of COD, BOD, nitrogen and phosphorous content in municipal wastewater sewage sludge
08	An Hungarian organization in the field of water and wastewater treatment	Decrease of COD, BOD, nitrogen and phosphorous content in municipal wastewaters
09	An Hungarian organization in the field of water and wastewater treatment	Collection and treatment of municipal wastewater in micro-regions comprising 3-6 small villages
10	An Hungarian organization in the field of water and wastewater treatment	Removal of solid and colloidal dispersed particles from wastewater of several categories
11	An Hungarian organization in the field of water and wastewater treatment	Collection of wastewater in small settlements without canalization and transport of collected wastewater to treatment plants

2.1 TR 1: Water monitoring system for drinking water technology

BBS code : *06 HU HUBU 0GWJ*

Comments about BAT

a. General remarks

"Monitoring of water networks is a system of measurements and analyses of the operational and technical state of the network in order to gain sound bases for its control and usage."

According to the above definition, full monitoring include actions the following three aspects:

a) *quantitative (hydraulic); b) qualitative; c) technical.*

Hydraulic monitoring (measurement parameters: the flow rate, pressure, water levels) should be carried out with the simultaneous analysis of the results, which allows for describing e.g. the water loss or rough localization of the place where the installation is damaged etc.

In the case of *qualitative* monitoring the parameters presented below are measured:

- physical e.g. pH, turbidity, conductivity;
- chemical, e.g. concentration of disinfectant;
- microbiological, e.g. presence of pathogens.

Monitoring of microbiological and chemical parameters allows to anticipation and prevention of possible health hazard for the consumers of water.

Technical monitoring constitutes a completion of the other components of monitoring. Its aim is to asses the technical state of the elements in the water network and to facilitate efficient water supply.

b. Designing a water quality monitoring program

The first step in designing a water quality monitoring program is to determine the purpose of the monitoring. This will help in selecting the parameters to be monitored. The decision should be drawn based on factors such as:

⇨ Types of water quality problems and pollution sources that will likely be encountered;

⇨ Cost of available monitoring equipment;

⇨ Precision and accuracy of available monitoring equipment.

Table 1 shows possible contamination of drinking water from different sources.

Table 1: Drinking water contamination from different sources

Source	Common associated pollutants and physical parameters
Cropland	Turbidity, phosphorus, nitrates, temperature, total solids
Forestry harvest	Turbidity, temperature, total solids
Grazing land	Fecal bacteria, turbidity, phosphorus, nitrates, temperature
Industrial discharge	Temperature, conductivity, total solids, toxics, pH
Mining	pH, alkalinity, total dissolved solids
Septic systems	Fecal bacteria (i.e., Escherichia coli), nitrates, phosphorus, dissolved oxygen/biochemical oxygen demand, conductivity, temperature
Sewage treatment plants	Dissolved oxygen, BOD_5, turbidity, conductivity, phosphorus, nitrates, fecal bacteria, temperature, total solids, pH
Urban runoff	Turbidity, phosphorus, nitrates, temperature, conductivity, dissolved oxygen and biochemical oxygen demand

In particular areas (i.e. industrial sites) the monitoring of toxic substances such as heavy metals and organic chemicals (e.g., pesticides, herbicides, solvents, and PCBs) should be included.

The parameters most commonly monitored in streams are discussed in detail below. They include stream flow, dissolved oxygen, temperature, pH, turbidity, phosphorus, nitrates, total solids, conductivity, total alkalinity, and fecal bacteria. Of these, the first five are the most common ones.

Relatively inexpensive and simple-to-use kits are available on the market to monitor these pollutants. Meters and sophisticated lab equipment may be more accurate, but they are also more expensive, less flexible (e.g., meters generally have to be read in the field), and require periodic calibration. Table 2 lists methods available for monitoring key parameters, including the preferred testing site (lab or field).

Table 2: Lists of methods available for monitoring key parameters

Method	Location (Lab or Field)	Comments
Dissolved Oxygen (DO)		
Meter	Field	The meter is fragile and must be handled carefully
Temperature		
Thermometer	Field	Cannot be done in the lab
pH		
Color comparator	Either	If lab, measured ASAP within 2 hours of collection
pH "Pocket Pal"	Either	If lab, measured ASAP within 2 hours of collection
Meter	Either	If lab, measured ASAP within 2 hours of collection
Turbidity		
Meter	Either	If lab, measured ASAP within 24 hours of collection
Total Orthophosphate		
Ascorbic Acid w/ color comparator	Either	If lab, measured within 48 hours of collection
Ascorbic acid w/ spectrophotometer	Either	If lab, measured within 48 hours of collection
Nitrate		
Cadmium reduction w/ color comparator	Either	If lab, measured within 48 hours of collection
Cadmium reduction w/ spectrophotometer	Either	If lab, measured within 48 hours of collection
Total Solids		
Oven drying/weighing	Lab	Must be measured within 7 days of collection
Conductivity		
Meter	Either	If lab, measured ASAP within 28 days of collection
Total Alkalinity		
Titration	Either	If lab, measured within 24 hours of collection
Fecal Bacteria		
Membrane filtration	Lab	Must be measured within 6 hours of collection

Additional measurements of COD and BOD5 could be required in particular condition of potential pollution deriving from industry emissions.

Finally it is worth to note that a correct sampling procedure is crucial for the reliability of the results.

List of Technology Offers (TO) from BBS Database

BBS code	Title	Enterprise	IRC
07 DE NDBA 0HZT	Integrated Environmental Monitoring and Disaster Management	A German company	IRC Northern Germany
07 IE IEEI 0I2H	Innovative non-contact Water Monitoring Equipment	An Irish university	IRC Ireland
06 IT LADA 0FHW	Method for the detection of coliform bacteria and in particular Escherichia coli	An Italian research institute	IRC CIRCE
028.OT.GR.APRE	Water and wine quality automatic analyser	An Italian SME	IRC CIRCE
NDC 110	Water quality monitoring and risk management system	A Greek company	IRC Hellenic
06 DE NDBA 0GQO	Water management – a brand-new approach for the water resources management	a German SME	IRC Northern Germany
06 DK DKEJ 0GB9	Passive water quality sampling technology by in-situ controlled solid phase extraction	A small Danish company	IRC Denmark

2.2 TR 2: Removal of solid and colloidal dispersions from raw water for drinking water

BBS code : *06 HU HUBU 0GWM*

Comments about BAT

a. General remarks

Natural fresh waters are not pure, but contain dissolved minerals, suspended matters and sometimes harmful bacteria. The sources for water are often drawn from rivers and lakes for cities and from groundwater wells in more rural areas. Such water is generally unsafe to drink without treatment. Membrane application constitutes the preferable technology for removal of solid and colloidal dispersions. A lot of membrane for drinking water applications are now available on the market. Main advantages of membrane application are reported in the following:

- Physical barrier to prevent Cryptosporidium, Giardia, bacteria, turbidity, and suspended solids without the need for chemical pre-treatment.
- Flexibility to handle changing feed water conditions and capacity demand increases.
- Simple automated operation ensuring system integrity is met and allowing operators advanced notice of potential maintenance.
- Lowest Life Cycle Costs as compared to most conventional technologies.

b. Membrane Process Overview

Step 1 – Normal Filtration

Filtration takes place from the outer surface of the fiber to the hollow inner core, or lumen. Filtered water passes through the wall of the fibers while particulates in the feed stream are retained on the outside of the fiber wall. Particles larger than 0.1 microns are retained on the outside surface of the fibers.

Step 2 – Automated Backwash

Backwashing commences automatically after a set interval (usually 15-60 minutes) for a set duration of 90 seconds. The backwash cycle interval and duration are dependent upon feedwater conditions and are operator adjustable. During a backwash, both filtrate water and air are used to scour the membrane surface.

Units are then drained to ensure harmful protozoa and bacteria are removed before returning to normal filtration.

Step 3 – Chemical Cleaning

Periodically, chemical cleaning is needed to dissolve or detach the accumulated particles on the membrane surface that cannot be dislodged by backwashing.

All membranes are made of oxidant-tolerant materials, therefore, chlorine is typically used in cleaning. A low-strength acid is also used to help remove inorganics.

Once the cleaning process is complete, the system automatically initiates a backwash to ensure all chemicals are removed before returning to normal filtration.

Step 4 – Membrane Integrity Testing

Typically membranes provide a physical barrier able to achieve reliable removal of Cryptosporidium, Giardia, and other harmful microorganisms. The key to this physical barrier is the ability to test fiber integrity using a direct integrity test, called an Air Hold Test. This on-line, automated test uses compressed air to detect any flaw in a membrane fiber, seal or o-ring. All membranes use an air pressure of 14 psi (96 kPA) to detect a 3-micron break, ensuring pathogen rejection.

List of Technology Offers (TOs) from BBS Database

BBS code	**Title**	**Enterprise**	**IRC**
07 FR IAPL 0HXT	Online monitoring station, detecting and quantifying micro organic pollutants in raw and treated water	A French company	Centr'Atlantic
07 NL NLSE 0J2M	Drinking water purification technology without connected electrical power	A Dutch SME	IRC-NL
07 LV LVTC 0IUX	Rapid method for detection of E. coli in drinking water and biofilm	A Latvian research group	IRC Latvia
07 DE BYBI 0INN	Water treatment systems for swimming pools and drinking water using ultra filtration	A German SME	IRC Bavaria
TO-MLT-ENV-014	Technical Know-how and Expertise for the production of Drinking Water and Process Water using Reverse Osmosis	A Maltese consultancy firm	IRC North Rhine-Westphalia/Ma

	Technologies		lta
07 DE DSBT 0I7B	Bio-composite materials as intelligent filter systems for water treatment	A Saxon research institute	IRC Saxony
07 SE CSAL 0HX9	Cleaning and disinfecting treatment of water	A Swedish SME	IRC Central Sweden
06 ES MADG 0GVF	Innovative filter for water and other liquids with automatic clearing procedure	A Spanish public university	IRC Madrid
05 FR SOCM 0D5E	Ultra filtration membrane and process for water and wastewater treatment	A French technology company	IRC South West France

2.3 TR 3: Modular system for filtration of surface water for drinking water

BBS code : *O6 HU HUBU 0GWN*

Comments about BAT

a. General remarks

Filters for removing impurities from a fluid flow are well known and used in many applications. They are also used to remove particles and bacteria to purify the water, thus making it suitable for drinking.

Filtration systems treat water by passing it through beds of granular materials (e.g. sand) that remove and retain contaminants. Conventional, direct, slow sand, and diatomaceous earth filtration systems all do a good job of removing most protozoa, bacteria, and viruses (if coagulation is used). Bag and cartridge filters generally do not remove any viruses and few bacteria.

Conventional filtration is a multistage operation. First, a chemical coagulant such as iron or aluminium salts is added to the source water. The mixture is then stirred to induce tiny suspended particles to aggregate to form larger and more easily removable clots. These coagulated masses, or "flocs," are then allowed to settle out of the water, taking many contaminants with them. Once these processes are complete, water is passed through filters so that remaining particles attach themselves to filter material.

Direct filtration is similar to conventional filtration, except that after the coagulant is added and the mixture stirred, there is no separate settling phase. Rather, the suspended particles are destabilized by the coagulant and thus attach more readily to the filter material when the water is then filtered.

Slow sand filtration systems have no coagulation and, usually, no sedimentation step. Water is induced to pass slowly downward through a bed of sand some two to four feet (0.6 to 1.2 meters) deep. A biologically active layer forms along the upper surface of the sand bed, trapping small particles and degrading some organic contaminants (Figure1).

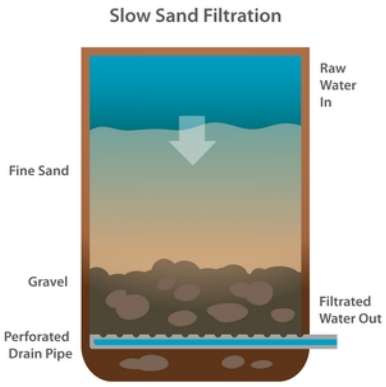

Figure 1: Example of a slow sand filter unit

Biosand filtration is a point-of-use analog to slow sand filtration, but its effectiveness is much less well established than the latter.

Diatomaceous earth filtration uses the fossil shells of tiny marine organisms as the filter through which raw source water is fed. The earth physically filters particle contaminants from the water (Figure 2).

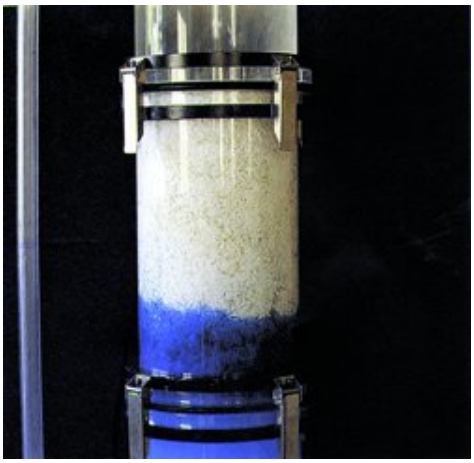

Figure 2: Example of a diatomaceous earth filter unit

Bag and cartridge filters are simple and easy-to-operate systems that use a woven bag or a cartridge with a wound filament filter or pleated filter to physically strain microbes and sediment from source water.

A typical filtration unit includes:

⇨ an intake pump on a small pontoon deployed inside the water source.

⇨ a clarifier

⇨ a mixing tank.

- ⇨ a dosing pump.
- ⇨ sand filters.
- ⇨ a collection tank, which can be used for direct water supply. Provision is made for connection to an elevated tank.

The control system is generally simple, consisting basically of switching on the supply pump and then adjusting valves.

List of Technology Offers (TOs) from BBS Database

BBS code	**Title**	**Enterprise**	**IRC**
07 FR IAPL 0HXT	Online monitoring station, detecting and quantifying micro organic pollutants in raw and treated water	A French company	Centr'Atlantic
07 NL NLSE 0J2M	Drinking water purification technology without connected electrical power	A Dutch SME	IRC-NL
07 LV LVTC 0IUX	Rapid method for detection of E. coli in drinking water and biofilm	A Latvian research group	IRC Latvia
07 DE BYBI 0INN	Water treatment systems for swimming pools and drinking water using ultra filtration	A German SME	IRC Bavaria
TO-MLT-ENV-014	Technical Know-how and Expertise for the production of Drinking Water and Process Water using Reverse Osmosis Technologies	A Maltese consultancy firm	IRC North Rhine-Westphalia/Malta
07 DE DSBT 0I7B	Bio-composite materials as intelligent filter systems for water treatment	A Saxon research institute	IRC Saxony
07 SE CSAL 0HX9	Cleaning and disinfecting treatment of water	A Swedish SME	IRC Central Sweden
05 FR SOCM 0D5E	Ultra filtration membrane and process for water and wastewater treatment	A French technology company	IRC South West France

2.4 TR 4: Removal of ammonia, arsenic, boron or nitrites from raw water intended to be used as drinking water

BBS code : *06 HU HUBU 0GWF*

Comments about BAT

General remarks

Several methods are available for nitrogen compound removal, a selection is reported in the following on the base on the efficiency and costs.

Removal of ammonia from drinking water by biological nitrification

To reach acceptable efficiencies the biological process has to be realized in biofilm reactors that is operating with attached biomass. Common silica sand covered with manganese oxides is used as support/filtration material. Manganese oxides layer serves as a rough support for the biofilm of nitrifying bacteria that are not thus removed from the packing during backwashing. Ammonia is under controlled conditions biologically oxidized to nitrate. Long term operational results showed that concentration of ammonia up to 3 mg/L can be removed with higher than 90 % efficiency. For a concentration of ammonia higher than 3 mg/L in raw water two step technology has to be applied (1st aeration, 1st filtration, 2nd aeration, 2nd filtration). Practicability of the two-step arrangement was also successfully verified in full scale.

The biological oxidation of ammonia is performed also in fluidized bed reactors having one type of biofilm supporting material: sand or granular activated carbon (GAC), in this case the process efficiency can be increased due to the presence of activated carbon acting as adsorbent medium.

Removal of ammonia from drinking water by ion exchange

The ion exchange process is performed with synthetic resin ion exchanger of the Na-type (strongly acid cationic ion exchange resin) or using Zeolites.

Zeolites are natural minerals, which can be described chemically as aluminum silicates. They are used for various applications, e.g., ion exchange, molecular sieves, and air-drying.

In the regular structure of silicates a few places are occupied by aluminum ions, and so an additional charge is caused. This charge is compensated by other ions like sodium, potassium or ammonia, which are reversibly fixed by interactions and can easily be exchanged by other ions. The composition of this structure leads to various forms of zeolites. Of all these zeolite types, clinoptilolite has the best selectivity for ammonia. Preparing clinoptilolite so that all exchange places are filled with sodium ions results in a form with the best selectivity for ammonia.

Know how related to arsenic removal from raw water intended to be used as drinking water

The arsenic removal technologies perform most effectively when treating arsenic in the form of As(V). As (III) may be converted through pre-oxidation to As(V). Data on oxidants indicate that chlorine, ferric chloride, and potassium permanganate are effective in oxidizing As(III) to As(V). Pre-oxidation with chlorine may create undesirable concentrations of disinfection by-products. Ozone and hydrogen peroxide should oxidize As(III) to As(V), but no data are available on performance.

- ✓ Coagulation/Filtration (C/F)

It is an effective treatment process for removal of As(V) according to laboratory and pilot-plant tests. The type of coagulant and dosage used affects the efficiency of the process. Within either high or low pH ranges, the efficiency of C/F is significantly reduced. Alum performance is slightly lower than ferric sulphate. Other coagulants were also less effective than ferric sulfate. Disposal of the arsenic-contaminated coagulation sludge may be a concern especially if nearby landfills are unwilling to accept such a sludge.

- ✓ Lime Softening (LS)

When operated within the optimum pH range of greater than 10.5 it is likely to provide a high percentage of As removal for influent concentrations of 50 µg/L. However, it may be difficult to reduce consistently to 1 µg/L by LS alone. Systems using LS may require secondary treatment to meet that goal.

- ✓ Activated Alumina (AA)

It is effective in treating water with high total dissolved solids (TDS). However, selenium, fluoride, chloride, and sulphate, if present at high levels, may compete for adsorption sites. AA is highly selective towards As(V); and this strong attraction results in regeneration problems, possibly resulting in 5 to 10 percent loss of adsorptive capacity for each run. Application of point-of-use treatment devices would need to consider regeneration and replacement.

- ✓ Ion Exchange (IE)

It can effectively remove arsenic. However, sulphate, TDS, selenium, fluoride, and nitrate compete with arsenic and can affect run length. Passage through a series of columns could improve removal and decrease regeneration frequency. Suspended solids and precipitated iron can cause clogging of the IE bed. Systems containing high levels of these constituents may require pretreatment.

- ✓ Reverse Osmosis (RO)

It provides removal efficiencies of arsenic greater than 95% when operating pressure is at ideal psi. If RO is used by small systems in the western U. S., 60% water recovery will lead to an increased need for raw water. The water recovery is the volume of water produced by the process divided by the influent stream (product water/influent stream). Discharge of reject water or brine may also be a concern. If RO is used by small systems in the western U. S., water recovery will likely need to be optimized due to the scarcity of water resources. The increased water recovery can lead to increased costs for arsenic removal.

- ✓ Electrodialysis Reversal (EDR)

It is expected to achieve removal efficiencies of 80%. One study demonstrated arsenic removal to 3 μg/L from an influent concentration of 21 μg/L.

- ✓ Nanofiltration (NF)

It is capable of arsenic removals of over 90%. The recoveries ranged between 15 to 20%. A recent study showed that the removal efficiency dropped significantly during pilot-scale tests where the process was operated at more realistic recoveries. If nanofiltration is used by small systems in the western U. S., water recovery will likely need to be optimized due to the scarcity of water resources. The increased water recovery can lead to increased costs for arsenic removal.

List of Technology Offers (TOs) from BBS Database

BBS code	**Title**	**Enterprise**	**IRC**
07 FR IAPL 0HXT	Online monitoring station, detecting and quantifying micro organic pollutants in raw and treated water	A French company	Centr'Atlantic
07 NL NLSE 0J2M	Drinking water purification technology without connected electrical power	A Dutch SME	IRC-NL
07 LV LVTC 0IUX	Rapid method for detection of E. coli in drinking water and biofilm	A Latvian research group	IRC Latvia
07 DE BYBI 0INN	Water treatment systems for swimming pools and drinking water using ultra filtration	A German SME	IRC Bavaria
TO-MLT-ENV-014	Technical Know-how and Expertise for the production of Drinking Water and Process Water using Reverse Osmosis Technologies	A Maltese consultancy firm	IRC North Rhine-Westphalia/Malta
07 DE DSBT 0I7B	Bio-composite materials as intelligent filter systems for water treatment	A Saxon research institute	IRC Saxony
07 SE CSAL 0HX9	Cleaning and disinfecting treatment of water	A Swedish SME	IRC Central Sweden
06 GB WADA 0G9Z	Electrochemical water treatment - contaminant removal	A Welsh company	WIRC

2.5 TR 5: Removal of microorganism from raw water for drinking water (disinfection)

BBS code : *06 HU HUBU 0GWH*

Comments about BAT

General remarks

Meeting the goal of clean, safe drinking water requires a multibarrier approach that includes protecting raw source water from contamination, appropriately treating raw water, and ensuring safe distribution of treated water to consumers' taps. Water is treated to render it suitable for human use and consumption. Water treatment involves two types of processes: physical removal of solids (mainly mineral and organic particulate matter) and chemical disinfection (killing/inactivating microorganisms). While the primary goal is to produce a biologically (disinfected) and chemically safe product, other objectives also must be met, including: no objectionable taste or odour; low levels of colour and turbidity (cloudiness); and chemical stability (non-corrosive and non-scaling). Individual facilities customize treatment to address the particular natural and manmade contamination characteristic of their raw water. Surface water usually presents a greater treatment challenge than groundwater, which is naturally filtered as it percolates through sediments.

Methods commonly used for the disinfection of drinking water are base on ozone addition, UltraViolet light treatment and chlorine addition. The last one is the most diffused and it can be applied in several forms: elemental chlorine (chlorine gas), sodium hypochlorite solution (bleach) and dry calcium hypochlorite. Fields of applications and costs of the above methods are summarized in Tab. 1.

Table 1 – Applications and relative costs of different systems for drinking water disinfection

Technology	**Applications**	**Costs**
Ozone	Drinking water, pharmaceutical industry, ultra pure water	High
UV	Drinking water, process water	Very high
Chlorine compounds	Drinking water, disinfection of piping	High

- ✓ Ozone

Ozone is a colourless gas at all concentrations experienced in industry. It has a pungent characteristic odour usually associated with electrical sparks and thunder storms. The odour is generally detectable by the human nose at concentrations between 0,02 and 0,05 ppm or approx. $1/100^{th}$ of the recommended 15 minute exposure level.

Ozone is an unstable gas which decomposes to biatomic oxygen at normal temperatures. Decomposition is accelerated by contact with solid surfaces, by contact with chemical substances and by the effect of heat. Ozone is produced by ozone generators which are normally fed by oxygen generators. Ozone injection is done by diffusers or Venturi's.

Because ozone is an unstable gas, there may be danger of explosion at high temperatures in the presence of materials such as hydrogen, iron, copper and chromium. In practice, occasional fires have occurred inside ozone generators, but with the exception of experiments under extreme conditions, we know of no reports of explosions.

The following occupational exposure limits for ozone apply in the UK, other parts of Europe, the USA and Canada:

- 0,1 ppm: the limit for regular exposure for up to 8 hours per day, 5 days per week (Netherlands: 0,06 ppm);
- 0,3 ppm: exposure should be limited to 15 minutes at a time.

Advantages

- Ozone is more effective than chlorine in destroying viruses and bacteria.
- The ozonation process utilizes a short contact time (approximately 10 to 30 minutes).
- There are no harmful residuals that need to be removed after ozonation because ozone decomposes rapidly.
- After ozonation, there is no re-growth of microorganisms, except for those protected by the particulates in the wastewater stream.
- Ozone is generated onsite, and thus, there are fewer safety problems associated with shipping and handling.
- Ozonation elevates the dissolved oxygen (DO) concentration of the effluent. The increase in DO can eliminate the need for re-aeration and also raise the level of DO in the receiving stream.

Disadvantages

- Low dosage may not effectively inactivate some viruses, spores, and cysts.
- Ozonation is a more complex technology than is chlorine or UV disinfection, requiring complicated equipment and efficient contacting systems.
- Ozone is very reactive and corrosive, thus requiring corrosion-resistant material such as stainless steel.

- Ozone is extremely irritating and possibly toxic, so off-gases from the contactor must be destroyed to prevent worker exposure.
- The cost of treatment can be relatively high in capital and in power intensiveness.

a. UV

For the past 100 years science has recognized the bactericidal effects of the ultraviolet area of the electromagnetic spectrum.

The specific wavelengths responsible for this reaction are situated between 240 - 280 nanometers (referred to as nm), with a peak wavelength of 265 nm, and are known as UV-C.

When a micro-organism is exposed to LTV-C, the nuclei of the cells, due to photolytic processes, are so changed that cell division, and therefore reproduction is prevented.

UV-C production

The Ultra Violet source is basically a fused silica quartz tube, typically l5 mm to 25 mm diameter ranging from 100 mm-1.200 mm long. The inert gas with which the tube is filled, provides the primary discharge and the necessary action to excite and vaporize the miniscule deposits of mercury within.

The low pressure UV lamp is only capable of producing lines at 185 nm and 254 nm. An increase in the current supplied causes the UV lamp to rapidly heat up so increasing the mercury pressure to produce the typical medium pressure spectral output.

UV dose

The UV dose is the product of UV intensity I (expressed as energy per unit surface area) and residence time t.

Therefore: DOSE = I × t

This is commonly expressed in $\mu Ws/cm^2$.

Doubling of the dose applied will increase the destruction by a factor of 10. Therefore doubling the dose required for 90% destruction will produce 99% destruction of the target organism. Tripling the dose will produce a 99.9% destruction of the target organism and so on.

Chlorine compounds

Among chlorine compounds, chlorine dioxide is a very good alternative to the previous methods due to its characteristics.

Like ozone and chlorine, chlorine dioxide is an oxidizing biocide and not a metabolic toxin. This means that chlorine dioxide kills microorganisms by disruption of the transport of nutrients across the cell wall, not by disruption of a metabolic process.

Stabilised chlorine dioxide is ClO_2 buffered in an aqueous solution. Adding an acid to the required concentration activates the disinfectant.

Of the oxidizing biocides, chlorine dioxide is the most selective oxidant. Both ozone and chlorine are much more reactive than chlorine dioxide, and they will be consumed by most organic compounds. Chlorine dioxide however, reacts only with reduced sulphur compounds, secondary and tertiary amines, and some other highly reduced and reactive organics. This allows much lower dosages of chlorine dioxide to achieve a more stable residual than either chlorine or ozone. Chlorine dioxide can be effectively used in much higher organic loading than either ozone or chlorine because of its selectivity.

The effectiveness of chlorine dioxide is at least as high as chlorines, though at lower concentrations. But there are more and important advantages.

1. The bactericidal efficiency is relatively unaffected by pH values between 4 and 10;
2. Chlorine dioxide is clearly superior to chlorine in the destruction of spores, bacteria's, viruses and other pathogen organisms on an equal residual base;
3. The required contact time for ClO_2 is lower;
4. Chlorine dioxide has better solubility;
5. No corrosion associated with high chlorine concentrations. Reduces long term maintenance costs;
6. Chlorine dioxide does not react with NH_3 or NH_4^+;
7. It destroys THM precursors and increases coagulation;
8. ClO_2 destroys phenols and has no distinct smell;
9. It gives a better removal of iron and magnesia compounds than chlorine.
10.

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
07 IL ILMA 0IZN	Breakthrough green hydro-optic water disinfectant technology 10,000 times more effective than existing methods	An Israeli SME	IRC Israel
06 IL ILMI 0GSN	A filtration media customized on particular pollutant distribution for removing organic pollutants and	An Israeli SME	IRC Israel

	dissolved organic matter (DOM) from water		
06 DE HRTH 0FJO	Environment-friendly and cost-efficient water disinfecting units	A German company	IRC Hessen/Rheinland-Pfalz
06 GB NIIN 0G2F	A compact point-of-use water treatment module based on photocatalysis	A UK University	IRCINVESTNI

2.6 TR 6: Municipal wastewater collecting system in areas with significant difference in ground level

BBS code : *06 HU HUBU 0GV7*

Comments about BAT

General remarks

An essential consideration when small community wastewater systems are being designed is the type of sewer system that will be used to transport the wastewater to the treatment system. The collection system generally comprises 70 to 90% of the total construction costs for a new wastewater treatment system. Conventional gravity sewers were designed to serve high density urban/suburban areas. When used as part of a system that serves small or rural communities, gravity sewers often add significant and unnecessary costs and therefore it's preferable the use of an alternative wastewater collection system, or a combination of conventional and alternative systems.

Conventional sewer systems depend on gravity to deliver the sewage from each property to the treatment plant. Therefore the system's collection pipes must continuously slope downwards. Solids are not separated from the wastewater before it enters the network of collection pipes. To ensure that the pipes do not become clogged with solid material, the downward slope of the pipes must be at a steep gradient that is uniform throughout the system. The pipes must also be laid in straight alignments between manholes to ensure that when a stoppage does occur it can be readily accessed. For conventional sewer systems serving a large area, the main objective is to reduce as much as possible pumping costs considering the high flow rate. Therefore the pipe depth is generally quite high to ensure the gravity flowing and a sufficient velocity to avoid sedimentation along the pipe.

On the contrary in the design of sewer systems for small communities with elevation differences within the network, the use of lift station/s will be more convenient to transport the sewage to the higher elevation, due to the low energy consumption related to the reduced flow rate.

The principal advantage of pressure collection systems is the lower cost of installing the network of collection pipes. The network of piping for an alternative collection system can be laid in much shallower and narrower trenches. They also do not need to be laid in a straight line or with a uniform gradient. Some systems can require the separation of solids before the sewage enter the network of collection pipes. Generally speaking, the limit for adoption of pressure systems is for flow rate lower than 100 m^3/h.

The EPA estimates that communities can reduce overall collection costs by 25 to 90% adopting pressure systems for small communities, especially when:

- Many of the properties use on-site systems such as septic tanks or aerobic treatment units.
- The average lot size per property is more than one-half acre.
- There will be fewer than 100 homes per mile of sewer pipe.
- The system will serve a community on very hilly terrain.
- There are subsurface obstacles, such as bedrock or groundwater, close to the ground's surface.

Alternative collection systems

i. Small Diameter Gravity Sewers

Small diameter gravity sewers can also be based on gravity flowing to transport sewage, much like the conventional sewers do. However, small diameter gravity sewers are always preceded by a septic tank. The settling that first occurs in the septic tank eliminates much of the inconveniences in the sewers due to solids deposition. This enables the collection pipes to have a smaller diameter and a more gradual incline. The pipes used are made of light weight plastic and can be buried at a relatively shallow depth. Manholes are not required for small diameter gravity systems; instead, clean out ports are used to service collector pipes. When it is necessary for the flow to be directed upwards, effluent pumps can be utilized to move the wastewater to higher elevations. High level water alarms are normally installed in the septic tanks to alert property owners of any potential problems within their part of the system.

Small diameter gravity sewers are well suited for communities where the houses are far apart, or where most houses are served by an existing septic tank. Operation and maintenance costs for small diameter gravity sewer systems are compatible to that of conventional gravity systems. Depending on the size of the system, one to two persons can be employed on a part-time basis to handle operation and maintenance, although at least one person should be on call at all times. The only additional maintenance requirement is the periodic pumpout of the septic tanks to clean it from solids deposition, which is usually done every three to five years by a contractor hired by the community.

ii. Pressure Sewers

Instead of relying on gravity, pressure sewers utilize the force supplied by pumps, which deliver the wastewater to the system from each property. Since pressure sewers do not rely on gravity, the systems network of piping can be laid in very shallow trenches that follow the contour of the land.

There are two kinds of pressure sewer systems, based upon the type of pump used to provide the pressure. Systems that use a combination of septic tank with an effluent pump are referred to as STEP pressure sewers. Like the small diameter gravity system, STEP pressure sewers utilize septic tanks to settle out the solids; this allows for the use of piping that is extremely narrow in diameter. The effluent pump delivers the wastewater to the sewer pipes and provides the necessary pressure to move it through the system.

The other type of pressure sewer uses a grinder pump. Wastewater from each property goes to a tank containing a pump with grinder blades that shred the solids into tiny particles. Both solids and liquids are then pumped into the sewer system. Because the effluent contains a mixture of solids as well as liquids, the diameter of the pipes must be slightly larger. However, grinder pumps eliminate the need to periodically pump the septic tanks for all the properties connected to the system. Both

the STEP and grinder systems are installed with high water alarms. Because of the addition of the pumps, pressure sewers tend to require more operation and maintenance than small diameter gravity sewers. Operators can usually be hired on a part time basis, as long as someone is on call at all times. Operators will need training on both the plumbing and electrical aspects of the system.

iii. Vacuum Sewers

Wastewater from one or more homes flows by gravity to a holding tank known as the valve pit. When the wastewater level reaches a certain level, sensors within the holding tank open a vacuum valve that allows the contents of the tank to be sucked into the network of collection piping. There are no manholes with a vacuum system; instead, access can be obtained at each valve pit. The vacuum or draw within the system is created at a vacuum station. Vacuum stations are small buildings that house a large storage tank and a system of vacuum pumps.

Vacuum sewer systems are limited to an extent by elevation changes of the land. Rolling terrain with small elevation changes can be accommodated, yet steep terrain would require the addition of lift stations like those used for conventional sewer systems. It is generally recommended that there be at least 75 properties per pump station, for the use of a vacuum sewer system to be cost effective. This minimum property requirement tends to make vacuum sewers most conducive for small communities with a relatively high density of properties per acre. The maintenance and operation of this system requires a full-time system operator with the necessary training. This can make the operation and maintenance costs of vacuum sewers exceed those of other systems.

iv. Conclusion

Some communities may find that their wastewater collection needs cannot be adequately met by any one particular system. It is often the case that a combination of various systems, including conventional systems, will be needed to overcome all the site limitations for the lowest cost. An important fact to remember when considering alternative systems is that they tend to require a greater amount of participation by the homeowner. Therefore, the need for community involvement in the choice of systems is important. Questions concerning homeowner maintenance requirements, or the possibility of hiring a contractor to routinely service the system for the community, need to be discussed before any final decisions are made.

Lift stations

Lift stations contain pumps, valves, and electrical equipment necessary to pump wastewater from lower to higher elevation through pipes. For example, a sewage lift station is used to pump sewage or wastewater up hill from a low-lying neighbourhood to a collection system of pipes.

Wastewater systems typically use gravity to transport waste from homes and businesses to provide water treatment at a central facility. For cities that have many changes in elevation, municipalities must use lift stations to pump the wastewater to a higher elevation. A sewer lift station is frequently used by municipalities to control the sewage treatment across several areas or neighbourhoods. A sewer lift station pumps the effluent to a collection area, ensuring that waste from lower elevation areas is processed. A wastewater lift station typically comprises a concrete well that is fitted with several submersible pumps. Lift station design also include incorporating level-sensing probes, valves and pressure sensors, and may also include a stand-by generator.

Lift stations must function in harsh and corrosive environments and are typically made of precast concrete with the pumps and valves accessible through a hatch for cleaning and maintenance.

All sewage must flow through the collection system pipes to the wastewater treatment plant by gravity flow. If a neighbourhood is located at a lower elevation than the nearest collection system,

the sewage must be pumped up hill to the nearest sanitary sewer manhole. Sanitary sewer lift stations pump sewage "uphill" to the collection system 24 hours a day, seven days a week.

i. Advantages

Lift stations are used to reduce the capital cost of sewer system construction. When gravity sewers are installed in trenches deeper than three meters (10 feet), the cost of sewer line installation increases significantly because of the more complex and costly excavation equipment and trench shoring techniques required. The size of the gravity sewer lines is dependent on the minimum pipe slope and flow. Pumping wastewater can convey the same flow using smaller pipeline size at shallower depth, and thereby, reducing pipeline costs.

ii. Disadvantages

Compared to sewer lines where gravity drives wastewater flow, lift stations require a source of electric power. If the power supply is interrupted, flow conveyance is discontinued and can result in flooding upstream of the lift station. It can also interrupt the normal operation of the downstream wastewater conveyance and treatment facilities. This limitation is typically addressed by providing an emergency power supply.

Key disadvantages of lift stations include the high cost to construct and maintain and the potential odours and noise.

iii. Wastewater pumps

The number of wastewater pumps and associated capacity should be selected to provide head-capacity characteristics that correspond as nearly as possible to wastewater quantity fluctuations. This can be accomplished by preparing pump/pipeline system head-capacity curves showing all conditions of head (elevation of a free surface of water) and capacity under which the pumps will be required to operate.

In areas with big differences in ground level, the collected wastewater needs to be lifted to the highest altitude just to permit a continuous gravity flow to the central treatment plant.

iv. Design criteria

Cost effective lift stations are designed to:

(1) match pump capacity, type, and configuration with wastewater quantity and quality;

(2) provide reliable and uninterruptible operation;

(3) allow for easy operation and maintenance of the installed equipment;

(4) accommodate future capacity expansion;

(5) avoid septic conditions and excessive release of odours in the collection system and at the lift station;

(6) minimize environmental and landscape impacts on the surrounding residential and commercial developments;

(7) avoid flooding of the lift station and the surrounding areas.

v. Odour control

A significant problem many times with lift stations is odour generation. In addition to concerns for sewer personnel exposed to accumulated gases, sewer gases left to accumulate in air-tight environments can create additional toxic gases and underground potential for explosion, stagnation, and dead space in lines. Typical odour control systems are biofilters, scrubbers or oxidation systems

like aeration. Aeration is an option to reduce odour. Many odours accumulate because of oxygen-deficient environments. The natural formation of hydrogen sulphide (H_2S) can result in major problems for today's collections departments. Among the many concerns are increased customer odour complaints, severe corrosion in collection pipeline networks, and the safety of maintenance personnel due to the toxicity of H_2S.

It's possible to prevent the formation of H_2S in lift stations with low costs of installation (rather than spend money treating it after it has been formed), with a modular system (Fig.1a) that injects a low volume oxygen stream directly into long force mains. The use of pure oxygen and the contact time in the force main allow the header to maintain a high enough dissolved oxygen to prevent reduction of these sulphates into H_2S. Further, if reduced sulphur compounds have already formed, they are oxidized into sulphates. Thus the odour problem is solved.

Fig.1a Modular oxidation system

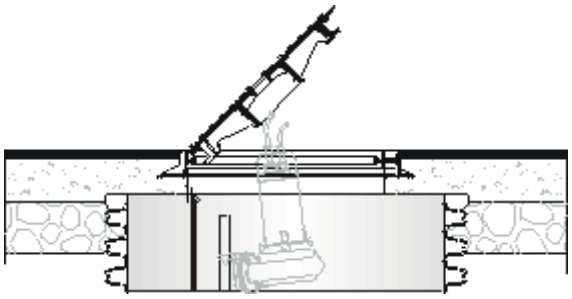

Fig.1b Lift station cover; it may contain a biofilter

vi. Construction Costs

The most important factors influencing cost are the design lift station capacity and the installed pump power. Another cost factor is the lift station complexity. Factors which classify a lift station as complex include two or more of the following:

(1) extent of excavation;

(2) congested site and/or restricted access;

(3) rock excavation;

(4) extensive dewatering requirements, such as cofferdams;

(5) site conflicts, including modification or removal of existing facilities;

(6) special foundations, including piling;

(7) dual power supply and on-site switch stations and emergency power generator.

Mechanical, electrical, and control equipment delivered to a pumping station construction site typically account for 15 to 30 percent of total construction costs. Lift station construction has a significant economy-of-scale. Typically, if the capacity of a lift station is increased 100 percent, the construction cost would increase only 50 to 55%. An important consideration is that two identical lift stations will cost 25 to 30 percent more than a single station of the same combined capacity. Usually, complex lift stations cost two to three times more than more simple lift stations with no construction complications.

vii. Operation and maintenance costs

Lift station operation and maintenance costs include power, labour, maintenance, and chemicals (if used for odour control). Usually, the costs for solids disposal are minimal, but are included if the lift station is equipped with bar screens to remove coarse materials from the wastewater. Typically, power costs account for 85 to 95% of the total operation and maintenance costs and are directly proportional to the unit cost of power and the actual power used by the lift station pumps. Labour costs average 1 to 2% of total costs. Annual maintenance costs vary, depending on the complexity of the equipment and instrumentation.

List of Technology Offers (TOs) from BBS Database

BBS code	**Title**	**Enterprise**	**IRC**
07 IT IRVI 0I0E	Containerized compact unit for domestic wastewater treatment with possible reuse for irrigation	An Italian engineering company	IRC IRENE
07 LU TSLU 0HDB	Innovative process for the treatment of wastewater and sewage	A Luxembourg company	IRC Luxembourg-Trier-Saarland
07 IT IRCR 0HKJ	Wastewater recovery	An Italian SME	IRC IRENE
06 IT MECR 0GO2	A shredder-compactor based on clean technology that triturates, compacts and reduces the volume of the urban solid waste	An Italian company	IRC MED.I.A.
07 FI FIFS 0I4M	Underground waste collection and management system for tight living blocks and places	A Finnish SME	IRC Finland
06 DE NRXE 0E2V	Know-how, expertise and technologies for collection, treatment and disposal of wastewaters	One of Germany's largest sewage disposal companies	IRC North Rhine-Westphalia/Malta
07 NL NLSE 0IS1	A manure treatment system to produce water of drinking quality	A small Dutch company	IRC-NL

2.7 TR 7: Treatment of sewage sludge from municipal wastewater

BBS code : *06 HUBU 0GV2*

Comments about BAT

Preferred technique indicated in the TR: treatment with anaerobic digestion technology.

The sludge treatment with anaerobic digestion process is generally applied for plant capacities above 30,000 person equivalent (p.e.) because the plant configuration (digester and energy recovery units) is much more complex that for aerobic treatment. Only for quite big installations energy recovery can be feasible and in this case electric energy production might alleviate the higher capital and operating costs for specialised personnel. From this prospect it is very important that sludge solid concentration is big enough to have a positive energetic balance, i.e. energy production higher than energy requirement for sludge heating from the ambient temperature to 35-37 °C.

Previous technical economical analysis demonstrated that lower potentialities do not allow a positive balance. Anaerobic digestion of sewage sludge produced in this region could be feasible only in a centralized sludge treatment plant where the sludge produced in the various small plants is delivered for treatment for example by truck. Even for a centralized treatment aerobic stabilization could be in this case more advantageous, especially if liquid sludge can be used on land, with a consequent sparing of dewatering operation.

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
07 LU TSLU 0HDB	Innovative process for the treatment of wastewater and sewage	An Italian company	IRC RECITAL
07 IT SUTC 0JEZ	A new technology for municipal and industrial wastewater treatment with low environmental impact	An Italian research institute	IRC IRIDE
06 IT LAUR 0E5W	Carbonaceous adsorbent from sewage sludge and their application in wastewater activated sludge system	An Italian university spin-off	IRC CIRCE
07 DE NRXE 0J1F	Efficient, compact effluent treatment plants with minimized sludge generation	A small German company	IRC North Rhine-Westphalia/Malta
07 SE WSIV 0HZ1	Bioreactor with multiple functions for treatment of bio waste (composting, sludge treatment, dewatering and wastewater treatment)	A Swedish company	IRC Western and Southern Sweden/Iceland
04 BE BIRC 0ATE	Targeted use of bio-fixed bacteria for water pollution treatment	A Belgian SME	BIRC for Europe
05 DE NRXE 0CMR	Improving existing Wastewater Treatment Plants and Sewerage Systems by integrated control technology	A German University of Applied Science	IRC North Rhine-Westphalia/Malta
IRCPK2003TO90	Wastewater sludge mineralising	An experienced Polish medium-size factory	IRC South Poland
06 DE NRXE 0E2V	Know-how, expertise and technologies for collection, treatment and disposal of wastewaters	One of Germany's largest sewage disposal companies	IRC North Rhine-Westphalia/Malta
07 NL NLSE 0IS1	A manure treatment system to produce water of drinking quality	A small Dutch company	IRC-NL

2.8 TR 8: Treatment of municipal wastewater using biological fluid bed, bio-disks, membranes, pure oxygen or modified zeolites

BBS code : *06 HU HUBU 0GV6*

Comments about BAT

Also in this case the application of quite complex and expensive technologies (i.e. membrane or pure oxygen) for so low capacities is questionable at least considering the less stringent limits for the discharges into receiving waters than those of Directive 91/271 (COD 200-300 mg/L and BOD_5 50-80 mg/L). More stringent limits on nutrients are instead considered (NH_4-N 2-20 mg/L and total P 0.7-10 mg/L) even if in a quite large range of variability (about one order of magnitude). The BATs are strongly dependent on these limits so the approach for treatment has to be different: for the higher values limits for BOD_5, COD and nutrients can be easily achieved by conventional biological plants i.e. activated sludge operating with suspended biomass, or, depending on the influent characteristics, utilizing attached biomass systems like bio-disks and trickling filters. For the most stringent limits more efficient treatments as membrane, pure oxygen or modified zeolites could be necessary. For activated sludge plants performance could be improved by adding in the aeration thank support particles where microorganisms can grow in the attached form. A more efficient action could be also achieved by the addition of activated carbon that can acts both as adsorbent medium and support for biofilm development. In this case removal of organic micropollutants can also be performed.

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
07 LU TSLU 0HDB	Innovative process for the treatment of wastewater and sewage	An Italian company	IRC RECITAL
07 IT SUTC 0JEZ	A new technology for municipal and industrial wastewater treatment with low environmental impact	An Italian research institute	IRC IRIDE
06 IT LAUR 0E5W	Carbonaceous adsorbent from sewage sludge and their application in wastewater activated sludge system	An Italian university spin-off	IRC CIRCE

07 DE NRXE 0J1F	Efficient, compact effluent treatment plants with minimised sludge generation	A small German company	IRC North Rhine-Westphalia/Malta
07 SE WSIV 0HZ1	Bioreactor with multiple functions for treatment of bio waste (composting, sludge treatment, dewatering and wastewater treatment)	A Swedish company	IRC Western and Southern Sweden/Iceland
07 NL NLSE 0IS1 .	A manure treatment system to produce water of drinking quality	A small Dutch company	IRC-NL
04 BE BIRC 0AT	Targeted use of bio-fixed bacteria for water pollution treatment	A Belgian SME	BIRC for Europe
06 NL NLSE 0GJI	Space-saving technology for treatment of wastewater	A Dutch company	IRC-NL
UK LSEIRC TO 2003-18	Innovative wastewater treatment processes	A UK SME	SEEIRC
05 SE CSAA 0C9G	Clean water; natural oxygenation and biological balance	A Swedish SME	IRC Central Sweden
06 GB WADA 0G9Z	Electrochemical water treatment - contaminant removal	A Welsh company	WIRC
05 FR SOCM 0D5E	Ultra filtration membrane and process for water and wastewater treatment	A French technology company	IRC South West France
TO2026	Micro-flotation wastewater technologies	A German engineering company	IRC North Rhine-Westphalia/Malta
06 GB WADA 0FNZ	Advanced packaged sewage treatment plant to serve communities and developments where there are no main drainage connections	A Welsh SME	WIRC

05 DE NRXE 0CMR	Improving existing Wastewater Treatment Plants and Sewerage Systems by integrated control technology	A German University of Applied Science	IRC North Rhine-Westphalia/Malta
06 GB NIIN 0F40	Submerged membrane bioreactor technology for wastewater treatment	A UK SME	IRCINVESTNI
06 ES CACI 0F6G	Wastewater treatment by electrocoagulation	A Spanish technology centre	IRC Catalonia
05 DE NSNA 0C0D	Sewage treatment in aquaculture	A company from Northwest Germany	IRC Lower Saxony/Saxony-Anhalt
06 FR IAAC 0EGB	New one-tank Sequencing Batch Reactor (SBR) to public and industrial wastewaters	A French industrial SME	Centr'Atlantic
06 SE CSAL 0E1U	Purification plant	A small Swedish SME	IRC Central Sweden
06 DE NRXE 0E2V	Know-how, expertise and technologies for collection, treatment and disposal of wastewaters	One of Germany’s largest sewage disposal companies	IRC North Rhine-Westphalia/Malta

2.9 TR 9: Municipal wastewater collecting system with transfer station

BBS code : *06 HU HUBU 0GV8*

Comments about BAT

Not available.

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
07 LU TSLU 0HDB	Innovative process for the treatment of wastewater and sewage	An Italian company	IRC RECITAL
07 IT SUTC 0JEZ	A new technology for municipal and industrial wastewater treatment with low environmental impact	An Italian research institute	IRC IRIDE
06 IT LAUR 0E5W	Carbonaceous adsorbent from sewage sludge and their application in wastewater activated sludge system	An Italian university spin-off	IRC CIRCE
07 DE NRXE 0J1F	Efficient, compact effluent treatment plants with minimised sludge generation	A small German company	IRC North Rhine-Westphalia/Malta
07 SE WSIV 0HZ1	Bioreactor with multiple functions for treatment of bio waste (composting, sludge treatment, dewatering and wastewater treatment)	A Swedish company	IRC Western and Southern Sweden/Iceland
05 DE NRXE 0CMR	Improving existing Wastewater Treatment Plants and Sewerage Systems by integrated control technology	A German University of Applied Science	IRC North Rhine-Westphalia/Malta

06 DE NRXE 0E2V	Know-how, expertise and technologies for collection, treatment and disposal of wastewaters	One of Germany's largest sewage disposal companies	IRC North Rhine-Westphalia/Malta
07 NL NLSE 0IS1	A manure treatment system to produce water of drinking quality	A small Dutch company	IRC-NL

2.10 TR 10: Removal of solid and colloidal dispersions from wastewater

BBS code : *06 HU HUBU 0GVP*

Comments about BAT

Preferred technologies in the TR: treatment with mechanical process, micro filtration or membrane techniques.

Microfiltration and membranes are usually utilized to reach very low TSS concentrations in the effluent. The specified values 75 -100 mg/L TSS are not so stringent and therefore such limits can be reached with conventional treatments like sedimentation eventually assisted by addition of precipitant chemicals. The application of filtration and membrane technologies is suggested only in particular sensitive areas requiring lower TSS limits. Preferred technology for solid removal from effluent wastewater is the use of sand filtration (dual media).

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
07 IT TUPR 0HBF	Purification of finishing wastewater and recycling of the treated water in the production department	An Italian research centre	IRC RECITAL
07 IL ILMI 0JFT	Innovative wastewater treatment system for heavy metals, removing metal ions by inducing sedimentation, without the use of any chemicals	An Israeli SME	IRC Israel

6 IT TUPR 0FJ3	Wastewater treatment and recycle in the processes of wet textile dyeing	An Italian research centre	IRC RECITAL
07 NL NLSE 0IS1	A manure treatment system to produce water of drinking quality	A small Dutch company	IRC-NL

2.11 TR 11: Centralized collection of municipal wastewater and transport to treatment plants

BBS code : *06 HU HUBU 0GVQ*

Comments about BAT

Not available

List of Technology offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
07 IT IRVI 0I0E	Containerized compact unit for domestic wastewater treatment with possible reuse for irrigation	An Italian engineering company	IRC IRENE
07 LU TSLU 0HDB	Innovative process for the treatment of wastewater and sewage	A company based in Luxembourg	IRC Luxembourg-Trier-Saarland
07 NL NLSE 0IS1	A manure treatment system to produce water of drinking quality	A small Dutch company	IRC-NL

3. List of providers

Enterprise	Mission	Contacts
„KIS" Engineering and Trading Ltd.		Address: H-3792 Sajóbábony, Gyártelep - HUNGARY Phone: (+36 46) 549-010 Fax: (+36 46) 549-238 E-mail: kiskft@kiskft.hu Website: www.kiskft.hu
A.C.S. Aqua-Care-Sytems GmbH	Environmental; water and wastewater	Am Klingenweg 12 Walluf D-65396 Germany Tel. +49 61 23990605 Fax: +49 61 23990608 kontakt@acs-water.de www.acs-water.de
agiplan GmbH	Environmental; water and wastewater	Kölner Straße 80-82 D-45481 Mülheim a.d. Ruhr DE Phone +49 208 99 25 242 E-mail BWolter@agiplan.de Web www.agiplan.de
agiplan Hungaria Kft.	Environmental; water and wastewater	Szalay u. 5/A H-1025 Budapest HU Phone +36 1 374 00 24 Fax +36 1 374 00 22 E-mail gpasztelyak@agiplan.de
AQUABIOTEC GmbH	Water and wastewater treatment	Maria-Goeppert-Str. 1 23562 Lübeck / Germany Phone: +49 (0) 451/29 03-140 Fax: +49 (0) 451/29 03-145 info@aquabiotec.com www.acquabiotec.com
ASIO, Ltd.	Wastewater treatment	Turanka 1 627 00 Brno CZ Phone: +420545423538 Fax: +420545423530 E-mail: info@asio.cz Web: www.asiogroup.com
AV Aggerwasser GmbH	Wastewater treatment, sewage plants, membrane process	Fabrikstrasse 1 – 51643 Gummersbach (Germany) Tel.: 02261 91 55 20 Fax: 02261 91 55 230 info@aggerwasser.de www.aggerwasser.de

BIOCONSULTING	Solutions for environmental problems,; bioprocesses, bio-treatment of complex effluents, wastegases and sludge	38, Kolner Str., 51379, Leverkusen – Germany Contact: DR Imre PASCIK Tel +49 2173 938715 imrepascik@web.de www.biocons.de
ChemTech Consulting GmbH	Environmental technologies, biotechnology	Chemtech GmbH Am Goldmorgen 21 41469 Neuss Tel.: 02137-77153 Fax: 02137-77153 mail: info@chemtech-gmbh.de www.chemtec-gmbh.de
– OZONIA Ltd. – (Degrémont Technologies)	UV and ozone disinfection systems (disinfection of water and wastewater).	Stettbachstrasse 1 8600 Dübendorf Switzerland Tél. : + 41 44 801 8511 Fax : +41 44 801 8501 Email: info-ozoniaCH@degtec.com www.degremont-technologies.com
enviplan Ingenieurgesellschaft mbH	Medium-scale manufacturing enterprise in machine and process plant construction	Dammstraße 21 D-33165 Lichtenau-Henglarn Phone +49 (5292) 9869-0 Fax +49 (5292) 9869-10 mail@enviplan.de www.enviplan.de
FM Environmental (Malta) Ltd	Design, manufacturing and supplies of water/wastewater treatment systems.	Water Technology House A15B Industrial Estate, Marsa LQA06 (Malta) Tel. +356 2122 6172 Fax. +356 2122 6173 fm@fmenvironmental.com.mt marketing@fmenvironmental.com.mt www.fmenvironmental.com.mt
FRÜHWALD Ltd.	Engineering structures made of concrete, units for wastewater treatment	Epreskert út 2. H-4244 Újfehértó HU – Hungarian subsidiary of the Austrian company Phone +36-42-291-0042 Fax: +36-42-291-819 E-mail: lissberger@fruehwald.co.at
GB Filters Ltd	Water filtration	37, Hanbury Rd CM1 3AE Chelmsford GB Phone: +441245 240880 Fax: +441245 290518

		E-mail: peter.noyce@gb-filters.com Web: www.gb-filters.com
GYULAVÁRI CONSULTING Kft.	Wastewater treatment	1051 Budapest, Nádor u.8. HU Phone +36 30 210 76 62, +36 23 545 187 Fax +36 23 370 488 E-mail: Gyulavari@t-online.hu
Hydro2 GmbH	Biological wastewater treatment plants with pure oxygen aeration and biofilter	Wasgenring 70 4055 Basel CH Phone: +41 61 382 20 44 Fax: +41 61 321 86 17 E-mail: cnolte@hydro2.ch Contact: Mr Christof Nolte
Idrabel sprl - bvba	European biotechnology company which develops and supplies products to treat all industrial and municipal organic pollution in water and soil.	Rue Saint-Denis 51 Saint-Denisstraat 51 1190 Bruxelles - Brussel tel 32 (2) 345.42.53 fax 32 (2) 345.64.81 Mobile +32 475 94 14 33 E-Mail idrabel@idrabel.com idrabel@skynet.be www.idrabel.com
Inge AG	Water and Wastewater treatment - membranes	Flurstrasse 27 86926 Greifenberg DE Phone: +49 8192 997 700 Fax: +49 8192 997 999 E-mail: jwunram@inge.ag Web: www.inge.ag Contact: Mr Josef Wunram
INJEKTOR Environmental Planning and Service Ltd	Sludge treatment; planning and developing of environmental technologies to sustain the natural conditions of surface and groundwater as well as of the soil.	H-7400 KAPOSVÁR, Petôfi Sándor u. 9/b (Hungary) Contact: Mr. Ferenc VÖRÖS, managing director Phone: +36-82-510 690; +36-82-510 691 Fax: +36-82-321 433 E-mail: injektor@t-online.hu
Insituform Hulin Ltd.	No-dig technologies	Insituform Hulin Ltd. Pf. 64. H-8609 Balatonszéplak HU – Hungarian subsudiary of a German company Phone : +36-84-550-066 Fax: +36-84-550-067 E-mail: insituform@hulin.t-online.hu Web : www.insituform.com; www.insituform.de

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ISRIM S. Cons. a r. l.	Advanced no profit private institute of research and training on materials, energy and environment	Loc. Pentima Bassa, 21 05100 Terni – Italy Phone + 39 0744 547801 Fax + 39 0744 470174 Mail : info@isrim.it Web. www.isrim.it Contacts : Dr. Francesca Santori (f.santori@isrim.it) Dr. Alberto Zingaretti (a.zingaretti@isrin.it)
Koch Membrane Systems	Membrane systems / process technology	Kackertstr. 10 52072 Aachen DE Phone : +49 (0)241 41326 0 Fax : +49 (0)241 41326 59 E-mail: infoeurope@kochmembrane.com
Kogelbauer Wasser	Water and wastewater treatment	Pölfing 5/2 8544 Pölfing – Brunn (Austria) Phone : +4369912339248 E-mail : m.goedl@kogelbauer-water.com Web : www.kogelbauer-water.com
Life Tech s.r.o.	Ozone technologies and dispositives (generators, detectors, monitors)	Šumavská 15, 602 00 Brno, Česká republika Tel: +420-541 592 568 Fax: +420-541 592 569 Mail : sales@lifetech.cz Web : www.lifetech.cz
Linari Engineering	Industrial automation, water management	Legal office: via dei Colatori, 13 - 58020 Valpiana (GR) - Italia Operative Office: via G. Da Verrazzano,1 - 56013 Marina di Pisa (PI) - Italia Phone. (+39) 050 34 048 Fax. (+39) 0 566-919.127 Mail: info@linarisrl.com Web: www.linarisrl.com
Living Planet Ltd.	Environmental protection: wastewater treatment, analysis of wastewaters	Szivárvány u. 10. H-2040 Budaörs HU Phone +36 1 3340047 Fax: +36 1 3340047 E-mail: livingplanet@living-planet.hu Web: http://www.living-planet.hu/
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Millennium Science and Engineering Ltd/Inc	Environmental consulting	21 The Steadings Business Centre Maisemore, Glos GL2 8EY United Kingdom Phone: +44 1452 412 151 Fax : +44 1452 412 284 E-mail : kbordacs@mse-environmental.co.uk Web : www.mse-environmental.com
Multiprojekt Ltd.	Water and sewage treatment (design and execution of complete establishments, development of sewage technology, manufacturing, distribution, installation and service of machines)	2040 Budaörs, Komáromi u. 22 (Hungary) Phone: +36-23-414-566 . Fax: +36-23-415-478 E-mail: multiprojekt@t-online.hu Web :www.multiprojektkft.com/main.php?mainid=1&lang=en
Oberland Kommunaldienste AG	Planning and construction of plant-growth purification stations for the clarification of waste water; biomass and composting; sewage sludge management	Hauptplatz 12, 86971 Peiting (Germany) Phone + 88 61/93 00 39-3 Fax + 88 61/93 00 39-9 Mail: info@oberland-kommunaldienste.de Web : www.oberland-kommunaldienste.de
OMS-HUNGARIA Ltd	Water and wastewater treatment	2890 Tata, Bacsó Béla út. 37. Phone: 06-34/487-869 Fax: 06-34/487-869 | Mail: info@oms.hu Web : www.oms.hu
PIERALISI Deutschland GmbH	Sludge dewatering	Ochsenfurter Str.2 97246 Eibelstadt (DE) Phone: +49 93 03 90 82 11 Fax: +49 93 03 90 82 20 E-mail: gert.bergjohann@pieralisi.de

PMCB BioTec Company	Environmental waste treatment technologies to provide sustainable solutions for Owners, Industry, and the Environment.	309 Commerce Drive, Suite 200 - Exton, PA 19341 Phone: 610 524.6364 sales@pmcbiotec.com Contact: Krisztina Bordacs, (European inquiries) European Technology Representative, MSE Ltd., Telephone: +44 1494 580 623 kbordacs2002@yahoo.com
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proaqua GmbH & Co.KG	Water and wastewater treatment	Dekan-Laist-Straße 13 D-55129 Mainz-Hechtsheim (Germany) Phone: +49 (0)6197 13100 Fax : +49 (0)6131-9713190 Mail: info@pro-aqua.net Web: www.pro-aqua.net
Purator Hungaria Ltd.	Environmental protection	H-1222 Budapest, Vöröskereszt u. 8-10. HU Hungarian representative of a German company Phone: +36 1 464 7200 Fax: +36 1 464 7201 Web: www.purator.hu
REDO Water Systems GmbH	Environment-friendly technology for water treatment without chemical additives	Waldstr. 79 64864 Groß-Zimmern (**G**ermany) Phone: + 49 6071 977922 Fax: +49 6071 977920 Mail : redo@redo-water-systems.com Web : www.redo-water-systems.com
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RGA Environment	Consulting society inthe field of environment, safety and quality	Via Campania, 47 – 00187 Rome (Italy) Tel. 06.47805.405 Fax 06.47805.465 info@rgassociati.it www.rgassociati.it
SECCUA GmbH	Watrer treatment,	Krummbachstr. 8 D-86989 Steingaden (Germany)

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Siemens Zrt.	Turbine and Turbine Generator; Manufacture of turbines and associated equipment for power generation	H-1143 Budapest Gizella út 51-57. Postacím: H-1956 Budapest (Hungary) Phone: (+36 1) 471 1000 Fax: (+36 1) 471-1002 Mail: info.hu@siemens.com Web: www.siemens.hu
Soluciones Medioambientales y Aguas, S.A.	Study, analysis and solutions to the wastewater treatment and it's reuse	C/ Colón 6, 3º 36201 Vigo, España Tf (34) 986441646 Fx (34) 986441647 Mail: Web: www.smasa.net
Sustech Consulting Ltd.	It offers a complete range of water treatment products and service	Cannon House, 206, Cannon Road, Sta. Venera SVR 9034 (MALTA) Phone: (+356) 21 493 330 Fax: (+356) 7926 1562 Mobile: (+356) 21 487 060 Contact: Ing. Marco Cremona Mail: info@sustechconsulting.com Web: www.sustechconsulting.com
TENCATE	Develops and produces specialist materials with specific properties available for different sectors (safety and protection; environment, aerospace,	Wierdensestraat 40 7607 GJ Almelo P.O. Box 58 7600 GD Almelo (NL) Phone: +31 546 544 911 Fax Stationsstraat: +31 546 81 41 45 Fax Wierdensestraat: +31 546 539 313 Mail: royal@tencate.com www.tencate.com
UV-Consulting	Advanced ultraviolet technology for different	Weberstraße 19 55130 Mainz - GERMANY. Tel: +49 (0) 6131 986759

Peschl	applications (air disinfection, water disinfection, etc.)	Fax: +49 (0) 6131 986763 Mail: service@**uv-consulting**.de Web: www.uv-consulting.de
Valasek Szivattyutechnika Kft	Pumping technology	H-1223 Budapest, Kápolna u. 10-26 (Hungary) Tel./Fax: (36) (1) 283 0035 Skype: (36) (1) 283 2668 Mail: info@valasekpumps.com Web: www.valasek.hu
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RDP for Malta: "Waste management"

4. Abstract

The main focus of this RDP is technology demand relating to waste management. Malta's economy is mainly depends on tourism, construction and manufacturing industries and SME's.

Industry is a source of waste generation, in particular hazardous wastes; currently they are stored by waste producer or exported for treatment or disposal but it's worrying that the amount of waste created in Malta is increasing by 2% on average every year.

The enforce to reduce negative trends in the field of waste management and the necessity of conforming activities to the environmental and waste legislation, particularly since Malta joined the EU (May 2004), have produced the following plans and policies:

- the Waste for Space subject Plan (2001), which indicates the then existing and planned national infrastructure for waste management;
- the Environmental Technologies Action Plan (ETAP);
- National Policy for Sustainable Development.

The upgrade of waste management equipments and infrastructures, could be also a business opportunity, considering that nearly all waste management in Malta is carrying out by Government, trough WasteServ Ltd., a public owned company. Concerning this, the RDP includes a list of infrastructure that is still lacking and a list of waste streams for which no disposal route exists in the country.

5. Overview of TR

TR No.	Company description	Request brief
01	A public entity	Three requests for know-how related to the management of agricultural waste and technologies for the treatment of manure with possible energy recovery
02		
03		
04	A beverage (alcoholic and nonalcoholic) producer	Small scale wastewater treatment system for various streams
05	A national authority	Information regarding technologies and methods available for changing diesel engines to LPG

06	A manufacturing company producing rubber components	A system to recover energy from waste vulcanized rubber to enable cooling of the shop-floor
07	A Government owned company	Offshore sources of renewable energies
08	A hotel forming part of a major international chain	Solar cooling system
09		Visually unobtrusive (possibly axial) wind energy generating system
10	A manufacturing company producing electronic components	Detection of heavy metal levels in industrial wastewater (from electro-plating)
11		Disposal route or treatment of waste epoxy resin, possibly with energy recovery
12		Zero-liquid-discharge wastewater treatment system
13	An air terminal	Solar cooling system
14	A waste oil management company	Hydro-carbon / Water separation system
15	An electro-plating company	Treatment of relatively small quantities of sludge from electroplating process
16	A hotel forming part of a major international chain	Know how on carbon neutral conferencing
17	A start-up environmental and renewable energies company	Know how related to ISO14064 and carbon trading
18	A Waste management company	Baseline odour measurements before the upgrading of a solid waste management site

5.1 TR 1: Know how related to the design of a centralized anaerobic digestion plant for agricultural wastes

BBS code : *07 MT NRME 0HLI*

Comments about BAT

Anaerobic digestion of agricultural waste is a quite common practice in Europe, especially in

Germany, Denmark, Austria, Sweden, Switzerland and Italy. There are more than 3.000 anaerobic digesters with animal manure. In Italy there are two companies most involved in these activities: RPA (Perugia) and Centro Ricerche Produzioni Animali (Reggio Emilia).

Technology should include a preliminary grinding of animal wastes up to a size of 12 mm and a mixing with other liquid organic wastes before feeding the anaerobic digester. Digestion can be carried out either with dry processes when the solid total concentration is higher than 20% or with wet digestion when slurry is liquid, i.e. with solid concentration lower than 10%. Reactors are generally vertical cylinders but sometimes also horizontal shape can be adopted especially for dry digestion systems. A specific item of the reactors is the possibility to have the cover that could be inflated and therefore the volume of the reactor non occupied by liquid is variable. An important part of the digester is the feeding system.

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
06 ES SSCT 0FCU	A new laboratory system for anaerobic biological treatment of solid waste	An Andalusian research group	IRC SOUTHERN EUROPE

5.2 TR 2: Know how related to pig slurry management and treatment systems and drafting of tender documents

BBS code : *07 MT NRME 0HLL*

Comments about BAT

As the practice of intensive animal production increases, there is a need for affordable treatment technologies that can help manage the large amounts of manure generated. The best approach could be an efficient liquid–solid separation module using polymer technology or mechanical separators

and integrate this separation module into systems of treatment technologies for both the separated liquid and solids. The liquid can be further treated to reduce N and P and produce effluents virtually free of these nutrients. Production of methane and energy is affected by solids concentration; the anaerobic process can be optimised with polymer application rate during separation in order to reach the right solids content and the best separation efficiency.

A system for pig slurry treatment, where anaerobic digestion, nitrification and denitrification have been integrated in a unique process treatment, has been also investigated. This configuration allowed both removal of Chemical Oxygen Demand (COD) and a decrease in nitrogen content. Strategies are reported to bring enough COD to the denitrification system. Results (90 % reduction in COD, 99.8 % reduction in NH_4^+-N and 98.8 % reduction in NO_3^-N) show this process could be considered a good alternative to treat these wastes.

Anaerobic lagoons can be adopted in warmer climate regions. Covers are used to collect biogas.

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
06DE BYBI 0FYY	Industrial centrifuges and belt presses for continuous liquid-solid separation in various applications	A German medium-sized company	IRC BAVARIA

5.3 TR 3: Know how related to agricultural wastes' management systems

BBS code : *07 MT NRME 0HLM*

Comments about BAT

There are various ways to dispose of solid residues, in general, the burning of residues (packaging material and plastics) in the field, although still allowed in many places, is not considered an environmentally sound technique. Incineration is a difficult process to control and temperatures may not reach the levels required for proper incineration, resulting in air emissions of substance associated with incomplete burning (e.g. cancerous substances), it may be an option to burn the residues to provide energy for heating, but no data have been available allowing an assessment of this. The burning of plastics, rubber, tyres and other materials in the open should not be allowed any more.

On-farm burying or landfilling of residues is also widely practised and may be an option in the short term but may not serve this purpose in the long term. Soil and groundwater contamination may occur, depending on the characteristics of the residues that are being buried. Initial cost savings may then turn into a financial burden, i.e. for cleaning and renovation of the site. Residues that are buried include building materials, such as asbestos cement roof sheets.

Possibilities of re-use for the on-farm composting of residues other than manure appear very limited, the secondary cardboard packaging having the most opportunity.

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
06 PL WPTS 0FXT	Preparations for ecological agriculture and liquid waste treatment	An SME from north-western Poland	IRC West Poland

5.4 TR 4: Packaged wastewater treatment (and re-use potential) for beverage production and bottling plant

BBS code : *07 MT NRME 0HLN*

Comments about BAT

Two wastewater streams are produced in the factory:

- Wastewater discharged from the bottle washer- three times a week (one rinse wastes 2,000 L/h for 8 hours);
- "Soda" wastewater usually discharged once every three weeks (total discharge approx. 8,000 L batch)

There is also a liquid waste stream: 500 L/week caustic soda (1 % concentration).

For the wastewater discharged from the bottle washer the first step is the characterization in terms of specific compounds i.e. presence of surfactants. Depending on their biodegradability the possible approach can be a biological treatment with an eventually previous physical-chemical stage. It is

worth to note that water quality for its reuse can strictly address the treatment scheme especially if tertiary treatment are required to avoid the presence of particulate matter and organics.

Also for the "soda" wastewater a better quantitative characterization i.e. chloride level is required. A reliable approach for treatment is a first step of neutralisation followed by a chemical-physical stage like precipitation and/or ion exchange.

Finally, the liquid waste stream has to be disposed of according to the country regulation.

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
06 DE NRXE 0FBR	Compact ship wastewater purification unit	A German company active in wastewater treatment	IRC North Rhine-Westphalia/Malta
07 DE HRIM 0HI7	New type hollow fibre membrane module for filtration of water, beverages and other liquids	A German expert in membrane technology	IRC Hessen/Rheinland - PFALZ

5.5 TR 5: Technologies for the conversion of combustion engines from petrol/diesel to LPG or other alternative fuels

Catalogue code: *PS_MT_17744*

Comments about BAT

Not available

List of Technology offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
07 IT MECR 0HX4	Transformation of mud and used oils into fuels, oils and gas - Liquefied Petrol Gas (LPG) through laser cracking	An Italian company	IRC MED.IA

5.6 TR 6: Converting rubber waste to energy which will be used for cooling

BBS code : *07 MT NRME 0HSJ*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
08 PL 62AP 0IMZ	Plants for processing various wastes into homogenous particles and alternative fuel	A Polish SME	BISNEP (EEN)

5.7 TR 7: Offshore renewable energy prototype technologies for field testing

BBS code : *07 MT NRME 0HSK*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
08 ES 25E2 0IHD	Innovative sea waves energy conversion plant	A Catalan R+D SME based in Spain	CATCIM (EEN)
08 IT 56Z4 0IM5	Generation of renewable energy and electricity from the wave motion of sea and ocean	A team of Italian engineers	Friend Europe (EEN) (Marco Gorini)
08 IT 53U6 0IJK	Innovative System to generate electrical energy from sea and river currents	An Italian SME	Enterprise Europe - Suisse

5.8 TR 8: Solar cooling system for a hotel located in the Mediterranean region

Catalogue code: *TR_MT_17747*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
05 GB EAST 0BT3	Innovative solar technology combining power, heat and cooling systems	A UK-based company	IRC EAST OF ENGLAND
07 IL ILMI 0HNQ	New solar energy system for hot water	A well known Israeli manufacturer in the solar energy industry	IRC ISRAEL
05 ES SSIT 0D2S	Two axis solar tracking systems for solar energy applications (thermal and photovoltaic solar energy)	A Spanish company from the Canary Islands	IRC SOUTHERN EUROPE
05 FR FMCP 0DGW	Solar-air-type collector for secondary homes	A French SME specialised in renewable energies	
06 DE NDAT 0EHM	Natural power unit combines wind and sun energy	A small German company	
06 PT PTIE 0EWE	Innovative solar thermal system using building louvre shading devices	A Portuguese university	

5.9 TR 9: Micro-wind turbine for the generation of electricity with minimum visual impact

BBS code : *07 MT NRME 0HSM*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
06 NL NLSY 0FFB	Soundless and high-output Venturi wind turbine technology for urban areas	A small Dutch company	IRC NL

5.10 TR 10: Treatment (possibly with energy recovery) of waste epoxy resin cull

BBS code : *07 MT NRME 0HSN*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
08 PL 62AP 0IMZ	Plants for processing various wastes into homogenous particles and alternative fuel	A Polish SME	BISNEP (EEN)

5.11 TR 11 : Monitoring of wastewater for the presence and concentration of heavy metals

BBS code : *07 MT NRME 0HSO*

Comments about BAT

A Maltese company has required an on-line analyser able to monitor copper and lead concentration in a wastewater with a concentration range of 0-10 mg/L with a pH in the range of 6-10.

As far as copper is concerned Metrom, a UK company, commercialises an on-line copper analyser for surface and wastewater. This instruments uses the differential absorbance colorimetry (DAC) methodology to prevent back ground sample colour and solids adversely affecting the analysis. A second company Scientific Instruments by USA has developed an instrument using a colorimetric procedure. Cupric iron is reduced to the cuprous state by ascorbic acid. The cuprous iron is buffered with sodium citrate and then reacted with neocuproine hydrochloride. The solution is then measured colorimetrically at 460 nm.

As far as lead is concerned there is not evidence in the technical literature that instruments were already developed and commercialised. In the scientific literature, anyway, there is an important work by Tercier – Waeber et al. (2005)[2], who have developed a submergible probe able to measure different fractions of copper, lead and cadmium in sea water, in addition to classical parameters pH, dissolved oxygen, temperature, salinity, turbidity and chlorophyll A. The probe uses anodic stripping voltammetry to measure metals in the concentration range of ppt, i.e. ng/L.

It should be pointed out that the above instruments are certainly more efficient in monitoring the metals presence in the clean water, while many problems can arise for the presence in the wastewater of solids and organic matter, especially for lead.

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
08 DK 20B7 0IKJ	Intelligent passive sampler for measuring water quality	A Danish company	Denmark in Europe (EEN)

[2] M. Tercier-Waeber, F. Confalonieri, G. Riccardi, A. Sina, S. Noel, J. Bnuffle & F. Graziottin (2005): "Multiphysical-chemical profiler for real- time in situ monitoring of trace metal speciation and master variable: development validation and field application", *Marine Chemistry*, **97**, 216-235.

5.12 TR 12: Water recycling with zero liquid discharge

BBS code : *07 MT NRME 0HSP*

Comments about BAT

A Maltese company has required a wastewater treatment plant able to completely remove copper, lead and sulphate with input concentration of 5, 1 and 600-700 mg/L, respectively. Such a process should allow to recover the water resource thus resulting in zero liquid discharge.

It should be pointed out that there is no technology with zero liquid discharge, unless an evaporation process is performed, but this would be not feasible considering the enormous cost of fuel to evaporate the water. With a total flux of 5 m^3/h approximately 470 Nm^3/h of methane would be required. Technology to be applied in this case could be the combination of reverse osmosis and ion exchange. Reverse osmosis is not able to reduce very much the liquid discharge considering that a retentate (residual concentrated flux) is produced that can be estimated in 10 –15 %. The process can be optimised by a pre-treatment with ultra filtration. The idea is to combine the first stage by membranes with a second stage by ion exchange. In the second stage the residual flux from the membrane stage has to be treated in order to reduce considerably the final residual flux deriving from the regenerative stage of the resins. Two options will be possible:

- precipitation of copper and lead in order to avoid the use of the cationic resin. In facts, both the metals can be precipitated as sulphurs by adding for example sodium sulphide or by directly adding hydrogen sulphide which is developed from a suspension of pyrite and hydrogen chloride;
- provide a double treatment with a cationic resin to entrap copper and lead and a second stage by anionic resin to entrap the sulphate. This second stage could be adversely affected by the presence of other anions, like carbonates and chlorides.

From the above discussion it clearly appears that we can try to reduce at 1/100 or 1/1000 the residual flux but any further reduction implies that technology has to be increased and of course the capital and operating costs.

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
06 DE NRXE 0FBR	Compact ship wastewater purification unit	A German company active in wastewater treatment	IRC North Rhine-Westphalia/Malta

5.13 TR 13: Supply and commissioning of a Solar Cooling system

Catalogue code: *TR_MT_17752*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
08 ES MAAH 0JPC	High-technology solar tracking system and its complementary services	A Spanish SME with 35 years experience in manufacturing and installing metallic solutions	Spain
05 ES SSIT 0D2S	Two-axis solar tracking systems for solar energy applications (thermal and photovoltaic solar energy)	A Spanish company from the Canary Islands	Spain
08 ES NWPT 0K28	Solar cooling system	A Spanish research centre	Spain

5.14 TR 14: Industrial Breakdown of Stable Oil-Water Emulsions

Catalogue code: *TR_MT_17820*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
08 ES 25E2 0IUW	Waste water treatment by electrocoagulation	A Spanish firm	CATCIM (EEN)
08 DE 0855 0IPD	Waste water treatment by new vortex separation technology with flow energy process	A German company	NRW Europa (EEN)
08 DE 0958 0IKC	Recycling of drilling	A German company	CIP Saxony

	emulsions and lubricants		(EEN)

5.15 TR 15 : Effluent treatment from plating processes

Catalogue code: *TR_MT 18421*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Name	Enterprise	IRC
08 DE 18A5 0IID	Conditioning of metalliferous dishwaters using electrodialysis	A German company	ESIC Sachsen-Anhalt (EEN)

5.16 TR 16 : Know how relating to carbon neutral conferencing

Catalogue code: *TR_MT 18670*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Name	Enterprise	IRC
08 DE 0855 0IJ6	Coating of catalytic converters to reduce pollutant emissions	A German company	NRW Europe (EEN)

6. List of providers

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Anemon S.p.a.	Wind Energy,	Via Ariosto, 11 / Viale Cavour, 86 44100 Ferrara - ITALY tel. (+39)0532/200177 fax (+39)0532/216133 e-mail: anemon@anemon.it www.anemon.it IRC IRENE
Antares Eco srl	Recycling machines	Via Cristoforo Colombo, 16 – 14100 Asti ITALY Tel: +39 0141 476539 – Fax: +39 0141 471293 e-mail: info@antareseco.it www.antareseco.it IRC ALPS
Argos Ambiente srl	Environmental consulting	Via Don G. Zanardo, 30 31040 Chiarano (TV) - Italia tel. 0422 746025 fax 0422 746953 e-mail info@argosambiente.it www.argosambiente.it IRC IRENE
A.S.T. Area Servizi Termologici	Solar thermal and RES plants installation	Via Erbosa 76, 4 59100 PRATO (PO) Tel: 0574433285 Fax: 0574433285

		IRC RECITAL
B & B Hydra Solar srl	Solar and hidraulic technologies	Via B. Buozzi 16 46036 Revere (MN) Tel. 0386/467310-1 Fax 0386/847335 info@bebhydrasolar.com www.bebhydrasolar.com IRC LOMBARDIA
Bioe srl	Waste technologies	Via Fabio Filzi 33, 20124 Milano tel: (+39) 02 67387000 info@bioe.it www.bioe.it IRC LOMBARDIA
Biotec Sistemi srl	Waste treatment and management, composting	Via Privata Galla 4 16010 Serra Riccò (GE) Tel: + 39 010 7261209 Fax: +39 010 751267 e-mail: biotec@biotecsistemi.it www.biotecsistemi.it IRC ALPS - Liguria
Bit Line	Environmental monitoring	Via Solferino 87 43040 Ramiola PR Telefono: 0525 / 40.10.99 Fax: 0525 / 46.31.11 info@bitline.it www.bitline.it IRC irene
Bonazzi srl	Solar thermal an PV energy	Via del Commercio, 2 26026 Pizzighettone (CR) Tel 037 2744612 fax037 2730363 info@bonazzisrl.com www.bonazzirl.com IRC LOMBARDIA
BRT Recycling Technologie GMbH	Recycling and waste management	Brochterbecker Strasse 28 49545 Tecklenburg Phone: +49-5482-9384-0 FAX: +49-5482-9384-84 e-mail: hallo@brt.info www.brt-it.com IRC Lower Saxony
BRU. Impianti Group srl	Energy recovering, incinerators	Via Busa 64 - 31033 Castelfranco Veneto (TV) - ITALIA Tel.: +39.0423.490722 Fax: +39.0423.498688 info@bruimpianti.com www.bruimpianti.com IRC IRENE
Centro Ricerche Produzioni Animali s.p.a.	Agrofood and environmental research	Corso Garibaldi, 42 a Reggio Emilia Tel +39 (0522) 436.999 www.crpa.it E.-mail: ghielmi@crpa.it

		IRC IRENE
Darsa Srl -	Environmental Technologies	Via Segaluzza, 30/A - I 33170 Pordenone (PN) Italy Tel. +390434570806 - Fax +390434570488 mail: vendite@darsa.it web: www.darsa.it Referente: Dott.: Damiano Liani IRC IRENE
DVD Impianti srl	Environmental technologies	Via Orvieto, 56 00040 Pomezia (Roma) Tel.: (+39) 06 9110262 Fax: (+39) 06 9110264 e-mail : info@dvdtecno.com www.dvdimpianti.com IRC CIRCE
Ecomaster Atzwanger spa (Atwanger spa)	Plants for environmental, energy, water treatment and aeolian	ATZWANGER SpA *Sede legale* - I-39051 Bronzolo (BZ) Direzione e amministrazione I-39100 Bolzano (BZ) Viale Druso, 229-233 Tel. +39 0471 243 811 Fax +39 0471 243 840 www.atzwanger.net IRC IRENE
Eko Technology srl	Waste recovery and treatment	Via Trave, 62 - 61032 - Fano (PU) tel. +39 0721.863276 fax +39 0721.868630 Skype 0721 863876 www.eko-technology.com waydonet@gmail.com IRC IRENE
Elettromeccanica Salmini	Alternative Energy, aeolian	Via Como, 5 21011 Casorate Sempione (VA) Tel +39 0331 296729 Fax +39 0331 295270 www.salmini.it ssalmini@tiscali.it IRC LOMBARDIA
Eliosistemi	Engin3ering society	Via Appia nuova 669, 00179 Roma tel. 06.7811759 fax 06.78395197 cell. 337.802536 (ing. Giorgio Piccinetti)
ENER G Group	Renewable Energy, Energy from Waste, Cogeneration, combined heat & power CHP and Efficient Energy	ENER·G House Daniel Adamson Road Manchester M50 1DT - UK T: 44 (0) 161 745 7450

	Management solutions	F: 44 (0) 161 745 7457 E: info@energ.co.uk www.energ.co.uk IRC North-Nord Manche
ESA energia solare applicata srl	Solar thermal, PV, Aeolian energy	Via Cellina, 1 - 33080 Porcia (PN) tel. +39 (0)434 923202 fax +39 (0)434 590991 e-mail : info@esaenergie.it www.esaenergie.it IRC IRENE veneto
Esatermo s.r.l.	Solar thermal an PV energy	C.da Fortugno Km.2 - 97100 Ragusa (Italy) Tel. 0932 667061 - Fax 0932 667468 www.esatermo.it IRC MEDIA
E.S.I. Energia da Sistemi Integrati	Solar and photovoltaic	Piazza del Principe 4 - 16126 Genova tel: 010-8685751, 010-8685780 fax: 010-8631606 IRC ALPS
Fabersol	Renewable energy (photovoltaic)	Via della Lastruccia 5. 59100 tel 338 2564605. fax 1782762388 info@fabersol.it. www.fabersol.it IRC RECITAL
G tek	Renewable energy	Via G.Puccini 10, 41012 Carpi (Mo) tel. 059 687214,fax. 059 689491 email gtek@gtek.it www.sole.gtek.it IRC IRENE Bologna
Gaia Energy	Solar Thermal and photovoltaic	*Sede Legale*: Corso Cirillo, 83 - 80028 Grumo Nevano (Napoli) *Sede Operativa*: via Borsellino, 116 - 80025 Casandrino (Napoli) Tel. +39.081.5056412 +39.081.8334510 +39.081.13073556 Fax +39.081.3958265 +39.081.5052912 info@gaiaenergy.it ufficiotecnico@gaiaenergy.it www.gaiaenergy.it IRC IRIDE - Salvatore
Gamesa S.p.A.	Solar and aeolian energy	Via Pio Emanuelli, 1 00143 Roma Tel. 06519613 - Fax 0651530911 geitalia@gamesacorp.com segreteriageolita@gamesacorp.com www.gamesa.it IRC CIRCE
GESTECO spa	Renewable energy from waste	Via Pramollo, 6 – Fraz. Grions del Torre 33040 – Povoletto (UD) Tel. 0432/634411 Fax 0432/634413

		e-mail: marketing@lucigroup.com info@gesteco.com www.gesteco.com IRC IRENE
Gimar di Maria Rosa Morrone	Solar and photovoltaic plants	VIA ROMA 50 84014 NOCERA INFERIORE SA TEL. 081-925020 FAX 081-920726 e-mail: info@gimarmorrone.it www.gimarmorrone.it IRC IRIDE - Salvatore
GMD Electronics	Innovative production of electric and thermal energy	Via della Bufalotta 855 - 00138 Roma - Italy Tel./fax 06 87133854 www.gmdel.com IRC CIRCE
Greenpower S.r.l	Water treatment, aeolian energy	Via Valeriano, 7 32100 Belluno Tel.0347 943867 Fax 0347 298739 info@green-power.net service@green-power.net www.green-power.net IRC IRENE
Green Solar srl	Renewable energy Photovoltaic, solar	Via C. Colombo 10, int. 3 44044 Cassana (FE) greensolar@greensolar.it info@greensolar.it www.greensolar.it IRC IRENE Bologna
GRUPPO INTINI	Solutions and services for civil protection and territorial and environmental protection.	Sede legale: Via Repubblica, 36/f 70015 Noci (Ba) – Italy Tel. 080 49431 fax: 080 4978009 Uffici: Via Crescenzio, 2 00193 - Roma - Italy tel. +39 06 68301814 fax. +39 06 68217805 info@gruppointini.com uf.tecnico@intini.it www.gruppointini.com IRC CIRCE
Heliant s.r.l.	PV and solar thermal applications	Operative site: via Orvieto, 19 10149 Torino (TO) Tel. and Skype contact : + 39 011 2166697 Fax + 39 011 2217818 raffaele@heliant.it marco@heliant.it www.heliant.it IRC ALPS
Idrocentro	Plumbing products, water treatment, alternative	Torre San Giorgio (CN) Tang. Torino, uscita La Loggia, SS per Saluzzo,

	energy	km 29 Tel. +39 0172 91 21 Fax +39 0172 96 075 info@idrocentro.com cussino@idrocentro.com www.idrocentro.com IRC ALPS
Idrosolar	Energy, fotothermal collector	via ardito desio 60 00131 Roma (RM) 0697848223 rmoretti@idrosolar.it Ing. Roberto Moretti www.idrosolar.it IRC CIRCE
Idratech	Water treatment	via A. Gandiglio 120 00151 Rome (RM) T: 0665743259 F: 0665799988 E: workgroup@idratech.it W: www.idratech.it IRC CIRCE
IGET	Renewable energy plant	SS 524 N 21 66030 MOZZAGROGNA (Ch) - Italy Tel 0872 57123 fax 0872 578735 info@igetcol.it www.igetcol.it IRC IRENE
Impianto di digestione anaerobica	Anaerobic digestion plant	Contact: Dott. Gianni Lastella lastella@trisaia.enea.it IRC IRIDE (Salvatore)
Kloben sas	Solar panel	Turco Group S.r.l. Via dell'Artigianato, 58 - Bovolone 37051 (Verona) - Italy Tel. +39 045 7971966 e-mail: info@kloben.it www.kloben.it IRC IRENE (Veneto)
La combustione srl	Energy saving ; PHOTOVOLTAIC – SOLAR THERMIC – GEOTHERMY ABSORBERS – BIOMASSES GASIFICATION	Via Raffaello n° 21 31021 Mogliano Veneto (TV) TELEFONO: 041 - 5937025 FAX: 041 - 5971234 info@lacombustione.it ufficiotecnico@lacombustione.it www.lacombustione.it IRC IRENE Veneto
Promeco spa	Engineering, planning & turnkey building of MSW and Industrial Waste	Via Torriani 17/a 22100 COMO (Italy) Tel +39 031 267331 Fax +39 031 267446

	treatment plants.	prometco@prometco.it www.prometco.it IRC LOMBARDIA
RAM srl – Servizi per l'energia	Renewable energies (Cogeneration, biogas, solar thermal, PV,etc.)	Sede legale: Via Leone X n.4 - 50129 Firenze Italy Ufficio operativo: Via Fonda di Mezzana 61/E - 59100 Prato (PO) Italy Telefono: +39 0574 521209 - Fax +39 0574 700185 E-mail: info@ramservizi.it www.ramservizi.it IRC RECITAL - Toscana
Reseda – Onlus	Solar	via Lombardia 19 - 00045 Genzano di Roma (RM) Italy segreteria@resedaweb.org Tel. 069364170 Fax 069364170 IRC CIRCE
Rizzi Energy spa	energy saving and heat recovery	via Nespolo 6, 25030 Adro (fraz. Torbiato) (Bs) tel. 030.7356336 030.7356761 030.7450551 fax 030.7450547 www.rizzienergy.com rizzi@rizzienergy.com IRC LOMBARDIA
Rossato Group	Solar technologies	via Napoli 50/52 04014 Pontinia (Lt) tel. 0773.848778 fax 0773.844051 www.eco-domus.it info@rossatogroup.com IRC CIRCE
Rota Guido srl	Facilities and equipment for zootechnics	Via 1° Maggio,3 29017 FIORENZUOLA D'ARDA (PC) Italy Tel. 0523 944 128 - Fax 0523 982 866 info@rotaguido.it www.rotaguido.it IRC LOMBARDIA
Sakeo	renewable energy, PV, biomass	via Cappello 12A, 35010 San Pietro in Giù (PD) tel. 049.9459112 fax 049.9459420 www.sakeo.com sakeo@sakeo.com IRC IRENE veneto
S.E.R. (Sistemi energie rinnovabili)	Renewable energy, plants and products	Via Delle Gere, snc 24040 POGNANO (BG) - Italy Tel. +39 035 07.78.650 Fax +39 035 07.78.651 info@s-e-r.it , amministrazione@s-e-r.it , www.s-e-r.it IRC LOMBARDIA

S.E.S.A. spa	Waste, depuration. Green energy	Via Comuna Snc - 35042 Este (PD) - Via Principe Amedeo, 43/A - 35042 Este (PD) Italy Tel. 0429 612711 - Fax 0429 612748 www.sesaeste.it/it/servizi/servizi-ambientali-este.php info@sesaeste.it IRC IRENE - Veneto
Solarwall	Solar Technologies	Via E. Fermi, 11 - 12038 Savigliano (CN) Italy Tel.: +39 0172 711106 Fax: +39 0172 712512 IRC ALPS
Solenia SA	Solar	Centro Monda 1 - 6528 Camorino - Svizzera info@solenia.com www.solenia.it IRC SOFRAA
Soltek s.r.l.	Pv, solar thermal, aeolian energy	Via Ferrovia, 2 84083 Castel S. Giorgio (SA) - Italy info@soltek.it www.soltek.it IRC IRIDE - Salvatore
Sunerg Solar s.r.l.c	Pv, solar thermal, aeolian energy	via Donnini, Loc. Cinquemiglia Città di Castello (PG) Italy info@sunergsolar.com wwww.sunergsolar.com IRC RECITAL
Sunservice sas	Solar and aeolian energy	Zona Industriale Predda Niedda Sud Strada 35 (ex. strada 11) - 07100 Sassari (SS) Italy Tel. 079 26 00 40 Fax. 079 2678268 info@sunservice.biz www.sunservice.biz CIRCE Sardegna
Suntek srl	Solar thermal, PV, aeolian and geothermal energy	fabrikstr. 2 - Via Delle Fabbriche, 2 I-39031 BRUNECK / BRUNICO (BZ) Tel. +39 0474.556022 Fax +39 0474.556024 info@suntek.it www.suntek.it IRC IRENE veneto
Technosolar snc	Solar panels, solar thermal and aeolian energies	Via del lavoro, 10 46039 VILLIMPENTA (MN) - tel 0376 271711 fax 0376/270435 www.tecnosolar-energia.it tecnosolar@tecnosolar-energia.it , assistenza@tecnosolar-energia.it Contact : Antonino Calarco - Mobile : 340 7131635 IRC LOMBARDIA
Terra Solar Technology	Solar technologies	tel. 06.90281490 fax 333.5095296 www.terrasolartek.com terrainforma@terrasolartek.com

		info@terrasolartek.com
Thermomax	Solar energy, collectors	Via S. Vecchia, 71/a - 23868 Valmadrera, Lecco (Italy) - Tel. 0341 551855 Fax 0341 551854 thermomax@thermomax.it www.thermomax.it IRC LOMBARDIA
TTW srl	Wastewater treatment plants	Via Emilia Pavese, 107 – 29100 Piacenza Tel. +39 0523/498667 Fax. +39 0523/401843 www.ttwater.it e-mail: ttw@ttwater.it Referente: Dott.: Marco Salmi e-mail: marco.salmi@ttwater.it
Velux Italia spa	Solar thermal (windiws, panels, accessories	Via Strà, 152 37030 Colognola ai Colli (VR) Italy Tel. 045 6173666 velux-i@velux.com www.velux.it IRC IRENE veneto
Vestas Italia srl	Wind technologies, energy	Via Ludovico Ariosto 12 74100 Taranto - Italy Tel.: +39 099 4606 111 Fax: +39 099 4606 301 vestas-italia@vestas.com www.vestas.it IRC IRIDE

RDP for North-East Poland:"Recycling of certain materials such as glass and plastics"

7. Abstract

The Regional Demand Profile covers Podlaskie region (called also as Podlasie), which is located in North-East Poland[3]. The main focus of the RDP is a technology demand relating to recycling of certain materials such as glass and plastics.
The attention of local authorities and SME managers is focused on various issues (as protecting the ground water, upstream methods of streaming and sorting waste, management and treatment of hazardous waste) but the recycling of certain materials such as glass and plastics was picked out the most important problem to solve.

The economic structure of the region is dominated by the agriculture sector, food industry and services (especially transport sector).

Companies and SMEs operating in these sectors are facing the problem of recycling of waste materials, such as glass and plastics, derived by different technological processes, in order to reduce their pollution rates.

According to the Voivodeship Inspection of Environmental Protection in Białystok (capital of Podlaskie region), the level of industrial wastes in 2004 was estimated at 1000 thousand tons in Podlaskie Voivodeship.

The majority of the wastes were generated by the agriculture, health care and food processing sector – 47,3%, nonorganic wastes from thermal processes accounted for 13,9% and wastes resulting from wood and pulp processing made up 13,1% of total industrial wastes.

Moreover, the annual demand for plastic bottles (PETG) in Poland, the most frequent municipal waste, is estimated at 110 thousand tons (1 ton makes up 25 thousands bottles), while only 140 tons are recycled per year (there are no data available on regional dimension).

At the moment, over 90% of wastes have treated by means of storage and neutralization at dumping ground.

There are 121 dumping grounds in Podlaskie region but only 13 of them meet all necessary requirements. According to UE regulations in that field there'll be the necessity to increase public investments in a modernization of existing dumping grounds but also to support the companies

[3] Podlaskie region is covered by IRC NEPIRC – North East Poland IRC. The NEPIRC consists of five organizations: Warsaw University (WU) acting through University Technology Transfer Center (UTTC), University of Warmia and Mazury in Olsztyn (UWM), University of Bialystok (UoB) acting through Technology Transfer Center of East (TTCoE), Technical University of Lublin (TUL) acting through Lublin Technology Transfer Center (LCTT) and CASE-Doradcy Sp. z o.o.. (CASE).

(especially small and medium enterprises) in a process of recycling of certain materials such as glass and plastics.

8. Overview of TR

TR No.	Company description	Request brief
01	A Polish SME operating in branch of beverages production, but also involved in waste management	The company is interested in hay-silage foil recycling and receiving fuel biocomponent from this process
02	A Polish SME with years of experience in recycling industry	The company is interested in recycling of certain types of foil : LDPE (low density polyethylene), LLDPE (linear low density polyethylene) and PP (polypropylene); other kinds of plastic may be also included
03	A Polish medium enterprise operating in the automobile industry	It is seeking a technology for large vehicles – lorries recycling
04	A Polish SME operating in the sector of motor vehicle commerce and services related to (servicing, repairing etc.)	It is seeking a complete line for recycling of cars as well as delivery vans of the weight up to 3,5 t.
05	A Polish micro-firm	The company is interested in a technology and machinery for production of hay-silage foil applicable in agriculture
06	A Polish SME active in the tourism field	The request is focused on energy-saving heating system based on alternative sources of energy
07	The Faculty of Agricultural University in Poland	It is looking for a new technology (method) that allows utilizing glycerine (80-90% purity) - a side product in the Faculty's researches (1200-1500 litters yearly). The Faculty is looking for sensible solution which does not cover purifying glycerine method info cosmetic one.
08	A small Polish company active in recycle and waste management branches	The company offers unique technology for managing sewage, plastic wastes and paraffin for a use to make fuel. The company is seeking financial resources to build up a prototype
09	A Polish SME	It is seeking innovative up-to-date technologies in the field of renewable sources of energy (solar collectors, heat pumps, wind power stations, photovoltaic cells, biomass, etc.)
10	A company from Eastern Poland	The firm is interested in technology that enables the company to manage waste products which are made during the estryfication process of vegetable oils
11	A company from Eastern Poland	Company is seeking technology of ethyl glycol recovery, possibility of reusing it in production of liquids used in cooling process, technologies of ethyl glycol utilization
12	A Polish company located in the Lublin region	The request consists in a technology which enables to process soft and hard post-production plastic materials originated from selective harvest. It should have a line with washing function, grinding-down function and drying function, final regranulation of plastic materials, and a pre-processing mill without the above-mentioned functions.

13	A Polish company	The company is looking for state-of-the-art technologies connected with rape oil and different kinds of oil plants pressing

8.1 TR 1: Hay-silage foil recycling with a fuel bio-component as the final product

BBS code : *07 PL EPUB 0HFG*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
06 PL EPUB 0GK7	Plants for processing various wastes into homogenous particles and alternative fuel	A Polish SME	IRC North-East Poland (Magdalena Maksimowicz)

8.2 TR 2: Plastic foil recycling technology

BBS code : *06 PL EPTU 0GUF*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
06 PL EPUB 0GK7	Plants for processing various wastes into homogenous particles and alternative fuel	A Polish SME	IRC North-East Poland (Magdalena Maksimowicz)
06 AT ATCA 0FAS	Low Temperature Conversion (LTC) - a revolutionary energy and fuel production process from organic wastes, biomass or brown coal	An Austrian SME	IRC Austria (Bernhard Jauch)

8.3 TR 3: Technology line for complex lorry (TIR) recycling

BBS code: *07 PL EPUB 0HGA*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
05 IL ILMI 0C1E	Novel rubber recycling technology, which converts rubber wastes (mainly tyres) into high-quality raw rubber material that can replace virgin rubber	An Israeli SME	IRC ISRAEL

8.4 TR 4: Complex line for recycling of passengers cars and delivery vans of the weight up to 3,5 t

BBS code : *07PL EPUB 0HG7*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
06 AT ATCA 0FAS	Low Temperature Conversion (LTC) - a revolutionary energy and fuel production process from organic wastes, biomass or brown coal	An Austrian SME	IRC Austria (Bernhard Jauch)
05 IL ILMI 0C1E	Novel rubber recycling technology, which converts rubber wastes (mainly tyres) into high-quality raw rubber material that can replace virgin rubber	An Israeli SME	Israel

8.5 TR 5: Hay silage foil production

BBS code : *07 PL EPUB 0HF3*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
06 ES BCAV 0FTE	Know-how in packaging technologies	A Spanish company	Spain
07 PL EPUB 0H87	Innovative plastic foil package	A Poland SME	Poland

8.6 TR 6: Heating system based on alternative energy sources

BBS code : *07 PL EPCA 0H8Q*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
07 ES SSCT 0HR6	Electromagnetic commuter for auxiliary heating equipments in solar water heating systems	An Andalusian private workgroup	IRC Southern Europe (Cristina Cabeza)
07 AT ATAP 0IZ2	Complete systems for thermal solar energy (panels, tanks, climatic wall)	An Austrian company	IRC Austria (René Stix)
07 DE DSTA 0IJ9	Crystal mirror heating system for bathrooms and more	A German company	IRC Saxony (Marghitta Wieloch)
06 GB EAST 0FX3	Compact High Efficiency Air Source Heat Pump	A UK company	East of England IRC (Andrew Goldsbrough

07 DE SDST 0III	Biomass heating systems and furnace modules for all classes of solid biomass fuels	A German SME	IRC Stuttgart-Erfurt-Zürich (Charlotte Schlicke)

8.7 TR 7: Innovative method for glycerine utilization

Catalogue code : *TR PL 18530*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
08 DE 1380 0IAP	Natural products for pharmaceutical and nutraceutical use	A German company	BW-Europe (EEN)

8.8 TR 8: Technology for sewage management and other wastes to retrieve renewable energy

BBS code : *07 PL EPCA 0IJV*

Comments about BAT

Not avaialble

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
08 DE NSTT 0K55	Methods for the production of natural gas from biogas, landfill gas or sewage gas	A German company	IRC Lower Saxony/Saxony-Anhalt (Helga Ilchmann)
07 SK SKBB 0HGV	Solid biofuels and energy production from sludge	A Slovak SME	IRC Slovakia (Peter KOPKAS)
05 DE NSNA 0C0D	Sewage treatment in aquaculture	A company from Northwest Germany	IRC Lower Saxony/Saxony-Anhalt (Melanie Albrecht)
06 PL EPUB 0GK7	Plants for processing various wastes into homogenous particles and alternative fuel	A Polish SME	IRC North-East Poland (Magdalena Maksimowic)

8.9 TR 9: Renewable sources of energy-technologies and cooperation in production, distribution and technical assistance

BBS code : *07 PL EPUB 0H86*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
08 IT LADA 0JKE	Wind/photovoltaic power station: a new technology for production of energy from complementary renewable sources	An Italian Company	IRC CIRCE (Sara Berselli)
07 LT LTIC 0JBJ	Photovoltaic cells manufacturing technology based on self-formation processes	A Lithuanian SME	IRC Lithuania (Asta Sukiene)
07 PL SPOP 0IJL	Autonomous wind-and-sun power station	A Polish research institute	IRC Central Poland (Katarzyna Pietruszynska)
06 AT ATCA 0FAS	Low Temperature Conversion (LTC) - a revolutionary energy and fuel production process from organic wastes, biomass or brown coal	An Austrian SME	IRC Austria (Bernhard Jauch)
07 IT LAUR 0J0C	A new two-stage gasifier	An Italian company involved in the energy production by renewable sources	IRC CIRCE (Giovanna Ferraro)
07 IT MECR 0IXG	Electric energy production system from renewable sources	Italian researchers	IRC MED.I.A (Anna Sangiorgi)
05 GB EAST 0BT3	Innovative solar technology combining power, heat and cooling systems	A UK-based company	East of England IRC (Micheli Julien)

8.10 TR 10: Technology of developing by-products in the estryfication process of vegetable oils

BBS code : *07 PL EPTU 0I6U*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	**Enterprise**	**IRC**
08 DE 0957 0IDG)	Polyolefin-Recycling and energy generation from waste	A German company	CIP Saxony (EEN)

8.11 TR 11: Practical implementation of treatment technology of used liquids (from cooling process)

BBS code : *07 PL EPTU 0I6V*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	**Title**	**Enterprise**	**IRC**
08 NL 60AH 0IP2	Method to recover useful materials such as demineralised water, salts, metals, id from aquous process streams	A Dutch SME	EUROGATE WAY.NL (EEN)

8.12 TR 12: Technology of processing soft and hard plastic post-production materials originated from selective harvest processing

BBS code : *07 PL EPTU 0I70*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
07 IT LAUR 0IX1	A new system for recycling plastic materials with a rational use of energy	An Italian University Research team	IRC CIRCE (G. Ferraro)

8.13 TR 13: Technologies for rape seed oil, technologies for methyl esters production, biogas works, biomass processing technologies

Catalogue code : *TR PL 18762*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
08 DE NSTT 0K55	Methods for the production of natural gas from biogas, landfill gas or sewage gas	A German company	IRC Lower Saxony/Saxony-Anhalt (Helga Ilchmann)
07 SK SKBB 0HGV	Solid biofuels and energy production from sludge	A Slovak SME	IRC Slovakia (Peter KOPKAS)
08 ES MADG 0JZ4	Hydrogen production by bioethanol steam reforming	A Spanish university	IRC Madrid (Bernardino Muñoz)
08 DE SDST 0JK4	Technology for energy recovery from urban waste	A German SME	IRC Stuttgart-Erfurt-Zürich (Teresa Puerta
07 IT LAPM 0J28	Biodiesel production by enzymatic catalysis	An Italian university research group	IRC CIRCE (Sebastiano Baghino)
07 IT LOCP 0HTC	ORC (Organic Rankine Cycle) system to produce electric and thermal energy from biomass and Concentrated Solar Power (CSP) plants	An Italian SME	IRC Lombardia (Virgilio Garavaglia)
07 SE WSIV 0HZ1	Bioreactor with multiple functions for treatment of bio waste (composting, sludge treatment, dewatering and wastewater treatment)	A Swedish company	IRC Western and Southern Sweden/Iceland (Max Maupoix)

9. List of providers

Enterprise	Mission	Contacts
Aertecnica Croci srl	Plants for recycling plastic materials	Via Ticinese 8, Pombia – Novara (Italy) Tel. 0321 956.498 - FAX 0321 957.259 www.aercroci.com info@aercroci.com
AIRA - Assoc. Industriale riciclatori auto	Recycling autovehicles	V.le Majno, 38 – Milano (MI) Tel. 02/29515281 Fax 022046397 www.airaassociazione.it aira@airaassociazione.it
ASTER - Scienza Tecnologia Impresa - S. cons. p.a.	Consortium (Emilia-Romagna Region, Universities and Research Centres) which promotes innovetion and technologies	Area di ricerca di Bologna, Via Gobetti 101 Bologna (BO) 051 6398099 fax 051 6398131 www.aster.it irene@aster.it
ATZWANGER	Technologies for environment, waste, energy	Viale Druso, 229 - 233 - I -39100 Bolzano Tel. +39 0471 243 811 - Fax +39 0471 243 840 www.atzwanger.net info@atzwanger.net
BIOAGRICOOP scrl	R&D in biological technologies and biology field	Via Miliani 7, 40132 Bologna (BO) Tel. 051 6199753 Fax 051 6177103 www.bioagricoop.it info@bioagricoop.it giovanni.galanti@bioagricoop.it (Project Manager)
CDM Engineering srl	Plastic material regeneration	Via Massari Marzoli, 4 Busto Arsizio (Varese) Tel. 0331 344029 Fax 0331 350782 info@cdmengineering.it
CIC, Consorzio italiano compostatori	Collaboration with public entities in waste (in particular, biomass) treatment, recycling, composting	Operative site: Via Cavour, 183/A - 00184 ROMA - Tel 06 4740589 - 06 4875508 - Fax 06 4875513 Technical site: c/o CEM Ambiente - Loc. Cascina Sofia - 20040 Cavenago Brianza (MI) - tel. 02 95019471 www.compost.it
COREPLA	Enterprises' consortium for plastic waste management and treatment	Via del Vecchio Politecnico, 3 Milano Tel. 02.760541 - Fax 02.76054320 www.corepla.it comunicazione@corepla.it
DALTECH sas	Products and services for wastewater treatment and waste	Via Toscana, 10 20060 VIGNATE (MI) tel. +39 02 95364194 fax. +39 02 95360786 www.daltech.it

		daltech@tiscalinet.it
Eco selekta italia srl	Techhnologies, patents and know how for PER valorization	Via Nazionale , 37 Salorno (Bolzano) Tel. 0471/884147 Fax 0471/884248 www.ecoselekta.com info@ecoselekta.com
ECOFER	Technology and ecological services related to ferrous and non-ferrous metals	Via Confortino, 31 40010 CALCARA di Crespellano (BO Tel. 051 6500511 - Fax 051 732319 www.italferro.it info@italferro.it
Guidetti srl	Recycling systems and machines	Via Salvi, 1 - 44045 Renazzo (FE) 051 972058 Fax: 051 972099 www.guidettirecyclingsrl.com info@guidettisrl.com
Italferro	Tecnologies and services to recover industrial waste	Via Confortino, 31 40010 CALCARA di Crespellano (BO Tel. 051 6500511 - Fax 051 732319 www.italferro.it info@italferro.it
PLAST HI TECH srl	Machine and plant for plastic management (granulate)	Via Gioia 20 CASSANA FERRARA (Ferrara) 0532 730606 ; fax 0532 732526 www.pht.it pht@pht.it
Polymec Srl	Equipments and technologies for treating waste	Via Bassa, 65 - 47020 - S. VITTORE di CESENA (Forlì) Tel. 0547-661668 - Fax. 0547-662472 www.poly,mec.it info@polymec.it
ROTAMFER spa	Metallic and dangerous waste	via Galilei, 19 - 37014 CASTELNUOVO del GARDA (VR) Tel. 045 7570877 - Fax 045 6450022 www.rotamfer.com rotamfer@rotamfer.com
SATRIND spa	Industrial grinding plants (project, realization and installation)	Via F. Baracca, 2 - 20010 Arluno (MI) 02 90376683 fax. 02 90376721
SOTEN srl	Waste recycling and regeneration	V. S.MARTINO 31/32 20017 RHO (MI) 02-9320031 Fax: 02-93507060
STEMIN spa	Metals recycling, new technologies and environment safety	via F.lli Kennedy, 35 Levate (BG) 035 4549040 - fax 035 4549043 www.stemin.it info@stemin.it
TRIMEC DI GASPARRI	Waste recycling and regeneration	V. LEGNANO 59 20027 RESCALDINA (MI) 0331-464950 - Fax: 0331-464276

FRANCO E C. SAS.		

RDP for Ireland: “Management of solid waste”

10. Abstract

This Regional Demand Profile is focused on seeking new technology developments specific to the handling and processing of Municipal, Industrial, Construction and Agricultural Solid Waste.

The rising demand for environmentally sustainable and economically effective treatment technologies, together with the impacts of new Landfill Directives, caused SW Management companies’ necessity and the interest in converting waste to either energy, recyclable products or materials, or disposal.

Segregated solid waste which was formerly disposed of or exported with no value-added, has appreciable intrinsic value, and this can be realized with the application of the appropriate conversion technologies. To remain competitive, SW Management industries must embrace these challenges and invest in “best practice” conversion process technologies.

One of the greatest challenges in the processing of solid waste is in the sorting and separation of materials, into suitable categories for further processing. After these solid materials are collected, they are usually brought to a Materials Recovery Facility where the sorting and separation operations begin. Current practice usually involves size reduction, and the removal of glass and metals.

This can be carried out quite effectively using various mechanical and electro-magnetic technologies. In countries where there is a pool of low cost labour available, this sorting is carried out by hand. In future, the requirement will be for systems and equipment which can automatically sort and separate the waste fractions, to allow their conversion into clean energy, or value-added recyclable material. This will become more important as the cost of fossil fuels continues to rise.

11. Overview of TR

TR No.	Company description	Request brief
01	An Irish SME involved in the integration of waste-management processes	New Technology for the strategic management of waste-collection operations
02	An Irish SME provides engineering support for the manufacturing industry	New Industrial Dryer Technology for wood waste and solid biomass
03	An Irish SME involved in	Technology for the recovery of precious and semi-

	recovery and recycling of waste material	precious metals, from the recycling of waste electrical and electronic materials
04	An Irish SME involved in the Recycling & Recovery Industry	Sorting and separation technology for Mixed Solid Waste
05	An Irish company	Environmentally friendly recovery of specific materials under ELV (motor vehicles) and WEEE Directives
06	An Irish SME involved in specific material recovery under existing EU Directives	Valuable material recovery system for specific WEEE and ELV material

11.1 TR 1: New Technology for the strategic management of waste-collection operations

BBS code *: 07 IE IEEI 0I61*

Comments about BAT

In the present TR a company is looking for new technologies for upgrading existing waste collection operations. The technologies should optimize the wheeled bin and multi-bag arrangements in order to present pre-sorted waste to the Materials Recovery Facilities (MRF). Nowadays a number of devices are going to be developed and adopted in order to increase the percentage of recycled waste. In fact these devices can be installed on the bins, commonly used for unsorted waste, and can be implemented with systems capable of making citizens pay on the basis of the amount of the waste inserted in the bin. Another important aspect is to make an information campaign capable of giving all the necessary instructions to citizens an how to separate waste. For example good habits should be encouraged and established for the correct collection of hazardous waste, such as batteries, accumulators, fluorescent light tubes, waste oils, mercury thermometers, paints, glues, varnishes, solvents and so on.

If we consider the BREF Document about "Waste Treatment Industries", relevance is given to the knowledge of the waste entering a treatment plant. To improve this knowledge, it is useful to implement a pre-acceptance procedure that counts the following procedures:

1) Tests for the incoming waste with respect to the planned treatment;
2) Making sure that all the necessary information is received on the nature of the processes producing the waste, including the variability of the process;
3) A system for providing and analyzing a representative samples of the waste from the production process producing such waste from the current holder;
4) Identifying the appropriate treatment for each waste to be received at the installation by identifying a suitable treatment method for each new waste enquiry and having a clear

method for each new waste enquiry and having a clear methodology in place to assess the treatment of waste, that considers the physico-chemical properties of the individual waste and the specifications for the treated waste.

5) Making sure that the waste code according to the European waste Level is provided.

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
08 IT 54W2 0IC3	A new system for the separate collection of municipal domestic solid waste	An Italian SME	SIMPLER (EEN)
08 AT 0105 0IDH	Innovative, environmental and green marketing-friendly container closure security strip	An Austrian firm	UKMidsEUInet (EEN)

11.2 TR 2: New Industrial Dryer Technology for wood waste and solid biomass

BBS code : *07 IE IEEI 0I5U*

Comments about BAT

In the BREF Document relating the waste treatment technologies, there is a description of BATs concerning the drying of solid waste fuel. The dewatering process can be applied depending on the water content and the physical characteristic of the wastes-. It may consist of one of the following operations: gravity thickening, centrifugal thickening, floatation thickening, gravity belt and rotary drum thickening. Some techniques include:

a) Using thermal drying for the material. In convection (direct or adiabatic) dryers, there is a direct contact between the heating medium and the product to be dried. The moisture from the fuel is removed by the heating medium. In conduction dryers, there is no direct contact between the heating medium and the product. Heat transfer takes place through heating surfaces. Moisture is removed by the carrier gas. Conduction dryers may be preferred for dusty or odorous wastes.

b) Using a biological degradation/drying system. Depending on the applied system, incidental process water arising during the degradation will have to be cleaned before being released to the watercourse. To maintain the biological activity, the is system is fed with air. The exhaust air is collected and also has to be cleaned.

Heat is necessary in case of thermal drying. Biological drying is more applicable to non-hazardous waste.

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
06 IL ILMA 0GOW	Environmentally friendly shredders for waste reduction and re cycling	An Israeli entrepreneur in the field of recycling and waste management	IRC IRELAND (Enterprise Ireland)

11.3 TR 3: Technology for the recovery of precious and semi-precious metals, from the recycling of waste electrical and electronic materials

BBS code : *07 IE IEEI 0I5W*

Comments about BAT

If we consider the experience of United States, in 1998 over 29,000 tonnes of metal were recovered from recycled electronic equipment. Aluminium: 4500 tonnes; steel: 19,900 tonnes; copper: 4600 tonnes and precious metals (gold, palladium, platinum, silver): 1 tonne. After being sorted in the materials recovery facilities, the metallic components are generally sent to metal recovery facilities.

A magnetic separator can separate ferrous components with permanent or electric magnet. The overhead belt magnet is the most common magnetic separation system. After shredding, particles are moved on the conveyer belt and over the magnet. The ferrous metal particles adhere to the belt and the non-ferrous metals are dropped into a non-ferrous metals collection bin by gravity. The ferrous metal particles remain attached to the belt and are carried away from the remaining particles and dropped into a collection bin when they are no longer affected by the magnetic field.

Eddy current separators can remove non-ferrous metals such as aluminium and copper from non-metallic materials. This happens thanks to the constitution of a magnetic field that allows the separation of non-ferrous metals. Aluminium is the most easily separated material because of its electrical conductivity and density. It should be noted that non ferrous metals trapped in a non-metallic material may be impossible to separate. For instance, CU wire covered with insulation would be impossible to separate.

Electronic scrap containing 5-40 wt% Cu are fed into a blast furnace. Copper compounds have to be reduced by reducing agents such as scrap iron and plastics. The product of the blast furnace when used for Cu recovery is called black copper and includes 70-85 wt.% copper. This black copper is fed into the converter to be oxidized. A converter uses air or oxygen-enriched air to make oxides form. Impurities are burned out and Fe is removed as slag. Blister Copper purity is 95 wt.%. In an anode furnace, blister copper and scrap Cu are melted. By adding a reducing agent, molten Cu is reduced. Anode copper purity is 98,5 wt.%. This anode copper can be further purified by dissolving it in H_2SO_4 electrolyte with other elements, such as Ni, Zn and Fe. The pure copper (99.99 wt.%) is deposited on the cathodes.

In a precious metals refinery, gold, solver, palladium an platinum are recovered. The anode slime from copper electrolysis is leached by pressure. The leach is then dried and, after the addition of fluxes, smelted in a precious metals furnace. During smelting, selenium is recovered. The remaining material, primarily silver, is cast into a silver anode. At a subsequent, high-intensity electrolytic refining process, a high purity silver cathode and anode gold slime are formed. The anode gold slime is then leached, and high purity gold, as well as palladium and platinum sludge, are precipitated. It has been noticed that recovering precious metals from electronic scrap is one of the greatest economy profits for the recycling industry.

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
	Precious metals recovery from polymetallic industrial wastes by hydrometallurgical process	Dott. Stefano Ubaldini (CNR-IGAG)	IRC CIRCE
06 HU HUTP 0E9A	Economical recycling of precious metals used in electroplating for surface	A Hungarian SME	IRC Hungary (Nandor)
BIRC/E/241103	Sustainable recycling treatment of non-ferrous metal residues	A Brussels company	IRC BELGIUM
07 IT IRCR 0HL3	Precious & non ferrous-metal recovery/extraction	An Italian SME specialised in the recovery of precious metals	IRC IRENE (Trieste)

11.4 TR 4: Sorting and separation technology for Mixed Solid Waste

BBS code : *07IE IEEI 0I60*

Comments about BAT

A number of distinct methods for the separate collection of dry recyclate and biodegradable materials from household waste are already in use in Europe and in North America. These include kerbside sort systems, co-mingled collection systems, co-collection (survival bag and split vehicle) systems and mini-recycling centres and kerbside containers. Amongst the factors that make s collection system to be successful, an effective promotion of the system and communication with householders are critical. A programme of public awarness and education must be carried out, during the planning and pilot phases and sustained after implementation of the full system. This can result in a more effective improvement and maintenance of the system.

In order to design the collection system, it is important to consider some parameters, as for example: the number of household, the property type, population density, current waste

management infrastructure (including any existing sorting/ processing facilities), socio-economic characteristic, end-market requirements, funding options, legislative requirements.

Monitoring activity is essential to detect the performance of the system so made. Some performance monitoring indicators have been highlighted: number of materials collected, number of household served, quantity of materials collected/ sent for reprocessing, householder participation rate; efficiency of collection, cost, etc.

Some recommendations can be considered for the development of collection systems:

a) the collection system must be developed on the characteristic of the served area and on the final market requirements;

b) collection systems should include both biodegradable and dry recyclable wastes;

c) collection systems should be introduced on opt-out basis (the citiziens should not need to ask for the service);

d) collection systems should maximize material capture from participating household;

e) provide household with containers (where possible); bins and boxes appear to give the highest capture rates, although the decision should also be based on collection method and frequency;

f) a consistent colour scheme should be adopted for collection containers e.g. red or blue for recyclable and green and brown for biodegradables;

g) try to carry out a household waste composition analysis to determine the materials present in the waste stream and provide baseline data for performance monitoring and improvement planning;

h) establish a performance monitoring system;

i) monitor costs of the system and record costs on a per tonne, per household and total basis in order to evaluate its efficiency.

List of Technology Offers (TOs) from BBS Database

BBS code	**Title**	**Enterprise**	**IRC**
08 IT 54W2 0IC3	A new system for the separate collection of municipal domestic solid waste	An Italian company	SIMPLER (EEN)
08 PL 62AP 0IMZ	Plants for processing various wastes into homogenous particles and alternative fuel	A Polish SME	BISNEP (EEN)

11.5 TR 5: *Environmentally friendly recovery of specific materials under ELV (motor vehicles) and WEEE Directives*

Catalogue code: *TR IE 19121*

Comments about BAT

See the comments about next TR

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
08 PL 62AP 0IMZ	Plants for processing various wastes into homogenous particles and alternative fuel	A Polish SME	BISNEP (EEN)
07 IT TUPT 0IS8	Re-Use for Rubber Scrap	An Italian SME operates a tyre recycling line	Italy

11.6 TR 6: Valuable material recovery system for specific WEEE and ELV material

Catalogue code: TR IE 19139

Comments about BAT

Directives 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment and 2002/96/EC on waste electrical and electronic equipment are designed to tackle the fast increasing waste stream of electrical and electronic equipment and complements European Union measures on landfill and incineration of waste. Increased recycling of electrical and electronic equipment will limit the total quantity of waste going to final disposal. Producers will be responsible for taking back and recycling electrical and electronic equipment. This will provide incentives to design electrical and electronic equipment in an environmentally more efficient way, which takes waste management aspects fully into account.

Consumers will be able to return their equipment free of charge. In order to prevent the generation of hazardous waste, Directive 2002/95/EC requires the substitution of various heavy metals (lead, mercury, cadmium, and hexavalent chromium) and brominated flame retardants (polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE)) in new electrical and electronic equipment put on the market from 1 July 2006.

The objective of the ELV Directive (Directive 2000/53/EC) is to prevent waste from end-of-life vehicles and promote the collection, re-use and recycling of their components to protect the environment. The Directive sets clear quantified targets for reuse, recycling and recovery of vehicles and their components and pushes producers to manufacture new vehicles also with a view

to their recyclability. The rate of re-use and recovery must be increased to 85% by average weight per vehicle and by year 2006 and to 95% by 2015. Use of lead, mercury, cadmium and hexavalent chromium will be prohibited in materials and components in vehicles put on the market after 1 July 2003.

Member States must set up collection systems for end-of-life vehicles and ensure that all vehicles are transferred to authorised treatment facilities. The last holder of an end-of-life vehicle will be able to dispose it free of charge ("free take-back" principle).

List of Technology Offers (TOs) from BBS Database

BBS code	**Title**	**Enterprise**	**IRC**
08 PL 62AP 0IMZ	Plants for processing various wastes into homogenous particles and alternative fuel	A Polish SME	BISNEP (EEN)
07 IT TUPT 0IS8	Re-Use for Rubber Scrap	An Italian SME operates a tyre recycling line	Italy

12. List of providers

Enterprise	Mission	Contacts
Cestra	Waste recovery and management	Via. G. Loreti, 65 00133 - Roma info@cestraecologia.it www.cestraecologia.it
Chimet	Recovery & refining of precious metals and the production of fine chemical products based on gold, silver, platinum, palladium, rhodium, ruthenium and iridium	Via dei laghi 31 - 33 C.P 79 Badia al Pino (Arezzo) - Italy Tel. +39 0575 4151 fax. + 39 0575 410214 www.chimet.com
Cogelme	Machines and Systems for Waste Recycling and for Materials Separation.	S.S. per Genova / Via Postumia 15057 Tortona (AL) - Italy Tel. +39 0131 861880 Fax. +39 0131 866337 e-mail: info@cogelme.it www.cogelme.com
Darsa	Environmental technologies; specialized in the production of complete sewage works and complete plants for recycling sewage within the production cycle.	Via Segaluzza, 30/A –I 33170 PORDENONE (PN) ITALY Tel/Ph. +39 0434 57 08 06 Fax +39 0434 57 04 88 vendite@darsa.it www.darsa.it
Ecologia Soluzioni Ambiente	Recovery in the environmental sector	P.zza Guido Rossa, 20 00065 Fiano Romano (Roma) Tel. +39 0765 481 547 Fax. +39 0765 489 291 filiale.roma@ecologia.re.it www.ecologiasa.it
Ecorecupero	Waste recovery, treatment, recycling	Via Matteotti, 17 18100 Imperia Tel/Fax 0183767751 www.ecorecupero.it
Ecotherm sas	Ecological and energy technologies	Via Dei Pratoni 3/29 50010 Badia a Settimo (FIRENZE) – Italia Tel + 39 55 7221594 – Fax + 39 55 7318419 E-Mail info@ecoth.it
Ecoworld	Machines and complete systems to recover and recycle different typologies of materials	Largo martiri della Liberazione, 1 - 14100 Asti Tel e Fax +39 0141 352462 www.eco-world.it

EKO Technology Srl	Waste management and recover to produce energy	Via Trave, 62 - 61032 - Fano (PU) tel. +39 0721.863276 fax +39 0721.868630 www.eko-technology.com
EPT Engineering Consulting	Environmental enginnering and integrated waste treatment	Via Maso Della Pieve 60/A I BOLZANO (BZ) Tel. ++39 0471 590170 Fax ++39 0471 594707 info@eptservice.com www.eptservice.com
Fontana (ENEA)	Research in the environmental sector, waste	Dott. Danilo Fontana ENEA Casaccia Via Anguillarese 301 00060 Rome T: 06 30484081 F: 06 30483818 E: danilo.fontana@mail.casaccia.enea.it IRC CIRCE
Idratech	Wastewater treatment	via A. Gandiglio 120 00151 Rome T: 0665743259 F: 0665799988 E: workgroup@idratech.it W: www.idratech.it IRC CIRCE
Nuova Sipa	Storage, treatment and management of waste ; energy from waste	Via Verdi, 18 ORSENIGO (CO) Tel. 031/3350411 - Fax 031/619202 e-mail:nuovasipa@nuovasipa.it www.nuovasipa.it
Promeco	Municipal solid waste (MSW) and Industrial Waste treatment plants; anaerobic digester	Via Torriani 17/a 22100 COMO (Italy) Tel +39 031 267331 Fax +39 031 267446 promeco@promeco.it www.promeco.it
Sea Marconi Technologies S.a.s	Haloclean® process	Via Ungheria 20 10093 Collegno (Torino), Italia tel. +39 011 234.34.34 fax +39 011 234.34.35 www.seamarconi.com
Siem	Waste management	Via Ariosto 47 46100 Mantova Tel. 0376323265 Fax 0376220977 www.siemspa.com
Sinergamma	Waste management, monitoring systems, environmental services	Via Capocci 24 00199 roma Tel: +39 0645551210 Fax: +39 0645543257 (Luca Di Leone: +39 335 5721435) E- mail: info@sinergamma.it l.dileone@sinergamma.it W: www.sinergamma.it

		IRC CIRCE
Sorain Cecchini Tecno	Waste treatment technologies	Via di Pontina, 545 - 00128 Roma Tel 39-06-50.78.07.92 Fax. 39-06-50.79.55.19 e-mail: info@sctecno.com Web: www.sctecno.com IRC CIRCE
STC srl	Promotes and develops technologies in different sectors (environment, electrochemistry, food-processing, etc.)	Sede operativa Via A. Murri, 22 - 72023 Mesagne (BR) Tel/Fax: (+39) 0831.738018 www.stcnet.it
TPA Trituratori spa	Machines and plants for shredding and recycling waste	Via Tremarende, 22 35010 S. Giustina in Colle (PD) Tel. +39 049 9301815 (ora chiamare 049 9303358) Fax +39 049 9300297 www.tpatrituratori.com

RDP for Italy (Latium): “Renewable sources of energy: photovoltaic and solar thermal energy”

13. Abstract

The Italy RDP is focused on renewable energy in order to promote and increase the use of alternative sources, as in particular solar thermal and photovoltaic.

Italy is a net energy importer, and presently consumes more than six times the amount of energy it produces. Italy is dependent on outside sources for almost all of its crude oil, natural gas, and coal, and even imports a significant part of its electricity supply. Italy presently ranks as the world's twelfth-greatest energy consumer (and fourth-greatest in the European Union), accounting for about 1.9% of the world's annual energy consumption.

The Italian authorities often underline the singularity of Italy’s electricity mix, which has no nuclear power (apart from nuclear electricity imported from France). Difficulty to exploit domestic energy resources also explains the strong historical dependency on primary energy imports and the need to diversify energy supply to spread the security of supply risks

Even if in 2004 renewable energy production grows (+16%) up to the 45% of national energy production, taking into account all the energy supply, including imported, only the 6.2% of total used energy is renewable energy, while 44% derives from petroleum, 34% from gas and the other from coal and from electricity imported by third countries (mainly produced in nuclear power plants).

Italy needs to conform itself to the international and European rules in the environmental field and to become more competitive in energy efficiency; European Commission, in fact, declared that Italy is late in the field of the renewable sources of energy.

Although there was a big expansion of wind power, biogas and biodiesel, Italy is still very far from the objectives established at European and National level. European Commission believes that this delay was determined by two factors. The first one is the lack of a clear and effective policy; the other is the presence of too many administrative obligations which represent an obstacle for the installation of some plants.

In addition, some financial barriers represent a further obstacle, as for example, the high costs for the connection to the grid.

The objective which was indicated for Italy is the production of 75 billion kWh/year of renewable energy against actual production which is about 50 billion. This means further 2000 MW from wind power plants, 500 MW of hydroelectric power plants, 2000 MW biomass and biogas power plants and 1000 MW from PV power plants.

In this framework, environment has become a crucial point of next Italian policy. In the next future attention will be focused on measures directed to the reduction and rationalization of energy consumption. The attention will be given to different topics concerning energy.

In National Financial Program for 2007 (L. n. 296/2006) specific measures are foreseen for different aspect of daily life:

- energy efficiency of buildings, introducing a tax deduction of 55% for the energy efficiency improvement interventions in existing buildings, for the installation of covering, floors and fixtures, for the installation of solar panels for the production of hot water, for the substitution of cooling and heating plants with plants provided with a condensation boiler and for the adaptation of the distribution grid;

-renewable sources of energy, for whom Financial Program for 2007 foresees state contributions for the production of energy from renewable sources, as European Directive 2000/77 indicated.

Other aspects of the Financial Program are about refrigerators (tax deduction of 200 euro for the purchase of high efficiency refrigerators); fluorescent lamps (tax deduction of 36% for shopkeeper for the adoption of high efficiency illumination systems).

It foresees some measures for cars in order to intensify the use of public transport, for industrial machines characterized by low energy consumption, for the promotion of environmental friendly fuels (this to line up Italian legislation to European directive 2003/30/CE) and the reduction of air emissions**.**

In order to make these tax deductions effective, the Government has approved in February 2007 a plan called "Climate, Energy Efficiency and Industrial Innovation". While the demand for environmental friendly and energy saving products is increasing there is the need for developing suitable offers through the innovation of Italian industry.

14. Overview of TR

TR No.	Company description	Request brief
01	A firm located in Rome specialized in research, design and implementation of electrical energy generation systems by a renewable source	Innovative photovoltaic panels and wind generators in order to improve their systems' performances in terms of duration of the working life, weight, size, management, maintenance and cost. Any other innovative aspect not listed before will be taken into consideration
02	A firm located in Rome specialized in research, design and implementation of electrical energy generation systems by a renewable source	The firm is looking for domes made in translucent material (glass) with high transparency. . Also good mechanical features and flexibility are sought in order to obtain different shapes and sizes
03	An Italian university research	A contact with foreign companies or research groups to carry out joint research project regarding high-temperature

	group	materials and chemical processes using concentrated solar energy as primary high-temperature source
04	An Italian university research team	A technology concerning the encapsulation materials/techniques for sealing TCO-coated plastic films like PET or PEN on metallic foils or other materials for dye sensitized and organic solar cell applications
05	An Italian company specialized in the production of rigid and flexible printed circuit boards, also capable of developing a wide range of products	A cooperation to development of an innovative process for the production of solar cells
06	An Italian company involved in photovoltaic field	A collaboration for providing innovative photovoltaic systems based on the concentration of sunlight and commercialization of wind power generators (maximum 20 kWp)
07	An Italian company involved in the production of photovoltaic modules	Technological and commercial partners for development of innovative machines to be inserted in the production line
08	An Italian company with a wide experience in solar heating/cooling radiant plants	New applications for their recently developed electronic controller that can manage the radiant system and also the entire heating plant of a building

14.1 TR 1: Photovoltaic panels and Aeolic generators

BBS code : *05 IT LAAP 0DYG*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
07 SE WSIK 0JD6	Method for producing photovoltaic cells and modules from silicon wafers	A Swedish company	IRC Western and Southern Sweden/Iceland (Magnus Karlsson)
06 ES BCAV 0EHC	Micro-wind-photovoltaic hybrid generator for isolated	A Spanish technological	BASQUE IRC (Leire Arriola)

	areas	centre	
07 ES CACI 0IVB	High efficiency in photovoltaic panels	A Spanish SME based in Catalonia	IRC CATALONIA (Marta Marques)
07 SE NSLA 0HWX	A parabolic trough solar collector	A small Swedish company	IRC Northern Sweden (Börje Vestin)

14.2 TR 2: High-transparency domes

BBS code : *05 IT LAAP 0DYH*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
08 DE 0958 0IJD	Crystal mirror heating system for bathrooms and more	A Dutch company	CIP Saxony

14.3 TR 3: Solar energy for studying high temperature materials and chemical processes

BBS code : *07 IT LADA 0HSC*

Comments about BAT

Not available

List of Technology Offers TOs from BBS Database

BBS code	Title	Enterprise	IRC
05 ES MAOT 0DP8	Machine, and its method of use, to reproduce the conditions of pressure, temperature and irradiation of any environment or planetary atmosphere under controlled procedures	A Spanish company	Spain

14.4 TR 4: Encapsulation techniques and printing technologies for hybrid organic solar cells

BBS code : *07 IT LAUR 0HC9*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
07 ES CACI 0IVZ	Novel compounds for the manufacture of organic and hybrid solar cells	A Spanish research organisation	IRC CATALONIA (Marta Marques)
07 DE SDST 0IDD	Plasma coatings for solar cell applications	An institute of a German university specialised in low-pressure microwave plasmas	IRC Stuttgart-Erfurt-Zürich (Katrin Heckmann)

14.5 TR 5: Innovative method for production solar cells

BBS code : *07 IT LADA 0HFS*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
07 LT LTIC 0JBJ	Photovoltaic cells manufacturing technology based on self-formation processes	A Lithuanian SME	IRC LITHUANIA (Asta Sukiene)
07 IT ONCA 0JBF	Third-generation photo-electrochemical solar cell structure	An Italian university with a long experience in thin films and a-Si-based II generation solar cells	ALPS IRC (Chiara Soffietti)
06 ES SSCT 0F9D	Photovoltaic Solar Cells Not Based On Silicon Technology And Availability	A cooperative research group of two Andalusian. universities	IRC Southern Europe (Laura Valle)

14.6 TR 6: Innovative concentration solar systems and wind generators

BBS code : *07 IT LADA 0HSG*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
08 IT LADA 0JKE	Wind/photovoltaic power station: a new technology for production of energy from complementary renewable sources	An Italian company	IRC CIRCE (Sara Berselli)
07 ES MADG 0HIW	Power inverter for photovoltaic plant and expertise in power control for wind generators	The Power System Control Group of a Madrid based university	IRC MADRID (Juan Francisco Reyes)
07 AT ATAP 0IZ2	Complete systems for thermal solar energy (panels, tanks, climatic wall)	An Austrian company	IRC AUSTRIA (René Stix)
07 PL SPOP 0IJL	Autonomous wind-and-sun power station	A Polish research Institute	IRC CENTRAL POLAND (Katarzyna Pietruszynska)
05 IT LAAP 0DYE	Electric generation systems with accumulation fuelled by photovoltaic or aeolian energy	A firm located in Rome specialised in research, planning and implementation of electrical energy generation systems fuelled by a renewable source	IRC CIRCE (Francesca Zinni)

14.7 TR 7: Innovative solutions for assembling and producing photovoltaic modules

BBS code : *07 IT LADA 0HWT*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
08 SK SKND 0K7L	Photovoltaic solar modulus and systems development	A company located in the eastern part of Slovakia	IRC SLOVAKIA (Lubica Jean-Jean)
07 LT LTIC 0JBJ	Photovoltaic cells manufacturing technology based on self-formation processes	A Lithuanian SME	IRC LITHUANIA (Asta Sukiene)
07 IT ONCA 0JBF	Third-generation photo-electrochemical solar cell structure	An Italian university with a long experience in thin films and a-Si-based II generation solar cells	ALPS IRC (Chiara Soffietti)
07 IT LAAP 0IWI	Innovative technology for silicon low cost production for photovoltaic use	A new Italian SME working in photovoltaic field	IRC CIRCE (Daniele Valli)
06 ES SSCT 0F9D	Photovoltaic Solar Cells Not Based On Silicon Technology And Availability	A cooperative research group of two Andalusian. universities	IRC Southern Europe (Laura Valle)
07 SE NSLA 0HWX	A parabolic trough solar collector	A small Swedish company	IRC Northern Sweden (Börje Vestin)

14.8 TR 8: Innovative application for devices managing and controlling heating/cooling radiant plants

BBS code : *07 IT LADA 0HT3*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC

07 CY CYIT 0HUX	Energy Performance System	A Cypriot IT company	IRC CYPRUS (Antonis Antoniou)
05 DE HRIM 0DQL	Know-how and optimum solutions for renewable energy projects	A German company	IRC Hessen/Rheinland-Pfalz (Heike Jaberg-Weinspach)

15. List of providers

Enterprise	Mission	Contacts
3M ITALIA S.P.A.	Energy efficiency in buildings - Wind Energy - Solar Thermal energy and photovoltaics	PIAZZA ADRIANA, 12 00193 Roma-Italy Tel. +39 06 68625235 Fax +39 06 68625265 pmazzoni1@mmm.com (Mr Paolo Mazzoni)
A.T.P. AMBIENTE TRASPORTI PROGETTAZIONE SRL	Environment, Engineering and Transport	Via Ludovico di Savoia 26 00185 Roma-Italy Tel. + 39 06 7005407 Fax + 39 06 7008759 atp01@atpprogetti.it
ABAKOS AMBIENTE S.R.L.	Photovoltaic energy diffusion	Via Gorgia di Leontini 260 00124 Roma-Italy +39 06 50918589 +39 06 5098384 www.abakosambiente.com info@abakosambiente.com
ACCAMSPA (Associazione Consortile dei Comuni dell'Alto Milanese)	Biomass	Via Strada Comunale di Arconate 121 21052 Busto Arsizio (Milano)-Italy Tel. +39 0331 351560 Fax +39 0331 351780 www.accam.it dirgenaccam@accam.it
ADVANCED COMPUTER SYSTEMS A.C.S. S.P.A	Satellite Ground Segments and Tools , Remote Sensing Applications and Services .	via della Bufalotta, 378 00139 Roma-Italy Mob. + 39 335 7681345 (Dr. Di Gianmatteo) www.acsys.it udig@acsys.it
AGRICONSULTING S.P.A.	Biomass, biofuels, biomass supply	Via Vitorchiano 12 00189 Roma-Italy www.agriconsulting.it a.berti@agriconsulting.it
AGROENERGIEN	Biogas power plants, self mixed digester (SMD-Fermenter), facilities to dry fermenetd waste and sludge, air-purification systems to reduce dust, odor and ammonia in the extracted air	Brunner Str. 18 26316 Varel (Germany) Tel. +49 4453 98 58 00 Fax +49 4453 98 58 02 www.agroenergien.de meiners@agroenergien.de (Mr Burkhard Meiners)
AGT ENGINEERING	Energy systems design, fuel cells base systems engineering	via Vigliena, 10 00192 Roma-Italy Tel. +39 06 45437023

		Fax +39 06 32609007 www. agtgroup.it f.ugolini@agtgroup.it (Mr Filippo Ugolini)
AIREST TECH S.R.L.	Solar Energy (Thermal and PV), Biomass, Rational Use of Energy	Via Polesine, 8 00162 Roma-Italy Tel. +39.335.8789793 Fax +39.06.86202434 www.airestech.it domenico.borello@gmail.com (Mr Domenico Borello)
ALFA AMBIENTE CONSULTING SRL	Consulting, engineering in safety and environmental sectors	L.go Luigi Antonelli 00145 Roma-Italy Tel. +39 06 89927254 Fax +39 06 89927255 www.alfambiente.it fusco@alfambiente.it (Mr Geremia Fusco)
AMIFB INFORMATICA	Information and telecommunication technologies	via Alvise Cadamosto, 14 00154 Roma - Italy Tel. +39 06 5747443 Fax +39 06 5743722 www.amifb.it franco.barion@amifb.it (Dr. Franco Barion)
ANSALDO CALDAIE S.P.A.	Design, manufacture and supply of Utility Boilers, Heat Recovery Steam Generators, and Biomass & Waste to Energy Boilers.	strada Milano, km 1,600 70023 Gioia del Colle (Bari) - Italy Tel. +39 080 3480315 Fax +39 080 3480300 Mail : antonio.ferrante@ansaldoboiler.it (Dr. Antonio Ferrante) factory@ansaldoboiler.it Web:_www.ansaldoboiler.it
ARPAL IT SRL	ICT - Systems and software for Transport Engineering and Environment	Clivo San Antonino, 4 00165 Roma - Italy +39 06 39366662 www.arpal.it palma@arpal.it (Mr. Armando L. Palma)
ATENATECH SRL	Energy and microbiological safe	via degli esplosivi 00036 Colleferro (Roma) - Italy + 39 06 97234055 + 39 06 97200965 www.atenatech.it amministrazione@atenatech.it
BBS SRL	ICT and alternative energies	Via Sante Bargellini 44 00157 Rome – Italy Mob. + 39 335 225225 www.bibiesse.com

		info@bibiesse.com mauro@spin.it (Mr Mauro Cristiano)
BIONARDO REPOWER GMBH	Biogas plant; solar & photovoltaik, plantoil, bodiesel, biomass	Karl-Schmid-Str.16 D-81829 München Tel. +49 (0)89 51099 737 T Fax +49 (0)89 51099 738 F www.bionardo.com info(at)bionardo.com j.falcan@bionardo.com (Mr Josip Falcan)
BLUENERGYCONTROL	Designing and building biogas and photovoltaic plants	via A.Mario 7 36100 Vicenza - Italy Tel. +39 0444963874 Fax +39 0444963876 www.bluenergycontrol.it pierpaolo@bluenergycontrol.it (mr Paolo Salazzari) alessia@bluenergycontrol.it (Ms Alessia Zenere)
C.R.F. COOPERATIVA RICERCA FINALIZZATA SC	Services in environmental and energy sectors	Largo della Pace, 12 01017 Tuscania (VT) - Italy Tel/fax +39 0761-434196 www.crf-scrl.com info@crf-scrl.com
CASTELLO DI ZENA - VIVECA SRL	Restoration in ancient buildings with new technologies applications	Strada Provinciale di Zena 80 - Loc. Zena 29013 Carpaneto Piacentino (Piacenza) - Italy Tel. & Fax + 39 0523 851001 info@castellodizena.it
CDM SRL	Renewable energy from agricultural areas ; wind and biogas plants	Zona ind.Le Cerealfer 70058 Spinazzola (Barletta-Andria-Trani) – Italy Tel. +39 3480031986 Fax +39.1782713268 colangelogiovanni@tele2.it (Mr Giovanni Colangelo)
CE.MI. SRL	Machines, technological know-how and services in the field of renewable energy	Via della Quaglia snc 04012 Cisterna di Latina (LT) – Italy Mob. +39 3335815877 www.cemiweb.com info@cemiweb.com
CENTRO SVILUPPO MATERIALI SPA	A reference research centre operating in the worldwide scenario of innovation in materials and related technologies of production, engineering, design and application	via di Castel Romano, 100 00128 Roma Mob. +39 335.6682135 Fax +39 06.5055461 www.c-s-m.it p.folgarait@c-s-m.it (Dr. Paolo Folgarait)
CISEL SRL	Design and production of printed circuit boards, with	Via della Stazione 64/66 60022 Castelfidardo (AN)- Italy

	application in different fields (ICT, medical, PV energy, etc.)	Tel. + 39 0542 653751 www.cisel.it tommaso.virnicchi@elca-technologies.com (Mr. Tommaso Virnicchi)
COMPAGNIA DELLE MURGE	Biomasses and wind	Cerealfer Zona Ind. le 70058 Spinazzola (Barletta-Andria-Trani) – Italy Mob. +39.348.0031986 gruppo.cdm@alice.it
CONSOLAR SOLARE ENERGIESYSTEME GMBH	R&D, production of storage tanks and tube collectors, sales activities in 9 European countries	Strubbergstrasse 70 60489 Frankfurt (Germany) Tel. +49 69 7409328-24 Fax +49 69 7409328-50 www.consolar.com peter.kamper@consolar.de (Mr Peter Camper)
CONTROL SYSTEM SRL	Project, installation and maintenance of global service technological plants	Via delle azalee, 19a 00172 Roma (RM) Italia Tel. +39 06 23.23.33.97 Fax +39 0623.23.32.03 www.controlsystemsrl.it info.azienda@controlsystemsrl.it
CONVERT ITALIA S.P.A.	Technological systems in general, particularly on the Energy (photovoltaic), and the Telecommunication services	Via Paolo di Dono, 3/A 00142 Roma Tel. +39 06510611 Fax +39 0651061200 www.convertitalia.com gmoro@convertitalia.com (Mr Giuseppe Moro)
CSM	A reference research centre operating in the worldwide scenario of innovation in materials and related technologies of production, engineering, design and application	via Castel Romano 100 00128 Roma Tel. +39 06 50551 Fax +39 06 5050250 www.c-s-m.it a.digianfrancesco@c-s-m.it (Mr Augusto Di Gianfrancesco)
CULTURADIMPRESA SRL	Planning of innovative strategies for the Economic, Social, and Professional development	VIA PO 43 00198 Roma - Italy Tel. +39 06 8550128 Fax +39 06 8550455 www.culturadimpresa.net cults@cults.it martina.coppola@cults.it (Ms Martina Coppola)
DINTEC	Planning and realizing projects on the topics of the innovation, the quality in agrofood and handicraft fields; services and management for increasing	Via Montebello 8 00185 Roma - Italy Tel. +39 06 47822420 Fax +39 06 47822439 www.dintec.it misuri@dintec.it (Mr Alessio Misuri)

	the SMEs competitiveness	
DITTA ANDREA MACELLARI	Solar energy	Via dell'Impruneta 13 00146 Roma – Italy Mob.+ 39 3925411026 andrea.macellari@alice.it
DOMOENERGY ENGINEERING	Renewable energy, Mini-wind, Geothermal heating, Solar plant, innovative solar energy solutions, Building automation, intelligent lighting sistems for indoor and outdoor, infrared camera analisys,innovative thermohydraulic plant design. Thermal insulation, energy efficiency in buildings	Via Collalto Sabino,1 02100 Rieti - Italy Mob. + 39 3476628567 Fax + 39 0746253323 www.domoenergy.it fabiosantori@domoenergy.it (Eng. Fabio Santori)
DUE EFFE	Installation of photovoltaic panels	Via Giuseppe Gavazzi, 36 00156 Roma - Italy Mob. +39 3395628439 Fax + 39 06 90024645 Fabrizio.ragni@gmail.com (Mr Fabrizio Ragni)
E.R.A. SRL	Designing and supplying of photovoltaic equipments	Via Gorizia, 52 00198 Roma - Italy Tel. +39 06 64780194 g.luise@mclink.it (Mr Gianni Luise)
ECOLCAP S.R.L	Production of innovative valves to reduce the water and energy consumptions	Corso Vittorio Emanuele, 115 Marigliano (NA) - Italy Tel. +390818431054 Fax +390818414039 www.ecolcap.it info@ecolcap.it
ECOMEDIA	Environmental engineering ; Photovoltaic, Energy management, GIS, surveying, mobility management	Via A. Rocca 2B 00135 Roma - Ital. Tel. +390640824127 Fax +39063975176 www.ecomedia.it info@ecomedia.it
EDIL GROUP ITALIA S.R.L.	Energy efficiency in buildings ; Design and planning of nursery schools low ecological impact	Via Montepulciano, 24 00182 Roma - Italy 06/979988789 06/97998789 edilgroupitaliasrl@libero.it
ELEKTRONIKSYSTEM UND LOGISTIK-GMBH	Consulting, Aviation Engineering, Automotive Engineering, Systems-	Livry Gargan Strasse 6 82256 Fürstenfeldbruck (Germany) Tel. +498992162839

	Enginieering, Logistics, IT & Telecommunications, Defense Systems	www.esg.de peter.dass@esg.de (Mr Peter Dass)
ELLEBI GROUP SRL	planning, engineering and production of mechanical and chemical industrial plants, superficial treatments (autophoretic and others), plant automation (also with remote control systems), chemical and metallurgical analysis (metallographic analysis in alloy, spettroscopy, gas chromatograph etc etc), vibro-mechanics, vision system, testing systems, remote control	Via Tovini, 23 25021 Bagnolo Mella (BS) Tel & Fax +39 030 620492 www.ellebigroup.eu bonometti@ellebigroup.eu
EMDA (East Midlands Development Agency)	One of nine Regional Development Agencies in England, set up in 1999 to bring a regional focus to economic development	Apex Court NG2 4LA Nottingham (United Kingdom) Tel. +44 07789 654712 www.emda.org.uk/main/ karl@sustainabletechnology.co.uk (Mr Karl Seare)
ENERGIA FUTURA SRL	Solar, thermal and photovoltaic	Via Strada di Vagno 15 05027 Nera Montoro (TR) - Italy Tel. +39 3381561060 Fax + 39 0761549509 waltercalamanti@hotmail.com (Mr Walter Calamanti)
ENERGY SAVING S.R.L.	Management consulting in different sectors (energy, environment, engineering, etc.)	Via Piave, 2 00018 Palombara Sabina (Roma) - Italy +39077465083 +39077465083 www.mancon.it enerman@tin.it
ENVITEC BIOGAS ITALIA	Biogas plants (production, maintenace, investor)	Borgo S. Agnese, 93/B 30026 Portogruaro (VE) - Italy tel: +39 0421 394745; +39 0421 390748 www.envitec-biogas.it gabriel.versolato@envitec-biogas.it (Mr Gabriele Versolato)
ERAMBIENTE	Editing and communication in the environmental sector	Via Carlo Perrier, 9A 00157 Roma - Italy www.erambiente.net fcatino@erambiente.net (Mr Fabio Catino)

ERGASUM	Engineering for energy plant	3° traversa via Vincenzo Barletta, 11 80078 Pozzuoli (NA) - Italy Mob. +39 3396831235 Fax +39 081 2140689 www.ergasum.com doriano@ergasum.com (Mr Andrea D'Oriano)
ES-COM	Consulting and services in order to promote the sustainable economic development and European integration by means of information activity, planning and technical attendance.	via dei bianchi, 3 89121 Reggio Calabria – Italy Mob. +39 3406854254 (Mr Alessandro Dattilo) Fax 067020191 www.es-com.it info@es-com.it
EURECO EUROPEAN ENVIRONMENTAL COMPANY S.P.A.	Services and managment in the energy and environmental fields	via S. Lucia, 20 80132 Napoli - Italy Tel. +39 0812405359 Fax +39 0812471266 www.eurecompany.it info@eurecompany.it
EUTIMIA SRL	Energy management and system integration to promote diffusion of renewable sources of energy	Via Ancona, 2 00043 Ciampino (Roma) - Italy Tel. +39 06 40043114/40043109 www.eutimia.it info@eutimia.it
FLUIDSOLUTIONS-A	A consulting company which provides a high value service for the solution of fluid dynamic problems applied to the engineering and architectural fields	Via G. Peroni, 442 00131 Roma – Italy a.ciarravano@fluidsolutions-a.com (Mr Alessandro Ciarravano)
FLYBY S.R.L.	Innovative solutions for applications in three fields : space, environment and renewable energies, biomedical ; PV plants remote control, PV plants design	via Puini 97, int.26 57128 Livorno - Italy Tel. +39 0586505016 Fax +39 0586-587280 www.flyby.it emilio.simeone@flyby.it (Dr Emilio Simeone)
FONDAZIONE ANNA MARIA CATALANO	R&D in the environmental sector	Via Monte Corona, 6 00141 Roma Tel. & Fax+39 068174198 www.fondazionecatalano.it info@fondazionecatalano.it
GENERA SRL	Engineering projects for a sustainable world	Via Francesco Patrizio da Cherso, 16 00143 Roma – Italy

		Tel. + 39 065163113 Fax + 39 065163146 www.generaweb.it info@generaweb.it
GMP ENGINEERING SAS	Project and realization of solar panels and installations	Via Piersanti Mattarella, 15 Cologno Monsese (MI) - Italy Tel. +39 0225410672 Fax +39 0225492522 www.gmpsolare.it info@gmpsolare.it
GREEN ENERGY SOLUTION SRL	Engineering, system integrator, research in the field of renewable energy	via San Marco, 8 33170 Pordenone - Italy Tel +39043427585 Fax +3904341999992 www.greenenergysolution.com info@greenenergysolution.com
HELIOS TECHNOLOGY	Manufacture of photovoltaic cells, photovoltaic modules, inverters and charge regulators	Via Postumia, 9/b 35010 Carmignano di Brenta (PD) - Italy Tel +39 049 9430288 Fax +39 049 9430323 www.heliostechnology.com m.rossetto@heliostechnology.com (Mr Mark Rossetto)
HOSANA LTD.	R&D, new technology for RES	Kaplická 12 14000 Prague 4 Czech Republic Tel. 00420-604 871 411 Fax 00420-241 730 134 hosana@volny.cz
HYDROGENESYS	High temperature pyrolysis for waste management	P.zza Martiri della Libertà, 25 27045 Casteggio (PV) - Italy Mob. +39 335 6318902 Fax +39 0383 82659 www.hydrogenesys.it brambilla@hydrogenesys.it (Mr Giorgio Brambilla)
ICI CALDAIE SPA	Research and development of highly reliable heating generators keeping up with the technological evolution.	Via G. Pascoli, 38 37059 Campagnola di Zevio (VR) - Italy Tel. +39 045-8738506 ; +39 045 8738511 Fax +39 045-8738507 ; +39 045 8731148 www.icicaldaie.com info.ita@icicaldaie.com gabriele.malaspina@icicaldaie.com (Mr Gabriele Malaspina)
ID SERVICES S.R.L.	Design, Installation, maintenance: energy, security and communication	Via D. Stiepovich, 180 00121 Roma – Italy Mob. 3389406520 (Mr. David Paternosto)

		idservices@virgilio.it
IGEAM SRL	Consulting, engineering and service for environment, health and safety and development	Via della Maglianella, 65T 00166 Roma - Italy Tel. +39 0666991344 Fax + 39 0666991330 www.igeam.it f.sconosciuto@igeam.it (Dr Francesca Sconosciuto)
INGEGNERIA AMBIENTALE SRL	Renewable energy	Viale Parioli, 27 00197 Roma - Italy Tel. +39 06 7259 4918 ingegneriambientale@libero.it
INTERENERGY	Engineering and technical consulting firm specialised in the field of sustainable energy, conventional and renewable energy sources, energy efficiency and rational use of energy, energy auditing and planning.	Via A. Boito, 102 00052 Borgo S. Martino di Cerveteri (RM) - Italy Tel & Fax +39 06 99206927 www.interenergy.it info@interenergy.it
INTRAVIDÉRE		via del Gesù, 62 001 Roma - Italy Mob. +39 3498655994 www.intravidere.com ciuffi@intravidere.com (Dr Filippo Ciuffi)
IPT	Focused on Territorial Information System (S.I.T.) and regarding activities (city planning, socio-medical and environmental applications, management of resources/infrastructures within territory, etc.)	Via Sallustiana, 23 – 00187 Roma Tel. ++39 +6/42041717 Fax. ++39 +6/42041703 www.iptsat.com val.caroselli@iptsat.com (Mr Valerio Caroselli)
ISIS R&D SRL	Research and development in aerospace and environment sectors	Viale G. Marconi, 00146 Roma - Italy Mob +39 393 8927899 Tel.: + 39 06 540 31 91 www.isis-rd.com claudio.ferrari@isis-rd.com
ISTITUTO PILOTA SRL	Design and delivery of training actions for companies also in the sector of renewable energies and consultancy for the development of human	via Sicilia 67 85100 Potenza – Italy Tel. +39 0971/263123 Fax + 39 0 971/263131 www.istitutopilota.it francofucci@istitutopilota.it (Dr Franco Fucci)

	resources and innovation	
ITEMS INTERNATIONAL	Information and communication technology strategies	via del casaletto 201 00151 Roma _ Italy Tel. +39065349187 www.items.fr giorgioprister@yahoo.it (Mr Giorgio Prister)
JACQUES GIORDANO INDUSTRIES	Solar energy, heat pompes	ZI Les Paluds - 529 Avenue de la Fleuride 13685 Aubagne (France) Tel +33(0)442 823 153 Fax +33(0)442 700 870 dominique.villier@giordano.fr (Mr Dominique Villier)
KEMOTECH SRL	Research and development on chemical synthesis; application in chemical, biological, nanotechnologies, drug delivery fields	Legal site : Via Roma, 72 09123 Cagliari – Italy Parco scientifico e tecnologico della Sardegna, Edificio 3 Loc. Piscinamanna - 09010 Pula (CA) - Italy Tel. +39 070 9243.2204 Fax +39 070 9242.206 paolo_lazzari@yahoo.it (Dr Paolo Lazzari)
LABOR	Energy, electronics, chemical processes	Via Giacomo Peroni, 386 00131 Roma - Italy Tel. +390640040354 Fax +390640040357 www.labor-eu.net a.picano@labor-roma.it (Mr Alfredo Picano)
M & P TRADE SRL	Solar energy, biomass, aeolic turbine	VIA DEGLI ESPLOSIVI snc 00034 Colleferro (RM) - Italy Tel. & Fax + 39 069708084474 www.mp-trade.it mp.trade@telematicaitalia.it
Marco Acquapendente	Designing and supplying of photovoltaic equipments	Via Michele di Lando 00162 Roma - Italy Mob + 39 335317108 Fax +39 06 77401790 macquapendente@libero.it
MEDI-PRAGMA	A professional marketing problem solving driven organization targeted on companies operating in the healthcare sector	Via Nizza, 152 00198 Roma – Italy 06845551 www.medipragma.com nicola.giampietro@medipragma.com (Mr Nicola Giampietro)
MMC CONSULTING S.R.L.	Research, analisys, marketing and consulting services for enterprises and public administrations	Via Pontaccio, 10 20121 milano - Italy Tel +390119954911 Fax +390119954911

		www.mmconsulting.org vrenna@mmconsulting.org (Mr Antonio Vrenna)
NEDAP N.V.	Renewable energy management systems	Parallelweg 2 7141 DC Groenlo - PO Box 6 7140 AA Groenlo - The Netherlands T +31 (0)544 471111 F +31 (0)544 463475 www.nedap.com ton.scharenborg@nedap.com (Mr Ton Scharenborg)
NHEOLIS srl	wind generator	160 Chemin de al Madragueville 13015 Mareille - France Tel. & Fax +33(0)491 634 203 nheolishaddjeri@yahoo.fr (Mr Haddjeri Nordine)
NOMOS SRL	R & D, production and marketing of Passive Refrigeration equipment	Via A. Carpi, 13 23887 Olgiate Molgora (LC) Tel. +39 0399274380 Fax +39 0399288469 www.refrigerazionepassiva.com Alberto.Ghiraldi@nomossrl.it (Mr Alberto Ghiraldi)
OMEGAWATT	Measurement and analysis of Energy consumption; services and instruments	237, Rue Des Acacias F-69400 Gleizé (France) Tel. +33 (0) 437554239 Fax +33 (0) 826077621 www.omegawatt.fr olivier.constant@omegawatt.fr
OPS srl	Technology for advanced condensation	ZI Macchiareddu - settima strada 09010 Uta (CA) Tel. +39 070 2548024 Fax +39 070 2548508 www.goldencalor.net info@goldencalor.com
OR. EL.	PV plants	Via Nettunense, Km 31 00042 Anzio (RM) Tel. 06 98981037 Fax 06 98980492 www.orel-italia.it fabio.garzia@orel-italia.it (Dr Fabio Garzia)
PA.L.MER. (Parco Scientifico e tecnologico del Lazio Merdionale)	Research of new solution to favour develop and technology transfer in Lazio territory	Via Carrara 12/A loc. Tor Tre Ponti 04013 Latina Scalo (LT) Tel. 0773.40.36.16 Fax 0773.40.54.78 www.pst-palmer.it chimico@pst-palmer.it
PARCO	Promotion of research results	Via dell'Elettronica snc

SCIENTIFICO E TECNOLOGICO ALTO LAZIO	for innovating and developping local territory	02100 Rieti Tel +39 0746 271106 Fax +39 0746 271991 www.pstaltolazio.it/page/standard/site.php direzione@pstaltolazio.it
PARTZSCH ELEKTROMOTOREN	Motors, build technologies, coils, insulation Resin-Rich and VPI	Oswald-Greiner Str., 3 04720 Doebeln (Germany) Mob. +39 3282936085 federicomarangoni@hotmail.com (Mr Federico Marangoni)
PRC GLOBAL PTE. LTD	Green fuel, biodiesel, biofuel, additive,energy efficiency	179, River Valley Rd. Unit -03-05, 179033 Singapore Tel. +65-9145-9147 Fax +65 6293 5162 www.infernofuel.com infernofuel@gmail.com
PREXIS	Automation and control systems; environmental engineering	Via della meccanica 10 02100 Rieti - Italy Tel. +39 074622881 Fax +39 07462286222 www.prexis.it carlo.raggi@prexis.it (Mr Carlo Raggi) gianfranco.venditti@prexis.it (Mr Gianfranco Venditti)
PROMOAMBIENTE	Promotion of PV solar energy; Partner of SOCO SNC – Agrate (MI) PV Solar chargers	VIA Z. Negroni, C-14 0048 Nettuno (RM) Tel. +39 069881299 Fax +39 0698840457 mandelli@interfree.it (Mr Marco Mandelli)
PROTEO spa	Development of new software technologies designed to minimize plants energetic and managing costs and improve service level of the networks (water, gas and sewer)	Via Santa Sofia, 65 95123 Catania - Italy Tel. +39 0957144373 Fax +39 0957144374 www.proteo.it patti@proteo.it (Mr Giuseppe Mario Patti)
QUASAR INGEGNERIA AMBIENTALE srl.	Environmental engineering	Viale Verona 190 38100 Trento - Italy Tel. +39 0461 391632 Fax +39 0461 935002 www.quasar.to agostini@quasar.to (Dr Matteo Agostini)
R. A. HELIOTECH	Project of PV and solar thermal applications for building	Via dei Fabbri Navali, 69 00122 Rome Tel. & Fax +39 06 81907539

		architech.rr@libero.it
ROBUR SPA	Energy efficiency; gas absorption heat pumps	via Parigi 4/6 24024 Zingonia ( ) - Italy Tel. +39 035888315 Fax +39 0354821335 www.robur.it fdepaoli@robur.it (Mr Ferruccio De Paoli)
ROSSATO GROUP SNC	Solar panels ; renewable energy plants ; heating pumps	Via Napoli, 50 04014 Pontinia (LT) - Italy Tel. +39 0773 848778 Fax +39 0773 844051 www.rossatogroup.com cristian@rossatogroup.com (Mr Cristian Rossato)
S.P.IN SRL	Scientific and Technological Research in the Energy-Environment-Transport-Defense sectors	Viale Parioli 27 00197 Roma - Italy Mob. +39 3339861039 Fax +39 06 97258656 www.spintecnologia.com paolotripodi@spintecnologia (Dr Paolo Tripodi)
SA. GER	Consulting, studies of feasibility, planning, realization and test of thermal and photovoltaic solar systems	Via Ternavasso, 21 10046 Poirino (TO) - Italy Tel. & Fax +39 0119450005 www.sagerconsulenze.com sa.ger@alice.it
SAACKE GMBH	Combustion and Energy Systems	Südweststr. 13 28237 Bremen - Germany Tel. +49-421-64950 Fax +49-421-6495384 www.saacke.de a.martens@saacke.de (Mr Andreas Martens)
SASSO srl	Energy plants, sustainable development	Via F. Cavallotti, 17 bis 12100 Cuneo - Italy Tel +39 692068 Fax +39 488465 www.sasso-italy.com s.quaranta@sasso-italy.com (mr Stefano Quaranta)
SAVENERTECH SNC	Technologies for energy saving	Via Di Vittorio, 15 21029 Vergiate (VA) Tel. & Fax +39 0331 923121 www.savenertech.it info@savenertech.it
SDI GROUP	Consulting, management and projecting in the field of renewable energy and	Viale Oceano Pacifico,38 00144 Roma - Italy Tel. 06 54889704

	sustainable development	l.borreale@energ-ethic.it (Mr Luca Borreale)
SEA TUSCIA S.R.L.	Energetic and renewable energy sources; occupational safety,renewable energy and enviromental protection consulting and management	Via Tarconte, 3 01100 Viterbo – Italy seatusciasrl@hotmail.it
SIELTE spa	Planning, implementing, engineering new solutions in the field of telecommunication, transports and technological systems	Via Cerza, 4 95027 San Gregorio di Catania Tel. +39 095 7241111 Fax+39 095 7241558 Mob. +39 3355771571 www.sielte.it R.Giusto@sielte.it (Mr Roberto Giusto)
SKYSET S.P.A.	Solar thermal and photovoltaic	Via di Vigna Murata , 40 00143 Roma - Italy Tel +39 06 54832828 Fax +39 06 5483 4020 www.skyset.com marco.depaoli@lab.skyset.com (Mr Marco De Paoli)
SMARTEC SRL	Planning innovated systems and complete production lines; planning, supply and installation of photovoltaic systems; modernization and development of industrial application (control monitoring, quality system, etc.)	Via Campi Flegrei, 34 80078 Pozzuoli (NA) - Italy Tel & Fax +39 0818555601 Mob. +39 329 053 79 09 www.smartec-eu.net michele.lopiano@smartec-eu.net (Mr Michele Lopiano)
SOCIETÀ ENERGIE ALTERNATIVE RINNOVABILI SC	Renewable energy	Via della Ricerca Scientifica, 1 00133 Roma - Italy Tel. +39 06 72594918 Fax searcoop@gmail.it (Mr Giustino Di Luzio)
SOLAR BRAIN S.R.L.	Solar thermal, photovoltaic, renewable energies, bio-architecture	Via Cassia, n°1219 00189 Roma - Italy Tel. +39 06 45472489 Fax +39 06 45491240 www.solarbrain.it info@solarbrain.it francesco.sarli@solarbrain.it (Dr Francesco Sarli)
SOLAR MOBIL GMBH	Renewable energies ; electric vehicle	Am Rathaus 7 84095 Furth b. Landshut – Germany www.solar-mobil-gmbh.de ingo.fahle@solar-gmbh.de (Mr Ingo Fahle)

SOLARIA TECNOLOGIE SRL	Photovoltaic energy : research and development	P.zza Buenos Aires, 20 00198 Roma - Italy Tel. +390685301450 Fax +390685301293 www.solariatecnologie.it info@solariatecnologie.it
SOLARTECH LTD.	Sales and install solar-technologies	Kálvária Sgt. 44. 6724 Szeged - Hungary www.solar-tech.hu bence@physx.u-szeged.hu (Mr Andrew C. Benedek)
SPIN s.a.s.	Consulting	Via Smaldone, 69 00171 Roma - Italy Mob. +39 3355771571 r.giusto@gmail.com (Mr Roberto Giusto)
STROMBUS	Energy Hydroelectric and Aeolic (projecting and realization)	via San G Calabria 37030 Terrossa di Roncà (VR) Tel. & Fax +39 0457460258 Strombus1@virgilio.it
STRUTTURA INFORMATICA SRL	IT solutions for Dynamic Simulation of Power Plants (Software development and modeling)	Via delle Panche, 79 50141 Firenze – Italy Tel. +39 0554379027 Fax +39 0554376309 hanne@strutturainformatica.it
STS	Information Technology and Telecommunications (services)	Via Luigi Robecchi Brichetti n.13 00154 Roma - Italy Italy tel.: +39 06 5717261 fax: +39 06 57172628 www.stsconsulting.it info@stsconsulting.it tlc@stsconsulting.it it@stsconsulting.it
STUDIO DR. ANDREA D'AVANZO	Activation of Public Funding, regional and international (consultancy)	Via F. Acqua Mariana, 44 00118 Roma - Italy Tel & Fax +39 06 7900836 a.davanzo@alice.it (Dr Andrea D'Avanzo)
SUNTECH SRL	R & D in electronics, environment and telecommunications; sales of solar panels, photovoltaic systems, electronic circuits	Via Vienna 2 24049 Verdellino (BG) - Italy Tel. & Fax +39 035 4820808 www.sun-tech.it maurizio.riva@sun-tech.it (Mr Maurizio Riva)
SYSTEMA S.P.A.	Production heating and cooling equipments	Via S. Martino, 17/23 35010 Santa Giustina in Colle (PD) - Italy Tel. +39 049 9355663 Fax +39 049 9355699

		www.systema.it antonio.polito@systema.it (Mr Antonio Polito)
TECHNICONSULT SNC	Consulting on alternative energy field	Via due ponti, 200/d 00189 Roma - Italy Tel. +39 06 33250904 Fax +39 06 33265045 erbaggic@tin.it (Pr Carlo Erbaggi)
TECNOTIN SRL	Systems for production of energy from renewable sources with particular regard to the photovoltaic one	via Pinamonte da Vimercate, 5 20121 Milano - Italy Tel. +39 02 6570570 Fax +39 02 6570679 www.tecnotin.com aghib@tecnotin.com (Mr Anthony John Aghib)
TERSIA	A company of Porfiri group specialized in the production of energy from renewable sources	Corso Italia, 27 17100 Savona - Italy Tel. +39 019 810580 Fax +39 019 8428496 www.tersia.it info@tersia.it enrico.pregliasco@parfiri.it (Dr Enrico Pregiasco)
TILS SPA	Consulting, knowledge management, promoting innovation technologies	Viale dell' Oceano Pacifico, 11 00144 Roma – Italy Tel: + 39 06 54889200 Fax: + 39 06 54210437 Mob. +39 3356511416 www.tils.com fabio.delpapa@tils.com (Dr Fabio Del Papa)
TRAVERE INDUSTRIES sas	Wind Energy (wind generator with automatic power regulation)	27 bis Impasse Pichon 83140 Six Fours - FRANCE Tel. +33(0)494 101 029 Fax +33(0)494 101 031 www.trevere-industries.com adrien.orieux@wanadoo.fr (Mr Adrien Oreux)
TURBODEN S.R.L.	Design and manufacture turbines and turnkey turbo-generator units based on the Organic Rankine Cycle (ORC) concept	Viale della Stazione, 23 25122 Brescia - Italy Tel. +39 0303772341 Fax +39 0303772346 www.turboden.com info@turboden.com
VOX NET SC	Integrating the different competences and academic formation by using the Information Communication Technology and the net economy solutions	Via Carlo Mezzacapo, 7 00158 Roma - Italy Tel. +39 06 43599635 Fax + 39 0643566923 www.voxnet.eu info@voxnet.it
WARE.IT	Supplying global	Via Sabotino, 2a

	consultancy on Open Source	00195 Roma - Italy Tel + 39 06 3722802/37518691 http://free.ware.it/ alessio@ware.it (Mr Alessio Di Giacomo)
WOLGAT LTD.	Consulting (Israeli high technology)	VIA BOCCEA 307 PAL.B 00166 Roma - Italy Tel. +39 06 66000121 Fax + 39 06 6625523 wolgat@fastwebnet.it
XEWER	Mobile and fixed plants for using renewable sources of energy (PV, solar)	Via Dandolo ,77 00153 Roma - Italy Tel. +39.06.91712480 Fax +39.085.7992400 Mob. +39.335.6110740 www.xewer.com info@xewer.com

RDP for Central Poland: “Waste Management”

16. Abstract

The technical field which this RDP deals with is waste management.

The choice of the RDP object is due to different reasons: first, because of problem’s scale in the considered region (the territorial unit of Poland called Mazovian voivodship), second, the necessity to adjust Polish environmental sector to the many law regulation changes which have occurred in the field of waste management, especially since Poland joined the EU in may 2004.

Those problems have involved SMEs and other installations operators in order to keep up technologically updated and fulfill new regulations.

In 2004 the total of 133.8 million tons of waste were generated in Poland, including 124 million tons from the industrial sector (waste except municipal wastes)

Mazovian voivodship is the fourth producer of waste in national scale. In 2005 in Mazovian voivodship 5 855,9 thousand of tons of waste were produced in 209 largest plants. In the previous year (2004) this amount was similar.

Index of industrial waste produced in the year 2005 per inhabitant in Mazovian voivodship was about 1,1 ton and was 3 times lower than national average.

We must consider also hazardous waste and

Large share of Environmental Legislation in Poland is UE driven. There are also some regulations with higher standards and requirements than European ones.

The main environmental regulation is “Environment Protection Law” (Polish Law Act of 27.04.2001 . Environment Protection Law). Waste problem is covered by Polish Law Act of 27.04.2001 on waste.

In Poland public body competent in environmental affairs is Ministerstwo Srodowiska (formerly Ministry of Environment Protection).

17. Overview of TRs

TR No.	Company description	Request brief
01	Technology for utilization of plastic waste in alternative fuels	The technology should consist of comminution, grinding and preparing inflammable mixture of plastics granulate keeping adequate level of economical saving.

02	Cable separating technology	It should be capable of precise separation of plastic parts from metal parts of cables.
03	Technology for utilization of cleaned parts of kinescopes	Technology for utilization of cleaned parts of kinescopes – picture tubes glass. It should be capable to utilize mixed picture tubes glass from recycled kinescopes
04	Technology for processing of hard asbestos	The technology should allow to add the wasted construction asbestos in process of production of building materials.
05	Post-ripper technology for utilization of light fraction of rest waste from the ripper	The technology should provide devices for segregation of the light fraction coming from the ripper, and also devices capable of processing of the light fraction towards its utilization.
06	Waste thermal treatment plant with effective multipurpose usage of energy	The technology should be capable of recovery of secondary materials as well as production of electrical renewable energy and recovery of warmth.
07	Sludge utilization technology from industrial waste water treatment plants	A technology which will allow to change status of the sludge as a "waste" into processed sludge as a "product" for further use.

17.1 TR 1: Technology for utilization of plastic waste in alternative fuels

Catalogue code : *TR_PL_19597*

Comments about BAT

In the present TR a company is looking for technologies for the utilisation of plastic waste with production of alternative fuels. Plastic waste is constituted by vehicles' bumpers, chemicals packaging, protective suits, PVC and maybe with the addition of technical waste paper from paint shops.

Nowadays, effective waste management must address waste reduction, reuse, recovery/recycling and, as the least progressive option, waste treatment. The increase in plastic waste production is a serious environmental issue. Plastics consumption continues to grow and while plastic recycling has seen a significant increase since the early 1990s, consumption still far exceeds recycling. Waste plastic can, however, serve as a potential resource and, with the correct treatment, can be reused or serve as hydrocarbon raw material or as a fuel.

In this context few words must be spent for PVC. PVC is highly versatile with many applications, it is non-biodegradable and has a high Cl content (56% of the total weight). Waste PVC incineration is highly energy demanding and can result in the formation of toxic chloro-emissions with adverse

ecological, environmental and public health impacts. For these reasons PVC and Cl must be removed throughout tailored pre-treatment.

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
08 PL 62AP 0IMZ	Plants for processing various wastes into homogenous particles and alternative fuel	A Polish SME	BISNEP (EEN)
07 IT LAUR 0IX1	A new system for recycling plastic materials with a rational use of energy	An Italian university research team	Italy

17.2 TR 2: Cable separating technology

Catalogue code : *TR_PL_19598*

Comments about BAT

In the BREF Document dedicated to waste management, magnetic separators are described as the best technology to achieve the separation of the metals from the cables in cable recycling process. Magnetic separators can be used to extract iron and steel as a resource, e.g. extracting tinplate cans from lightweight packaging. The process can also allow the removal of any ferrous metals from the waste, thereby avoiding downstream operating trouble and improving the product quality. Magnetic separators are used to protect the knives of rotary cutters from blunting or snapping and for the subsequent cleaning of the copper product.

Best available techniques referring to the magnetic separation of ferrous metals are:

a. installing an overband magnetic separator lengthwise over the conveyor belts right above the trajectory of the material;
b. resorting the material with a magnetic drum separator or with a magnetic pulley, since small ferrous particles could still remain under a non magnetic layer;
c. increasing the conveyor belt's velocity gaining a low level of the material;
d. use the overfed feed design for the magnetic drum separator.

Installation in line (lenghtwise) to the belt is preferred since it aids effective separation of the loosened material out of the trajectory. If the magnet is aligned transversally to the material (i.e. suspended across the conveyor belt), the power of the magnet must be several times higher than in a lengthwise alignment, since sometimes non magnetic objects are situated on top of ferrous items, which the magnet then has to work through.

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
08 SE 67CI 0ICW	Separating technology for magnetic and non-magnetic sheets / blanks, when placed in stacks	A Swedish SME	SweNet (Sweden)

17.3 TR 3: Technology for utilization of cleaned parts of kinescopes

Catalogue code : *TR_PL_19599*

Comments about BAT

A very recent issue, of great environmental concern for developed Countries, is represented by the management of waste coming from electrical and electronic equipments.

The Waste Electrical and Electronic Equipment Directive (WEEE Directive) is the European Community directive 2002/96/EC on waste electrical and electronic equipment which, together with the RoHS Directive 2002/95/EC, became European Law in February 2003, setting collection, recycling and recovery targets for all types of electrical goods.

Increased recycling of electrical and electronic equipment will limit the total quantity of waste going to final disposal. Producers will be responsible for taking back and recycling electrical and electronic equipment. This will provide incentives to design electrical and electronic equipment in an environmentally more efficient way, which takes waste management aspects fully into account. Consumers will be able to return their equipment free of charge. In order to prevent the generation of hazardous waste, Directive 2002/95/EC requires the substitution of various heavy metals (lead, mercury, cadmium, and hexavalent chromium) and brominated flame retardants (polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE)) in new electrical and electronic equipment put on the market from 1 July 2006.

The WEEE Directive obliged the twenty-five EU member states to transpose its provisions into national law by 13 August 2004. Only Cyprus met this deadline. On 13 August 2005, one year after the deadline, all member states except for Malta and the UK had transposed at least framework regulations. As the national transposition of the WEEE Directive varies between the member states, a patchwork of requirements and compliance solutions is emerging across Europe.

The environmental problem concerning the recycling of CRTs is that it represents more than the 60% of the total weight of a TV or a PC monitor and it is constituted for the 85% of glass. The recycling of the glass is very problematic because of its content of dangerous elements such as

heavy metals, which compromise the use of CRTs for the fabrication of industrial glass. Up to now the technologies, that have been adopted, have been addressed to employ the glass for the production of second raw materials for the manufacture of new CRTs. This operation is going to be unnecessary in the next years, if we consider that plasma and liquid crystals technologies are going to be more and more diffused.

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
06 PL SPOP 0EWN	Method of kinescope and/or screen utilisation and recycling yttrium and europium compounds from phosphors layer deleted from the utilised kinescopes and screens	A Polish research institute	Poland
06 PL SPIM 0JVM	Innovative technology for treatment of hazardous waste	A Polish SME	Poland

17.4 TR 4: Technology for processing of hard asbestos

Catalogue code : *TR_PL_19600*

Comments about BAT

Demolition waste streams constitutes the largest waste stream in quantitative terms within the European Union, apart from mining and farm wastes. The presence of asbestos and heavy metals is responsible for the contamination of landfills and recycled inert wastes.

The composition of the construction and demolition waste stream varies on the basis of many factors, such as raw materials, construction products used, architectural techniques and local construction and demolition practises. The main wastes present in this stream are soil, ballast, concrete, asphalt, bricks, tiles, plaster, masonry, wood, metal, paper and plastic.

If we consider the hypothesis of recycling, the development of the recycled products market should be accompanied by the provision of recovery systems which can be used throughout the Member States and thus avoid the costly transport of construction and demolition waste. The systems should be able to recover the main types of waste, these essentially being the aggregates obtained from concrete and brick waste, waste containing gypsum, wood, plastics, ferrous and non-ferrous metals, and glass. Mobile separation and crushing units could move from one centre to another or even treat the waste on the construction and demolition site itself.

A major prerequisite for progress in recovering construction and demolition waste is the development of potential sales outlets for recycled materials. The use of recycled materials for the manufacture of construction products must be encouraged. In principle, markets do exist: in producing new asphalt, as fillers, or materials for road-base courses, the manufacture of cement, etc. In practice, Member States will have to ensure that there is no discrimination against the use of recycled materials. The technical rules applied to recycled materials must be the same as those for new materials. Products made form recycled raw materials must therefore be regarded as new products and follow the technical-approval procedures to guarantee their suitability for use.

In the following paragraph, we make a list of specific action that should be followed in managing asbestos waste:

1) Inventory of buildings before these are demolished to enable any possible presence of asbestos to be detected;
2) Whenever possible, separate collection of wastes containing asbestos before a building is demolished;
3) Disposal of asbestos waste in such a way as to achieve a high level of environmental protection and human health;
4) Waste containing asbestos should not be recycled;

Certain traces of asbestos in recycled aggregates cannot be avoided, but these should not exceed 10 mg/kg.

List of Technology Offers (TOs= from BBS Database

BBS code	Title	Enterprise	IRC
BICBA010	Inorganic Composite Sorbent for the Removal and Immobilisation of Heavy Metals and/or Phosphates	A West-Slovakian company	Slovakia
06 PL SPIM 0JVM	Innovative technology for treatment of hazardous waste	A Polish SME	Poland

17.5 TR 5: Post-ripper technology for utilization of light fraction of rest waste from the car-ripping

Catalogue code : *TR_PL_21427*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
08 PL 62AP 0IMZ	Plants for processing various wastes into homogenous particles and alternative fuel	A Polish SME	BISNEP (EEN)
07 IT TUPT 0IS8	Re-Use for Rubber Scrap	An Italian SME operates a tyre recycling line	Italy

17.6 TR 6: Waste thermal treatment plant with effective multipurpose usage of energy

Catalogue code : *TR_PL_20006*

Comments about BAT

Not available

List of Technology Offers TOs from BBS Database

BBS code	Title	Enterprise	IRC
08 DE 18A5 0IDP	Thermal exploitation of waste products as derived fuel	A German company	ESIC Sachsen-Anhalt (EEN)

17.7 TR 7: Sludge utilization technology from industrial waste water treatment plants

Catalogue code : *TR_PL_20006*

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
08 DE 0957 0IDG)	Polyolefin-Recycling and energy generation from waste	A German company	CIP Saxony (EEN)
08 DE 18A5 0IDP	Thermal exploitation of waste products as derived fuel	A German company	ESIC Sachsen-Anhalt (EEN)

18. List of providers

Enterprise	Mission	Contacts
Barel		
Cambi AS		
Case Doradcy		
ChemTech-ProSynTech, Chemical Engineering &Techn.		
Drum-Clean-Recycling		
Econ AS		
Ecotech Polska		
Fundacion Cartif		
Ingenieurbuero Richter GmbH		
Mining Mechanization Centre Komag		
Orkel Compaction AS		
Salsnes AS		
Seccua GmbH		
Zenit		

RDP for Latvia: “Waste Management”

19. Abstract

Waste management is one of the most important problems in the fast developing Latvian economy. Keeping to the traditional industries and developing new ones are important activities for raising competitiveness in international markets. However, expanding of industries and raising the country welfare has a side effect –management problems of fast growing waste amounts.

In order to solve the waste problems locally and according to international requirements, the Ministry of Environment has elaborated the National Environmental Policy Plan 2003-2012, and National Waste Management Plan, which clearly show the most actual directions of waste management development in Latvia in short-term and long-term scale. There is an urgent need for creation of waste management infrastructure in Latvia, including implementation of biodegradable organic municipal waste collection and treatment system.

The official data from waste management plan of Latvia reveals that only small part of municipal waste is recycled.

Even today the prevalent solution in waste management is the disposal of waste. During the very compressed time schedule – till 2010 - 25% from all biomass (91 000 tons totally in country) should be recycled: therefore the current practical actions are necessary. Due to the objectives regarding the closing and recovery of all waste dumps and realization of the waste disposal only in the new created waste sanitary landfills following the state legal requirements, various activities had been started for waste sanitary landfill site search, elaboration and realization of corresponding projects.

As at the starting moment there will be small amount of precisely sorted waste, the collection companies need small sorting lines for manual sorting of packaging waste and large mechanically operate sorting lines for mixed waste.

The main demands of waste management can be characterized as: 1. Most of the used landfills were not constructed according the demands of EC directive and now existing norms in Latvia. They must be closed and renovated. The problematic is recovering of existing big dump sites (more than 5 ha) which needs landfill gas and leachate management, equipment for soil extraction to cover dumpsite surface and installation for production of electricity and heat from landfill gas. 2. The major part of municipal waste is collected in non sorted way. The collection companies are lacking appropriate waste sorting and pre-treatment equipment. 3. Local government and their companies, which are able to introduce the bio waste collection and treatment schema, need the technologies and equipment for collection and treatment of bio waste.

20. Overview of TR

TR No.	Company description	Request brief
01	Waste Management Association of Latvia	Development of technologies for biodegradable waste management
02	A waste management company	Producing of small size anaerobic digester
03	A Latvian company	Landfill gas extraction and soil treatment technology for the recovering of closed waste deposit area
04	A Latvian waste treatment equipment supply company	Technologies for the sorting of municipal waste
05	A Latvian poultry breading and processing company	Technologies for poultry manure and slaughterhouse waste management

20.1 TR 1: Biodegradable waste management technologies

BBS code : *07 LV LVTC 0HFK*

Comments about BAT

Not available

List of Technology Offers TOs from BBS Database

BBS code	Title	Enterprise	IRC
07 SE WSIV 0HZ1	Bioreactor with multiple functions for treatment of bio waste (composting, sludge treatment, dewatering and wastewater treatment)	A Swedish company	IRC Western and Southern Sweden/Iceland
06 IT LADA 0G52	Production of biodegradable polymers from renewable resources through sequential anaerobic/aerobic processes	An Italian research group	IRC CIRCE

20.2 TR 2: Small size anaerobic digester for biodegradable waste

BBS code : *07 LV LVTC 0HFJ*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
07 DK DKEC 0IWC	State-of-the-art anaerobic digestion and composting	A Danish SME	IRC Denmark
07 GR IHND 0I79	Combined biological treatment of Green Olive debittering Wastewater (GOW) and Olive Mill Wastewater (OMW)	A Greek university laboratory	IRC Hellenic

20.3 TR 3: Recovery of Landfill Site

BBS code : *07 LV LVTC 0HH2*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
08 AT 0105 0IDH	Innovative, economical and ecologically sound solution for waste disposal and landfill rehabilitation through Diagenetic Inertising	An Austrian company	CIP- Network AUSTRIA (EEN)

20.4 TR 4: Provision of sorted waste fractions

BBS code : *07 LV LVTC 0HI0*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
08 IT 54W2 0IC3	A new system for the separate collection of municipal domestic solid waste	An Italian company	SIMPLER (EEN)
08 PL 62AP 0IMZ	Plants for processing various wastes into homogenous particles and alternative fuel	A Polish SME	BISNEP (EEN)

20.5 TR 5: Poultry waste treatment technologies

BBS code : *07 LV LVTC 0HGC*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
06 ES SSCT 0FCU	A new laboratory system for anaerobic biological treatment of solid waste	An Andalusian research group	IRC SOUTHERN EUROPE

21. List of providers

Enterprise	Mission	Contacts

RDP for Lithuania: “Waste Treatment and Prevention”

22. Abstract

This RDP is focused on waste treatment and prevention fields.

As it is stated in Lithuanian Environmental Strategy (approved by the decision of the

Parliament, 1996, No 103-2347) waste treatment is a priority field on environment protection in the country. The highest priority is given to prevention of waste generation.

Implementation of a modern waste management system may increase costs for the services of waste collection and management. This would induce inhabitants and enterprises to refuse such services and that could be a reason for illegal waste disposal and environmental pollution. Since the primary sorting of household waste has not yet been developed it will be difficult to increase the use of secondary raw materials and the majority of hazardous household waste will be further disposed in the landfills.

Again, the lack of development of capacity of the recycling industries and not having increased the demand for secondary raw materials the use of these materials will not be adequate and they will be disposed of in landfills. The public may oppose the construction of regional landfills, and thus the establishment of regional waste management systems would be unreasonably delayed. This could hamper the development of regional waste management systems. It will be very difficult to establish proper repositories for radioactive waste and, in particular, used nuclear fuel, if required assistance for decommissioning of Ignalina NP is not secured.

23. Overview of TR

TR No.	Company description	Request brief
01	Water treatment technologies for sewage from biogas production	A Lithuanian SME is looking for water treatment technology for sewage left after biogas production from grain stilage
02	Valorization of recycled cathode ray tube (CRT) glass waste	A Lithuanian recycling SME is looking for possible usages of old TV and monitors’ glass waste.
03	Forniture waste recycling	A Lithuanian SME looks for technologies for re-use or utilization of foamed polystyrene from used furniture and mattresses
04	Recycling of used motor and industrial oil	A Lithuanian SME looks for technologies for recycling wasted motor or industrial oils.
05	Recycling of furniture waste	A Lithuanian company is looking for technologies able to re-use wooden parts of used furniture.

23.1 TR 1: Water treatment technologies for sewage from biogas production

BBS code : *07 LT LTIC 0H9S*

Comments about BAT

In the request the influent characterization does not indicate the suspended solids (TSS), nitrogen (N) and phosphorus (P) concentrations that are necessary in order to plan an effective treatment strategy. Presumably TSS, N, P are at low concentrations and the main concerns are due to BOD and COD. According to this assumption in order to achieve the BOD and COD removal the following strategies can be considered depending on the characteristics of biodegradability of the influent organicload:

- biological treatment realized with a first anaerobic stage carried out at long retention times (t>30 d) in the mesophilic range of temperature 35-37 °C or, in order to increase the process kinetics, in thermophilic conditions (T= 55-57 °C) followed by an aerobic stage
- combination of a chemical-physical stage (i.e. ozonation,) able to increase the biodegradability of the COD components with a biological treatment constituted by a two stage anaerobic-aerobic process. In this case the anaerobic process can be carried out at lower temperatures.

Another possible alternative is the reuse in agriculture (according to the country legislation) but in this case an accurate characterization is required in order to verify the level of toxic compounds.

Finally, if the grain stillage facility is located close to an urban wastewater treatment plants and, compatibly with the Lithuanian legislation on this matter, the liquid surnatant could be gradually fed to the plant at a flow rate low enough to guarantee the respect of the influent admissible organic load as it is usual for the surnatant from the sludge digester.

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
05 HU HUTP 0DD2	Sewage Treatment Systems	A Hungarian company	Hungary
07 IT LOCM 0JDF	New technology based on bio-flotation for sewage treatments and water recycling	An Italian research centre	Italy

23.2 TR 2: Valorization of recycled cathode ray tube (CRT) glass waste

BBS code : *06 LT LTIC 0G9N*

Comments about BAT

A very recent issue, of great environmental concern for developed Countries, is represented by the management of waste coming from electrical and electronic equipments.

The Waste Electrical and Electronic Equipment Directive (WEEE Directive) is the European Community directive 2002/96/EC on waste electrical and electronic equipment which, together with the RoHS Directive 2002/95/EC, became European Law in February 2003, setting collection, recycling and recovery targets for all types of electrical goods.

Increased recycling of electrical and electronic equipment will limit the total quantity of waste going to final disposal. Producers will be responsible for taking back and recycling electrical and electronic equipment. This will provide incentives to design electrical and electronic equipment in an environmentally more efficient way, which takes waste management aspects fully into account. Consumers will be able to return their equipment free of charge. In order to prevent the generation of hazardous waste, Directive 2002/95/EC requires the substitution of various heavy metals (lead, mercury, cadmium, and hexavalent chromium) and brominated flame retardants (polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE)) in new electrical and electronic equipment put on the market from 1 July 2006.

The WEEE Directive obliged the twenty-five EU member states to transpose its provisions into national law by 13 August 2004. Only Cyprus met this deadline. On 13 August 2005, one year after the deadline, all member states except for Malta and the UK had transposed at least framework regulations. As the national transposition of the WEEE Directive varies between the member states, a patchwork of requirements and compliance solutions is emerging across Europe.

The environmental problem concerning the recycling of CRTs is that it represents more than the 60% of the total weight of a TV or a PC monitor and it is constituted for the 85% of glass. The recycling of the glass is very problematic because of its content of dangerous elements such as heavy metals, which compromise the use of CRTs for the fabrication of industrial glass. Up to now the technologies, that have been adopted, have been addressed to employ the glass for the production of second raw materials for the manufacture of new CRTs. This operation is going to be unnecessary in the next years, if we consider that plasma and liquid crystals technologies are going to be more and more diffused.

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
06 PL SPOP 0EWN	Method of kinescope and/or screen utilisation and recycling	A Polish research institute	Poland

	yttrium and europium compounds from phosphors layer deleted from the utilised kinescopes and screens		

23.3 TR 3: Forniture waste recycling

BBS code : *06 LT LTSP 0GBZ*

Comments about BAT

This TR is about the recycling of latex, textile polyester and foamed polystyrene. These kind of materials, together with other different ones, are polymers which are used for the production of a wide range of products. The chemistry of polymer production consists of three basic reaction types, polymerisation, polycondensation and polyaddition. These include preparation, the reaction itself and the separation of products. In many cases cooling, heating, or the application of vacuum or pressure is necessary. The unavoidable waste streams are treated in recovery and/or abatement systems or disposed of as waste.

Expanded polystyrene (EPS) is produced in thousands of different forms for specific packaging requirements and polystyrene is also used to make products such as disposable cups, trays, cutlery, cartons, CD cases and containers.

EPS RECOVERY

In 2003 about 100.000 tons of EPS have been recovered all over Europe. The most important uses of EPS after its recovery are the following (European average data):

1. direct re-use in expansion process (43%)
2. compaction (4%)
3. re-granulation (22%)
4. thermovalorization (30%)
5. landfill (1%)

Most important uses after EPS recovery are: 1) chipping of packaging ed its utilization in making new products; 2) chipping of EPS packaging and realization of concrete block; 3) re-granulation of EPS and realization of objects such as furniture, video tapes.

EPS RECYCLE

In order to maximize the recycling of EPS, producers could adopt some measures also during design phase. For example they could employ labels more easily removable, employing water soluble glue. For the separation, methods commonly employed are the analysis of plastic components, separation on density characteristic or electrostatic separation.

There are three main possibilities for the recycle of EPS:

1) Mechanical recycling: it represents an efficient solution which must always be encouraged where possible form the environmental and economic points of view. This operation is divided in five phases: 1) disposal by the householders; 2) recovery of EPS by the responsible authorities; 3) separation of single kind of plastics; 4) removal of labels, content residues and dirty parts; 5) re-elaboration for the production of new products.

   In EU countries objectives of mechanical recycle for some sectors have been already fixed and possibilities for increasing plastic recycle are going to be investigated.

2) Chemical recycling: this technique, which is mainly used for mixed plastics waste, is nowadays used only in Germany. Main steps for this kind of treatment are the following: collection and sorting; treatment of plastic wastes; chemical recycling for the production of raw material; polymerization for the production of new product obtained with chemical recycling. Chemical recycling can be realized through in four different ways: pyrolysis (plastic waste is heated in absence of oxygen and a liquid and gaseous hydrocarbon mixture is then obtained); hydrogenation (plastic waste is heated in the presence of hydrogen in order to disintegrate polymers and to obtain liquid hydrocarbons); gasification (plastic waste is heated in deficit of air in order to produce a mixture of carbon oxide and hydrogen, used for the production of new raw materials such as methanol); chemiolysis (some plastic materials are chemically treated and transformed in original raw materials).

3) Combustion: the process to generate heat and electricity. Three kind of plants are adopted for the recovery of energy from plastic waste: combustion of house waste in municipal incinerators or combustion of plastic, usually together with fossil fuels, in productive plants or electricity generation plants. In mixed wastes incineration, 8% of plastic content is responsible for the 30% of the released energy. One problem to be solved is the emission of dioxins (this term is referred to a family of compounds constituted by 75 dioxins and 135 furans).

List of Technology Offers (TOs) from BBS Database

BBS code	**Title**	**Enterprise**	**IRC**
05 FR NMCN 0CUK	A new regenerating technology and service to solve the Expanded Polystyrene recycling dilemma	A French company	France
BICBA010	Inorganic Composite Sorbent for the Removal and Immobilisation of Heavy Metals and/or Phosphates	A West-Slovakian company	Slovakia

23.4 TR 4: Recycling of used motor and industrial oil

BBS code : *07 LT LTIC 0I1V*

Comments about BAT

Nowadays there are two main options for the treatment of waste oils. One is the treatment of the waste oil to produce a material that will be used mainly as fuel or for other uses (e.g. absorbant, mould release oil, flotation oil). These include treatments as cleaning of waste oil, thermal cracking and gasification etc.. The other way is to treat the waste oil to reconvert it into material that can be used as a base oil to produce lubrificants. This latter way is usually referred to as "re-refining".

In the first case the calorific value of waste oil can be utilized. When used as a substitute fuel, principally for coal, diesel and light fuel oil, used oil has an economic value. A number of different burning applications for used oil exist, distinguishable partly by the temperature at which they burn, and partly by the control technology they use to reduce environmental effects. Before its use as fuel, several cleaning and transformation treatments may need to be applied. These are summarized in the Table below.

Type of treatment	Changes that occur in the waste oils after treatment	Fuel use	Industrial sector use
No treatment. Used directly in a combustion process (Not covered in this document)	No change	Directly used as fuel in kilns, furnaces, etc.	Waste incinerators, Cement kilns, Space heaters (garages, green houses, workshops, etc.) [1], On-board ships (typically using marine oils), Quarry stone industries.
Mild re-processing	Removal of water and sediments	Waste fuel blend to fuel oil (replacement of fuel oil)	Cement kilns, Road stone plants, Large marine engines, Pulverised power plants
Severe reprocessing (chemical or thermal processes)	Demetallised heavy fuel oil (or heavy distillate)	Waste fuel blend to fuel oil (replacement of fuel oil)	Marine diesel oil, Fuel for heating plants
Thermal cracking	Demetallised and cracked material	Distillate gasoil	Gasoil (also called heating oil, diesel oil, furnace oil, etc.), Demetallised heavy fuel oil, Marine gasoil, Rerefined light base oil not used as fuel
Hydrogenation	Reduction of sulphur and PAH contents		
Gasification [2]	Converted to synthetic gas (H_2 + CO)	Fuel gas	Chemical production of methanol Large combustion plants (e.g. gas turbines)
[1] Forbidden in some MSs [2] More information in Section 2.5.3			

Some BATs for the preparation of liquid waste fuel are the following:

a) Using heat-exchange unit external to the vessel. There, water vapour is driven off and the oil feedstock may be heated to 90°C, which serves to separate the majority of suspended (as opposed to dissolved) water;

b) Using carbon adsorption or condensation to avoid VOC emissions;
c) Removing the high solid content from liquid waste to be used as fuel. For this, warm oil from the heating vessels is tipically passed over open filters to remove the solids;
d) Removing oil from liquid effluent prior to discharge to foul sewers or other waters, usually by oil/water interceptors, tilting plate separators and/or filtration techniques and then using the oil as fuel;
e) Ensuring that in a multi-chamber oil interceptor every single chamber oil interceptor is large enough to allow six minutes retention at maximum foreseeable flowrates;
f) using a vertical agitator without any bearing inside the tank

In the second case, to re-use a waste oil to make a lubrificant, cleaning or re-refining processes are necessary in order to make it into a product suitable to be re-used as a base oil to produce a lubrificant. These processes involve the removal of impurities, defects and any leftover products from its old use. Generally, this type of process removes all impurities and additives and only base oil then remains. Subsequently, lubrificant producers add substances to attain the specifications of a virgin product. Re-refining treatments may differ depending on the technology used for one or several of the following operations: pretreatment, cleaning, fractioning and finishing. Pretreatment consists of removing water and light ends and fuel traces such as naphta, etc.. In the cleaning waste the oil is deasphalted in order to remove all the asphaltic residues as heavy metals, polymers, additives, other degradation compounds. The fractionation of oil consists in separate the base oils using their different boiling temperatures, to produce two or three cuts (distillation fractions). The final cleaning of the different cuts (distillation fractions) is carried out to achieve specific product specifications (e.g. improve colour, smell, thermal and oxidation stability, viscosity, etc.).Finishing may also include the removal of PAHs in the case of sever high temperature and high pressure) hydrofinishing or solvent extraction (low temperature and low pressure).

The yield of re-refining plants varies between 55 and 75%, depending on the process and to a minor degree on the composition of waste oil. The techniques to be considered as BATs for increasing the yield of re-refining are the following:

a) Sending the residue from the vacuum distillation column to a selectopropane unit, where 80% of brightstock can be recovered, reducing the residue content at the same time;
b) Sending the bottom residue from the vacuum distillation column to a thermal cracking unit to produce gasoil. This technique doesn't generate contaminated water;
c) Selecting the appropriate vacuum in the vacuum distillation units (e.g. a three stage group with steam ejectors at 17 mmHg). Vacuum can be generated by dry vacuum pumps or high efficient multistage steam injectors;
d) Using a scrubbing unit to reduce VOC emissions and to recuperate raw material;
e) Using sieves to remove matter such as polymer fibre;
f) Having in place an intermediate tank between the dehydrotreatment and the distillations, in order to separate the materials that can provoke fouling of the following plant section (i.e. the furnace and distillation column) and also utilizing a sufficient residence time for the additive reaction with the used oil to occur. The precipitate from this reaction is extracted

from the bottom of the tank and pumped to storage, where the dehydrated oil content can be separated to allow its re-use.

Waste oils suitable to be recycled are:

- Black engine oils, which have homogeneous characteristic and are sought by re-refining plants;
- Black industrial oils are potentially suitable for regeneration but due to the content of additives and other substances are not typically preferred by re-refining plants;
- Light industrial oils, which are relatively clean. They can either be re-refined on-site or can be re-used for other purposes. Their market is very specific and independent from the classical supply routes of recycling.

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
08 DE 0958 0IKC	Recycling of drilling emulsions and lubricants	A German SME	CIP Saxony (EEN)

23.5 TR 5: Recycling of furniture waste

BBS code : *07 LT LTIC 0I1U*

Comments about BAT

This TR is focused on the recycling of wooden parts of furniture. A wide range of wood waste recycling options are available across Europe. If we consider the manufacturing industries that produce wood furniture, technologies addressed to recycling wood waste, can be divided in on-site and off site technologies. On site recycling options are those which can be located on the furniture manufacturing site. They include:

- Finger jointing and lamination (more suitable for big industries that produce a huge amount of wood waste);
- Briquetting (it is closely related to pelletisation, which normally occurs off-site);
- Combustion with heat recovery.

Off-site recycling options involve activities more commonly undertaken by a third party on separate site. They include:

- Animal bedding, cat litter and industrial spillage absorbents;
- Composting;

- Mulches and surfacing products;
- Fuel briquettes and pellets;
- Panelboard material;
- Other options: charcoal production, wood-plastic composites and local community based outlets.

Finger jointing and lamination. Finger jointing involves joining the ends of two or more pieces of wood to produce a single length. The joints can be made with only one finger (a scarf joint), a series of horizontal fingers, or commonly, a series of vertical fingers. Lamination is simply the gluing and pressing of surfaces together to form a larger block of wood. Both processes can be used to convert short off-cuts into usable pieces of wood.

Combustion with heat recovery. Combustion with heat recovery has been used by the furniture manufacturing industries for many years. Wood dust is extracted and moved via a conveyor system into a silo. Off-cuts can be passed through a hogger to reduce the particle size and allow storage in the same silo. The material is automatically fed into a burner unit and the heat is either distributed for space heating or dissipated to the atmosphere. Combined heat and power plants can produce electricity as well as heat thus representing the most promising option for energy saving. When heat is not necessary, all of the energy can be diverted to electricity generation.

Animal bedding, cat litter and industrial spillage absorbents. The highest value markets for wood waste are those involving the manufacture of animal bedding such as that for gerbils, which is typically packaged in 1kg to 4 kg bags, through to 25 kg or larger bags for equestrian use and bulk loads for poultry. There are also closely related markets for shavings for compression into cat litter pellets and as industrial spillage absorbents. From an environmental and economic perspective, the benefits of using wood waste as bedding do not have to end after its first use. Horse bedding will become manure which is often used as a soil improver by local households. Some poultry farmers pelletise their used bedding for more formal sale as a fertilizer product.

Composting. The process of composting involves the controlled biological decomposition of organic matter, to produce a compost material that is sanitary and stable. The addition of such organic matter to soil can improve the soil structure and its water-holding capacity, provide nutrients and encourage beneficial soil fauna. The process can be conducted in windrows (material stored in long lines up to 4m high) and in in-vessel technologies. A number of key variables (such as oxygen, water, carbon, nitrogen, temperature and so on) control the effectiveness of the micro-organisms in achieving the breakdown of material.

Mulches and surfacing products. Mulches are layers which are placed on top of soil to help control weeds, protect plant roots from temperature fluctuations, reduce water loss from the soil and look attractive. Wood waste material has other uses as surfacing products such as the creation of all weather gallops and forest paths. It can also be used in greater depth to provide a safe play area for children.

Fuel briquettes and pellets. Wood dust is difficult to handle, easily mobilized into the atmosphere and explosive. Furthermore, all wood dust can contribute to asthma and hardwood dust is carcinogenic. By compressing the dust into a solid such as a briquette or pellet, these problems are overcome and the substance can be handled in a similar manner to solid off-cuts. Briquettes consist

of wood dust which has been compressed into a solid shape, typically ranging from 7×2×2 cm to 15×15×7 cm in size. They can be used for domestic heating and, if larger, they can be converted in charcoal for use in barbeques. Wood pellets are much smaller than briquettes –typically around 2cm long. The diameter varies according to use, with 6mm typically used for domestic purposes while 8,10 and 12 mm pellets are used in industrial applications.

Panel board material. The panel board industry is a major consumer of recycled wood chip. The recycled wood content in panel board is typically the 65%, thus making this opportunity really promising in recycling wood waste. Anyway the level of contamination in wood waste supplies continue to be an issue. The presence of contaminants make necessary some tailored decontaminating processes before utilize the wood in furniture manufacturing industries.

List of Technology Offers (TOs) from BBS Database

BBS code	**Title**	**Enterprise**	**IRC**

24. List of providers

RDP for South-East Italy: ”Efficient management and treatment of the wastewater coming from the textile industry”

25. Abstract

Main focus of such RDP are the technical solutions regarding the pollution and the treatment of the wastewaters coming from the textile industry, with a special focus on: the treatment of the chrome used in the tanning-mills, treatment of surfactants and dyes used in the industrial laundries, rational management of the water in the textile processing-streams.

In Campania the management of the water resources needs to be adequately addressed, due to the increasing water consumption and the preserving discharge of contaminants in the environment, which correspond to inadequate and inefficient infrastructures, distribution services, sewage disposal plants and water treatment systems.

The leather and textile sector, one of the most deep-rooted in Campania, is traditionally characterized by an intensive consumption of water utilized as solvent, cleaning agent and heat carrier both in the manufacturing process and in the ancillary services. Water resources are exploited indiscriminately and the used water is considered as a waste dischargeable in the collecting system or in the bodies of surface water and groundwater. Therefore, it is essential, on the one hand, to promote policies and technologies aiming at protecting and monitoring water resources and, on the other hand, to provide proper information in order to spread a new “culture of water”.

26. Overview of TRs

TR No.	Company description	Request brief
01	Southern Italian company specialized in tannery activities	New technologies and methods for the recovery of the chrome during the tanning process-stream
02	A unit of an Italian research institute	Improvement of the biological wastewater treatment for highly organic and metallic tanning wastewater
03	A tanning company	New technologies and process for a rational use of water in medium-size tanning enterprise
04	Southern Italian industrial laundry	Replacement of the sodium hypochlorite used as whitening and sanitizer in the industrial community-laundry

05	Southern Italian dyeing mill of cotton yarn	Recovery of the salts coming from the blackening baths
06	Southern Italian laundry-dyeing mill	New technologies and methods for the eliminations of dyes and surfactants from the wastewater produced by a dyeing-mill

26.1 TR 1: New technologies and methods for the recovery and the reprocess of the chrome during the tanning process-stream

Catalogue code: *TR_IT_21267*

Comments about BAT

In accordance with the best available technologies foreseen at European level, it is necessary to convey separately the wastewaters containing Cr at concentration above 1 g/L coming from the tanning process and then to submit them to the recovery of Cr. This operation can be conducted *in loco* or in plants outside the industrial site. This procedure is aimed to enhance the efficiency of Cr precipitation which can be more effective when separated.

For the recovery of Cr, chemical physical processes, based on a double stage of precipitation/resolubilization, are usually applied. As an alternative processes based on ion exchange or on micro filtration membranes have been proposed

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
07 IT IRCR 0HL3	Precious & non ferrous-metal recovery/extraction	An Italian SME	IRC Irene
07 IT TUPR 0HC2	Treatment and recycle of effluents from textile dyeing/finishing processes	An Italian company operating in the textile sector	IRC Recital
07 IT TUPR 0HBF	Purification of finishing wastewater and recycling of the treated water in the production department	An Italian research centre	IRC Recital
07 FR SOAM 0IY8	Organic and Metallic Pollutant Extraction Process from Industrial Effluents Without using solvent	A laboratory located in Toulouse, France.	IRC South West France
05 SK SKBB 0DGF	Inorganic Composite Sorbent	A Slovakian company	IRC Slovakia

	for Immobilization of Heavy Metals		
05 FR SOCM 0D5E	Ultra filtration membrane and process for water and wastewater treatment	A French technology company	IRC South West France
BI CBA 010	Inorganic composite sorbent fro the removal and immobilization of heavy metals and/or Phosphates	A West Slovakia company	IRC Slovakia
TO – ELEC	Electrochemical technology and know-how for treating wastewater	The Department of Chemistry/Physics of the University of Alicante in Spain	IRC Cenemes
07 GR IHCR 0I2T	Utilization of low-cost adsorbents for removal of heavy metals	A Greek Technological company	IRC Hellenic

26.2 TR 2: Improvement of the biological wastewater treatment for highly organic and metallic tanning wastewater

BBS code : *07 IT SUEN 0HQT*

Comments about BAT

Wastewater treatment

In order to enhance the efficiency of the wastewater treatment it is needed to make a preliminary confinement of the concentrate streams, in particular for the chromium and sulphide solutions even if the technique of stream confinement and combination treatment could be very hard in pre-existing plants because the high costs and the local operative conditions as peculiar as that is needed a preventative technical-economic analysis.

Besides the streams are actually characterized by a high organic content, shown from the BOD, COD analysis and the whole solids, suspended as well as dissolved.

A set of strategies that allow to minimize the environmental impact, and actually some procedure focused to decrease the water consumption, are next showed:

- Keep separate the effluents with sulphide inside. The emission level, after the treatment, is

2 mgS^{-2} /L (by analysis on sample of the confined effluent). Just after the sulphide elimination, that can be on either in situ or in plants apart from the industrial place, these effluents can be mixed.

- Collect distinctly the effluents with chromium concentration >1g/l coming from the tanning process, and send ahead to the recovery process, that can be on either in situ or in plants apart from the industrial place. The recovered chromium is recycled in the process. If this

preliminary confinement can not be complete, there would be a decrease of the first treatment efficiency due to the chromium precipitation with the proteins.

- Make the effluents with chromium concentration < 1g/l together with other streams.
- In order to guarantee a regular and efficient performance of the treatment plants regarded the big variations of the stream capacity and composition, it is needed to check all the treatment process regularly and thoroughly.
- Manage the sludge for his recovering.

For all the procedure describe above, it's important to figure out, case by case, if the primary, secondary and tertiary treatment are more efficient, from the economic and environmental point of view, either in situ or in peculiar treatment plants apart from the industrial place.

Sometime It could be better to manage the effluents, coming from the tannery process, in the own site first and then in the public plants. Otherwise it is possible to perform the pollutant elimination of the water streams inside the industrial building directly and completely.

Regarding certain matter elimination, like biocide, organic halogen compounds, surface-active agent and other processing reactive that require specific treatment, the operative conditions should be set on the base of the peculiar local characteristic.

The effluent treatment changes according to the kind of factory and peculiar local characteristic but actually it is a combination of the following techniques:

- Mechanical treatment, that includes the raw effluent pre-treatment:
  - ✓ Griding to remove raw materials, pieces of hide and fibers: it is so allowed the elimination of the suspended elimination by 30-40%;
  - ✓ disoleation of oils and greases separated on surface
  - ✓ sedimentation that allows to remove the COD more than 30% from the stream checked
- Chemical-physics treatment:
  - ✓ Oxidation of sulfides carried on the streams coming from the pre-treatment processes
  - ✓ Chromium precipitation
  - ✓ Capacity equalization
  - ✓ COD elimination by the coagulation and flocculation with ph monitoring.

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
07 IT SUUN 0IQT	Bioremediation technology for decolourising and detoxifying industrial coloured wastewaters	An Italian university	IRC Iride
07 IT IRCR 0HL3	Precious & non ferrous-metal recovery/extraction	An Italian SME	IRC Irene

06 IT TUPR 0FJ3	Wastewater treatment and recycle in the processes of wet textile dyeing	An Italian research centre	IRC Recital
07 IT TUPR 0HAE	Treatment of wastewater from industrial textile washing	An Italian research centre	IRC Recital
BI CBA 010	Inorganic composite sorbent fro the removal and immobilization of heavy metals and/or Phosphates	A West Slovakia company	IRC Slovakia
07 ES CACI 0HHL	Pollutant destructive technologies based on chemical oxidation	A technical chemistry research group	IRC Catalonia
07 ES CACI 0HGF	Membrane Technologies for industrial water treatment	A research group of catalan university	IRC Catalonia
04 ES MADG 0AXP	Wastewater treatment	A Spanish research group	IRC Madrid
TO-AM-010	Low-cost treatment	A small German company	IRC Lower Saxony
Biocarb01	The active coke fixed bed bioreactor process for treating industrial wastewater	A German company	IRC Lower Saxony
06 GB LSKT 0EGE	Water purification using free radicals as oxidizing agnets	A UK company	SEEIRC
TO - ELEC	Electrochemical technology and know-how for treating wastewater	The Department of Chemistry/Physics of the University of Alicante in Spain	IRC Cenemes
07 GR IHCR 0I2T	Utilization of low-cost adsorbents for removal of heavy metals	A Greek Technological company	IRC Hellenic
06 DE HRIM 0E39	Water purification in industrial processes	A German enterprise	IRC Hessen

26.3 TR 3: New technologies and process for a rational use of water in medium-size tanning enterprise

BBS code : *07 IT SUTC 0JEQ*

Comments about BAT

Reduction of water consumption and integrated process measures

In a tannery, water resources management depends on the kind of productive plant, on the local conditions (availability, quality and cost of water) and on the discharge limits fixed by the law.

In order to enhance the efficiency of wastewaters treatment, it is necessary to optimize the consumption of water and to reduce the employment of chemical reagents, both in the productive process and in the water treatment.

Through this strategy it is possible to reduce not only the size of the productive plant, but also the energetic consumption to it related. Although the reduction of water consumption doesn't determine a similar decrease in the pollutant load, the effluents, which are concentrated, are often more treatable. This aspect determines in many cases a reduction of cost. If operational conditions are technologically efficient, water consumption can decrease from 40-50 m^3/t to 12-30 m^3/t of treated leather .

An efficient use of water resources depends also on:

- A careful control of water employed in the process (sometimes only the 50% of water employed is actually used in the process, the remaining part is usually lost for different causes)
- Employment of batch processes instead of those in continuous mode of operation. This feature can also allow a water saving of about 50% and also it can provide products, which have more homogeneous characteristics
- The efficiency of the process can be enhanced through the optimization of the mechanical operations; the good distribution of chemical reagents; the careful control of the dosage, pH and temperature
- The reuse of the treated discharge water, whenever its characteristic are suitable for the processes where it can be used
- Recovery of specific process solutions
- Careful maintenance for the minimization of losses

Management and treatment of wastewaters

In order to maximize the efficiency of the treatment technologies for wastewaters, it is convenient to operate a preliminary separation of the concentrated streams; in particular those containing sulphurs and chrome. Unfortunately the separation of water streams and combined treatments can be particularly difficult in pre-existing plants because of the high costs and of the local operative conditions for which it is requested a preliminary technical-economical analysis.

Effluents are also characterized by high organic load, which can be estimated through the measure of BOD, COD, total suspended and dissolved solids.

A list of the strategies that can minimize the environmental impact, as well as a list of the procedures that can reduce water consumes, is reported below:

- To keep isolated the effluents containing sulphurs. Emission level, after treatment, is 2 mg S^{2-}/L (analysis conducted on samples of isolated effluent). Only after sulphurs removal, which can be conducted in loco or in plants located outside the industrial site, the effluents can be mixed together.
- To convey separately the effluents containing Chrome at concentration >1 g/L coming from the tanning process and to send them to the recovery process, which can be performed in loco or in plants outside the industrial site. The recovered chrome is recycled. If this preliminary

separation of the effluents is not carried out, the efficiency of the downstream processes is reduced because of the chrome precipitation together with the proteins.

- To treat the effluents containing chrome at concentration < 1 g/L together with the other streams
- In order to ensure a regular and efficient performance of treatment plants, considering the high fluctuation of the streams in terms of composition and volumes, it is necessary to regularly and carefully monitor all the treatment processes.
- To treat properly the sewage.

For all the above mentioned techniques, it is necessary to evaluate, case by case, if primary, secondary and tertiary treatments become more efficient from the economical and environmental point of view if they are performed in loco or in specific plants outside the industrial site.

Sometimes it can be more advantageous to treat the effluents, coming from the tanning process, initially inside the site and then in municipal plants. In other cases, it is possible to treat the pollutant substances of the aqueous effluents entirely inside the industrial plant.

List of Technology Offers (TOs) from BBS Database

BBS code	**Title**	**Enterprise**	**IRC**
07 IT MESP 0IS9	New microfiltration membranes: a simple, easily scalable method for industrial production	A research group of an Italian university	IRC MED.I.A.
06 IT TUPR 0GGW	Modular system for filtration of surface waters	An Italian company	IRC Recital
07 IT IRCR 0HKJ	Wastewater recovery	An Italian SME	IRC Irene
06 IT TUPR 0FJ3	Wastewater treatment and recycle in the processes of wet textile dyeing	An Italian research centre	IRC Recital
06 IT TUPR 0GGW	Modular system for filtration of surface waters	An Italian company	IRC Recital
07 IT TUPR 0HAE	Treatment of wastewater from industrial textile washing	An Italian research centre	IRC Recital
07 DE TSEI 0INB	Closed water water recycling loop	A German plant manufacturer	IRC Luxembourg-Trier- Saarland

26.4 TR 4: Replacement of the sodium hypochlorite used as whitening and sanitiser in the industrial community-laundry

Catalogue code: *TR_IT_21426*

Comments about BAT

Best Available Technologies for whitening processes foresee:

- The employment, as whitening agent, of hydrogen peroxide (H_2O_2), in combination with those techniques that minimize the use of stabilizers;
- Treatments with complexing agents which are easily biodegradable and removable;
- The use of sodium hypochlorite for the treatment of linen fibres and those which cannot be whitened through the employment of H_2O_2.

  The best procedure consists in a two phases process: in the first part Na_2O_2 (sodium peroxide) is used, while in the second one ClO_2 (chlorine dioxide). However, it is necessary to verify that elementary chlorine is not present in the chlorine dioxide which is employed, produced through the employment of hydrogen peroxide as reducing agent for sodium chlorate.

- The employment of sodium hypochlorite is recommended only when a high purity of the colour is requested or when the textiles are fragile or polymerizable.

  In these cases for reducing the formation of adsorbable organic halogen compounds (AOX), the whitening process with sodium hypochlorite is realized in two phases: in the first phase peroxide is used while in the second one hypochlorite is. The wastewater coming from the whitening process conducted with hypochlorite is kept separated from the others wastewaters for avoiding the formation of dangerous AOX.

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
08 NL 60AF 0IKG	A cooling water treatment system that is environment-friendly	A small Dutch company	EUROGATE WAY.NL (EEN)
08 ES 25E2 0IVZ	Industrial and/or domestic wastewater treatment	A Spanish technological centre	CATCIM (EEN)

26.5 TR 5: Recovery of the salts coming from the blackening baths

Catalogue code : *TR_IT_21427*

Comments about BAT

Also in this case like the previous the goal of the process is to remove the colorant matters with so high efficiency as to allow the salt rich water recovering, so the available technologies need the chemical-physical processes already shown in the previous paragraph.

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
08 NL 60AF 0IKG	A cooling water treatment system that is environment-friendly	A small Dutch company	EUROGATE WAY.NL (EEN)
08 NL 60AF 0IWZ	Zero-waste, crystallisation technology to remove pollutants from water	A Dutch engineering company	EUROGATE WAY.NL (EEN)
08 NL 60AH 0IP2	Method to recover useful materials such as demineralised water, salts, metals, id from aquous process streams	A Dutch SME	EUROGATE WAY.NL (EEN)
08 ES 25E2 0IVZ	Industrial and/or domestic wastewater treatment	A Spanish technological centre	CATCIM (EEN)

26.6 TR 6: New technologies and methods for the eliminations of dyes and surfactants from the wastewater produced by a dyeing-mill, in order to re-use in the processing stream

Catalogue code: *TR_IT_21122*

Comments about BAT

About the sewage disposal the best available technologies (BAT) are:

- wastewater treatment with an activated sludge plant, characterized by a small feed/microorganism ratio. If the polluted stream is formed by contents able to disturb the

biological degradation process, it is needed to perform a specific and separated pre-treatment;

- a pre-treatment with a chemical oxidation process for wastewater characterized by a no-biodegradable COD > 5.000 mg/L. This typology of wastewater comes from continuous or almost continuous process of colouration and finishing, from the printing pulp, from exhausted blackening bath of colouration and finishing.

Some specific residuals, i.e. printing pulp and liquid residual of stain, are characterized by no biodegradable contents so high as to avoid the introduction in the cycle of the shared wastewater treatment. Such as wastewater should be empty properly, for example by thermal oxidation (because the high calorific value of the streams).

However for the wastewater with pigment contents, it can be convenient change the chemical oxidation process with a precipitation/flocculation process following by a burning down of the sludge made.

In order to completely remove the azo dye from the solutions or the printing pulp it's better to make an anaerobic treatment before the aerobic one.

If the drain water streams, with a plenty of no-biodegradable contents, can not be treat separately, it is necessary to perform some appropriate chemical and physical processes in order to achieve same requirements. Such as techniques involve:

- tertiary treatments after the biological process. The adsorption on active carbon, with carbon recovering in the activated sludge process, and destruction of the no-biodegradable compounds by burning down, or chemical oxidation of the sludge surplus (the biomass with exhausted carbon)
- biological, physical and chemical matching treatments with addition of active powder carbon or iron salts in the activated sludge process and following treatment of the sludge surplus by either wet or hydrogen peroxide oxidation
- ozonization of the restive compounds before the activated sludge treatment

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
07 IT MESP 0IS9	New microfiltration membranes: a simple, easily scalable method for industrial production	A research group of an Italian university	IRC MED.I.A.
05 FR SOCM 0D5E	Ultra filtration membrane and process for water and wastewater treatment	A French technology company	IRC South West France
07 GR HFHF 0HIX	Innovative technology for the treatment of wastewater containing non-biodegradable	A Greek SME	IRC Help forward

	compounds		
06 GB LSKT 0EGE	Water purification using free radicals as oxidizing agnets	A UK company	SEEIRC
06 DE HRIM 0E39	Water purification in industrial processes	A German enterprise	IRC Hessen

27. List of providers

Enterprise	Mission	Contacts
W2O Dr Wolfram Scholz	Membrane processing	Telefono: +44 1604 478 415 Emailinfo@W2Oenvironment.net; sales@W2Oenvironment.net;
ITALPROGETTI engineering S.p.A.	Precipitation/ridissolution processing	Lungarno Pacinotti 59/A 56020 San Romano (Pisa) - Italia tel. +39 0571 450477 fax +39 0571 450301 www.italprogetti.it/jspitalprogetti/azienda.jsp?az=dove
SER.ECO. srl	Wastewater treatment	Via del lavoro. 22/1 – 30030 Cazzago di Pianiga (VE) TEL. 041 5101757 FAX. 041 5101746 e-mail: info@serecosrl.it www.serecosrl.it
Consorzio Recupero Cromo	Chrome recovering	via Nuova Francesca,1-C.P.83 - 56029 Santa Croce sull'Arno (Pisa) – Italy Tel. 0571.297751 Fax 0571.29747 E-mail: info@recuperocromo.it Web: www.recuperocromo.it
TTW srl	Wastewater treatment	Via Emilia Pavese, 107 29100 Piacenza (PC) - Italia tel. +39 0523 498 667 fax +39 0523 401 843 e-mail: ttw@ttwater.it web: www.depurazioneacquettw.it
Darsa Srl	Wastewater treatment, environmental techynologies	Via Segaluzza, 30/A Z. I.le Sud I-33170 Pordenone (PN) ITALY Tel. +39 0434 570806 Fax +39 0434 570488 mail: vendite@darsa.it web: www.darsa.it
Ecologia soluzione ambiente S.p.A.	Wastewater treatment, solid waste installations	Tel. +39 0522/884411; Fax. +39 0522/884401 E-mail: ecologia @ecologia.re.it Web: www.ecologia.re.it
G.O.S.T. s.r.l. - Gruppo Operatori Servizi Tecnologici	Wastewater treatment	Via Romana 06080 - Capodacqua di Assisi (Perugia) - Italy Tel. 075.8064198; Fax 075.8064143

		E-mail:gost@gost.it Web : www.gost.it/depura.html
Joseph Egli Italia S.r.l. Technical Ecological Activities	Water treatment technology and plant	Via G. Leopardi, 4 35035 Mestrino (Pordenone) - Italy Tel.:049,900.40.31; Fax:049,900.70.84 e-mail: tea@egli.it www.egli.it
BMD srl	Purification and filtration	Via Dorando Petri snc - 00011 Tivoli Terme (Rm) Tel. 0774 379230 r.a. Fax 0774 379231 e-mail: info@bmd.it bmd@bmd.it Web : www.bmd.it
Centro Impianti Depurazione Acque	Wastewater treatment , depuration	E-mail : cidea@libero.it Web : www.cidea.it
Cestra Ecologia	Waste recovering	Via G. Loreti, 65 - 00133 Roma Tel. 06 2025336 Fax 06 2025660 info.cestra@ecologia.it www.cestraecologia.it
CIANA	Wastewater treatment and chemical plants, ecology services	Via Argelato. 37 00127 Vitinia- Roma Tel. 06 5237 0753-0771- 2942 Fax 06 5237 0841 Mail : info@cianasrl.com; ufficiotecnico@cianasrl.com Web : www.cianasrl.com
Ecobios Italia	Wastewater treatment, biocatalyst treatment	ADMINISTRATIVE Office: Tel. +39 06-37.51.51.08 - Fax +39 06-372.53.18 ENVIRONMENTAL Micro-Bioengineering, Circonvallazione Clodia, 82 - ROME (00195) LABORATORY Production: Largo Fontana , 56- 80073 (Marina Grande) CAPRI Tel. +39 081-837.32.34 SCIENTIFIC R&D : Prof. Roberto A. BLUNDO (B.Eng, M.Biol, Ph.D) – (Mobile) +39 320-741.33.70 Mail : ecobios@blundo.it Web : www.ecobios.com
Ecologia soluzioni ambiente	Wastewater treatment	Via Vittorio Veneto 2-2/A, 42021 Bibbiano (Reggio Emilia) - Italy Tel +39 0522 88 44 11 Fax +39 0522 88 44 01 E-mail : ecologia@ecologia.re.it Web : www.ecologia.re.it

ECONET	Wastewater treatment, environmental services	Legal site: SS Cassia Km 97,000 01027 Montefiascone - VT Operative site: Strada Poggino, 5 01100 Viterbo Tel. 0039 0761 35 42 32 Fax. 0039 0761 27 56 06 info@econetsrl.it www.econetsrl.it
Ecotherm spa	Environmental technologies and services	VIA VACCARECCIA, 43/D - 00040 POMEZIA (RM) TEL. 0691607058 FAX.06918023 Technical director : Oreste Mancini oreste.mancini@site.ecothermspa.it www.ecothermspa.it
Etatron D.S.	Water treatment, pumps, control dispositives	Via Catania, 4 - 00040 Pavona di Albano Laziale (RM) - ITALY Tel. +39 069349891 Fax +39 069343924 info@etatronds.com www.etatronds.com
SETAR	Wastewater treatment	se.tar@tiscalinet.it ;
Technodal Srl	Wastewater treatment plant	L.go A. Vessella, 27 00199 ROMA - Italia tel.: 06.86200258 info@technodal.it www.technodal.it
W.D.T.	Waste recovering	Via dei Castelli Romani 00040 Pomezia – Roma Ph +39 06 9116 21 Fax +39 06 9116 2224 email info@wtd.it www.wtd.it
MERAFIN srl	Wastewater treatment	Via Benedetto Stay, 69 - 00143 Roma Tel +39 06.5043203 - 06.5040839 Fax +39 06.233242802 e-mail: info@merafin.com www.merafin.com
ATD srl	Wastewater treatment	Via Nomentana, 401 - 00013 Fonte Nuova (RM) Italy Tel 06.90024436 Fax 0690020000 info@atditalia.com; www.atditalia.com
Idrofulax sas	Wastewater treatment	Via Treviso 26/28 – Viterbo , Italy

		Tel. 0761 331703 Tel. e Fax 0761 347474 info@idrofulax.it; www.idrofulax.it
Ecotech srl	Wastewater treatment	Zona Ind.le - 64015 Nereto (Teramo) ITALIA tel. 0861 856948 fax 0861 810480 info@ecotech.nu; www.ecotech.nu
Megakem	Wastewater treatment	 info@megakem.com;
EXTRA srl	Managing ecological plants	C.da Case Bruciate - Zona Industriale - 65010 Collecorvino (PE) Tel. e Fax +39.085.8208175 - 085.8208007 extra@extragroup.it; www.cdgservice.it/frame/main.html
CON.I.V. spa	Wastewater treatment	Via Ciccarone - 98/b 66054 Vasto (CH) tel: 0873 363684 fax: 0873 368496 coniv@clio.it http://www.paginegialle.it/coniv;
Magic Boat sl	Water treatments	C/Valencia nº 6 - Polígono Son Bugadellas - Santa Ponsa - 07180 Calvia - Mallorca (Baleares) Tel: 971697942 Fax: 971699578 magic@magic.es www.magic.es/index.htm
Tecnofil Industries	Water treatment	5 rue Jean Perrin - Espace Polygone - 66000 PERPIGNAN (France) - tél. : 0033(0)4 68 61 40 11 - fax : 0033(0)4 68 61 02 12 E-maill : contact@tecnofil-industries.com www.tecnofil-industries.com
Intraser 2000	Water treatment and engineering services	C/ Apel.les Mestres, 13 Sabadell 08205 Tel. 93 712 19 69 Fax 93 711 18 07 info@intraser2000.com; www.intraser2000.com

RDP for Slovakia: “Utilization of renewable energy sources and environment protection in Slovakia”

28. Abstract

As an EU Member State Slovakia also has obligations to implement an Environmental Technologies Action Plan in the line with EU policy. Besides delivering in the environmental front, environmental technologies are widely seen as an opportunity for economic growth.

A Regional Demand Profile for the Region of Slovakia which addresses the protection environmental topic of utilization of renewable energy sources and environment protection has been compiled by BIC Bratislava. The field of utilization of renewable energy sources and environment protection has been chosen due to its relevance to industry and SMEs and the sharp increase in enforceable legislation, particularly since Slovakia joined the EU on 1st May of 2004.

This RDP is focusing on utilization of renewable energy sources and environment protection. The requested technologies can be applied according to needs of local entities. Concrete demands for the region are given in the technology request profiles included in this RDP.

Legal basis of the development outlined in this RDP: EU and national (harmonized with EU) legislation and Act of Accession of the ten New Member States to the Union. The Act of Accession provided grace periods to the new member states for the fulfillment of several requirements of the EU legislation (derogations).

29. Overview of TR

TR No.	Company description	Request brief
01	A Slovak investor/SME	Technology and know-how to start up a plant for processing biomass combustion equipment.
02	A Slovak energy-based SME	Technology and knowhow to start up a plant for processing biomass combustion equipment. This combustion equipment should range from 100 kW to 0.5 (1) MW of heat energy. Used biomass should be cereal straw and oil-seed rape in bale.
03	A small energy-based SME from Slovakia	Know-how for anaerobic digesters and manure treatment biogas processing technology. Partners should have good experience in the area of biogas production.

04	A Slovak company active in the field of design and production of textile products	An environment-friendly technology for production of compressed air with regressive heat acquisition.
05	A Slovak company active in the environmental sector	An environment-friendly technology for controlled process of communal waste processing. The technology should enable acquisition of reusable materials and energy.
06	A Slovak entrepreneur	It has developed a new material suitable for thermal insulation of buildings. This material can be used for production of tiles with various diameters. He is looking for a technology suitable for production of tiles according to the developed mineral mixture.
07	Consultancy services in RES technology elaboration of FS, economical evaluation of alternative options.	RES technology for combine biomass firing with fossil fuels
08	Production of pellets, operation of pellets boiler room, preparation of strategies, new projects with biomass	Best drying machines. Production of energy from biomass.
09	Research in the field of plant physiology, plant production, ecotoxicology, phytoremediation technology and biofuels – optimalization of energy crops production.	Support of join in cooperation with companies utilizing rape seeds for FAME production

29.1 TR 1: Biomass combustion equipment

BBS code : *05 SK SKBB 0BQA*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
07 RO RIAP 0J8A	Installation for co-generation by using biomass transformed in gases	A small Romanian research company	Romanian IRC 4D (Mihail Soare)
06 GB MICU 0GVV	Small-scale Biomass-fuelled Combined Heat and Power	A UK company	MIRC (Alex Mauser)

	Unit		
07 IT LAUR 0J8Z	Feasibility studies and planning of industrial and private installation supplied by renewable energies	An Italian university spin-off	IRC CIRCE (Giovanna Ferraro)
07 IT LAUR 0J0C	A new two-stage gasifier	An Italian company	IRC CIRCE (Giovanna Ferraro)

29.2 TR 2: Straw-combusted water heater

BBS code : *06 SK SKBB 0FI3*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
08 GB 43O3 0IOM	Small-scale Biomass Fuelled Combined Heat and Power Unit	A UK company	UKMidsEUInet (EEN)
06 GB NMRT 0G5M	Zero-pollution multi-fuel combustion system (PCCP)	A UK industry	United Kingdom

29.3 TR 3: Manure treatment biogas processing technology

BBS code : *06 SK SKBB 0GPP*

List of Technology offers (TOs) from BBS Database (responding to Slovakia TR 3)

BBS code	Title	Enterprise	IRC
08 DE NSTT 0K55	Methods for the production of natural gas from biogas, landfill gas or sewage gas	A German company	IRC Lower Saxony/Saxony-Anhalt (Helga Ilchmann)

29.4 TR 4: Equipment for production of compressed air with regressive heat acquisition

BBS code : *07 SK SKBB 0HS3*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
05 DE NRXE 0CBB	Heat Recycling Power Plant (HRPP)	A German SME	Germany
05 PL EPCA 0DEQ	Innovative compressors	A Polish SME	Poland

29.5 TR 5: Technology for controlled process of communal waste processing

BBS code : *07 SK SKBB 0HS7*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
08 DE SDST 0JK4	Technology for energy recovery from urban waste	A German SME	IRC Stuttgart-Erfurt-Zürich (Teresa Puerta)

29.6 TR 6: Technology for production of thermo-insulating tiles from mineral mixtures

BBS code : *07 SK SKBB 0HS9*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
06 SK SKBB 0FXK	Thermo-insulating tile and mineral mixture for its production	A Slovakian entrepeneur	Slovakia

29.7 TR 7: RES technology for combine biomass firing with fossil fuels

Catalogue code : *TR SK 22221*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
07 SK SKBB 0HGV	Solid biofuels and energy production from sludge	A Slovak SME	IRC Slovakia (Peter KOPKAS)
08 PL EPUW 0JK5	Energetic willow - raising and logging biomass technologies	A research unit from North Poland	IRC North-East Poland (Anna Kaminska-Bisior)

29.8 TR 8: Best drying machines

Catalogue code : *TR SK 22223*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
07 IT LAUR 0HBU	New concept drying plants for fuel production from biomass	An Italian University team	Italy

29.9 TR 9: Support of join in cooperation with companies utilizing rape seeds for FAME production

Catalogue code : *TR SK 22234*

Comment about BAT

Not avaible.

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
07 SK SKBB 0HGV	Solid biofuels and energy production from sludge	A Slovak SME	IRC Slovakia (Peter KOPKAS)

30. List of providers

Enterprise	Mission	Contacts
Agrogeo Ltd.	Produces environmental friendly end-products through cost effective technologies which base on applied scientific achievements	H-6000 Kecskemét, Deák F. square 5. (Hungary) Tel./Fax: 76-481-502 E-mail: agrogeo@microsystem.hu Web: www.agrogeo.hu
Amandus Kahl GmbH & Co. KG	Plan, design, and build machines, plants for environmental sector	Dieselstrasse 5 - 9 Reinbek near Hamburg D-21465 (Germany)
Energie Steiermark AG	Electricity, natural gas, district heating and residual waste management, waste processing and recycling	Leonhardstraße 59 A-8010 Graz (Deutchland) Tel: +43 (0)316/9000 Fax: +43 (0)316/9000-5919 karl-franz.maier@e-steiermark.com www.e-steiermark.com
Envihorizont Ltd.	Environment protection, energy, farm waste treatment	7100 Szekszárd, Rizling 9, P.O.Box.: 199 (Hungary) T el.: +36 74 415 379, Fax: +36 74 511 804 envizont@axelero.hu www.envihorizont.hu
Laser Consult Kft	Consulting society for helping regional companies, businesses and public institutions to gain access to, use and manage innovation, innovation sources and innovation reserves	Central Office: Address: H-6723 Szeged, József A. sgt. 130. Postal Address: H-6701 Szeged, Pf. 1191 (Hungary) Tel.: +36 62 562-782 Fax: +36 62 562-783 Mobile: +36 30 9784 215 E-mail: laserconsul@laserconsult.hu ; laserconsult@t-online.hu www.laserconsult.hu
Noel Gauci Group	A maltese company specialised in domestic renewable energies, such as solar heaters and photovoltaics.	P.O. BOX 4 QORMI (Malta – EUROPE) Phone: 00 356 21 490590 Email: info@noelgaucigroup.com http://www.noelgaucigroup.com
Technicky skusobny ustav Piestany, s.p. (Technical Testing Institute Piestany)	Certification, testing, inspection	Krajinska cesta 2929/9 921 01 Piestany (Slovak Republic) e-mail: tsu@tsu.sk www.tsu.sk

RDP for Greece: “Management of Specific Waste Streams”

31. Abstract

This Regional Demand Profile (RDP) for Greece has been prepared as part of the methodology being tested by the METTTES (More Efficient Trans-national Technology Transfer in the Environmental Sector) project to increase the number of Transnational Technology Transfers (TTTs) of the Innovation Relay Centre (IRC) Network. Greece, is considered as a region for the purpose of the methodology.

The main focus of this RDP is technology demand relating to the Management of Hazardous Waste and other Specific Waste Streams, such as Hospital waste, Animal by-products and Food/Agro Waste.

For the last 10 years, Greece has enjoyed an average annual growth of almost 4%. As a member of the European Union (EU), Greece has benefited from the influx of European cohesion funds. Indeed, a substantial part of EU cohesion funds and public investment - as well as preparations for the 2004 Olympic Games - were dedicated to improving Greece’s infrastructure network, including several environmental projects. The current period is particularly critical for environment-related business

opportunities, as both the government and businesses must take certain measures to meet the country’s obligations against the EU. In particular, recycling, solid and hazardous waste treatment, and alternative energy sources in Greece fall short of EU averages.

In recent years, waste management has proved to be one of Greece’s most complicated environmental problems.

As far as Hazardous Waste Management is concerned, as a new legislative framework was quite recently adopted (the general technical specifications for hazardous waste management in 2006, and the National Plan for the treatment of Hazardous Waste in 2 March 2007). Therefore a set of systematic measures for dealing with these waste streams, still remain to be implemented.

Overall, in Greece there are very few hazardous waste treatment and final disposal sites, which are not sufficient for dealing with the existing demand. There is a strong need for incoming new technologies, creating several opportunities for trans-national collaborations and place for significant investments in this field. As is the case with hazardous/ industrial/hospital waste management, there is

also strong technology demand and significant space for improvement in the field of animal byproducts/ waste treatment and management. Last but not least, as the agro-food sector is one of the major industrial sectors in the country, there is current and prospective demand, for technologies/ systems for the treatment of agro-food related waste streams for the production of usable energy.

The initial assessment of the various environmental problems/ fields in Greece in order to select the ones making up RDP and being subject to further analysis, was based on four criteria:
- The role of SMEs in the introduction of new technologies
- Whether technology/ systems demand in the specific field is mainly generated/ addressed by SMEs rather than public authorities
- Whether the specific environmental/ field demonstrates strong demand for new/ improved technologies
- Whether there are legal requirements/ administrative regulations/ environmental policies pressing for reforms

The field of "specific solid/ liquid waste streams" was found to meet the most criteria compared to the other examined problems/ fields. Within this selected field, hazardous-industrial/hospital/ animal byproducts and agro-food waste are identified as the most suitable for the RDP.

Nine technology Requests have been identified and are presented in Annex I of the current RDP. All Technology Requests making up the present RDP originate from SMEs, as small and medium enterprises are important players in terms of introducing changes to conventional practices and accelerating the implementation of new technologies. The analysis and assessment of the various technology demands in METTTES has largely focused on SME-relevant topics and assessed the most representative needs of enterprise players in the environment field.

32. Overview of TR

TR No.	Company description	Request brief
01	A Greek company in the field of water & environmental engineering, focusing on the design and installation of wastewater treatment plants	The company is looking for novel technological solutions for industrial and hazardous waste treatment, in the fields of: - Petroleum Wastewater treatment (Refineries, fuel and oil depot stations) - Cosmetics waste treatment - Industrial Wastewater treatment (such as: Papermills, metal plating industries, tanneries, dyefinishing, paint, detergent, cosmetics, wood treatment, marble treatment factories etc.) - Toxic and Contaminating Wastewater Treatment Chemical, acidic, alkaline, heavy metals, radio-active, hospital wastewater (AIDS, hepatitis etc)
02	A Greek SME	The SME is looking for innovative technologies on the management and treatment of hazardous waste occurring from a number of industrial sectors including: production of pesticides, metallurgy, tanneries, chemical industries, dyers, storage and processing of petroleum products, steelworks
03	A Greek company active in solid waste management	The company is seeking a system for efficient medical waste management
04	A dynamic Greek company in the	The company is seeking an effective rendering system for

	field of marine/solid waste management	meat and fish by-products originating from meat/fish processing units
05	A Greek company in the field of marine/solid waste management	The company is seeking mobile composting units for organic materials, such as vegetables and fruit waste, food waste, etc.
06	A Greek consulting and engineering SME active in the design, implementation and support of energy investments	The SME is seeking advanced know-how/ systems for the treatment of solid and/or liquid waste and residues (derived from fish, wood, chip/particle-boards, olive oil, slaughter houses and textile-dyeing processing units) in order to produce usable energy
07	A Greek company active in marine waste management	The company is looking for a technology/ treatment process for the utilization of sand blasting waste
08	A Greek company in the field of water & environmental engineering	The company is looking for novel technological solutions for wastewater and water treatment
09	A Greek company active in solid waste management	The company is seeking technologies/ systems for the management of sewage sludge, produced during the biological treatment of wastewater

32.1 TR 1: Technologies for industrial and hazardous waste treatment

BBS code : *07 GR HFHF 0IIT*

Comments about BAT

The TR is quite large, including many different types of industrial wastewater to be treated. It is not possible therefore to discuss the broad system of industrial wastewater, without a precise idea of the pollutant that has to be destroyed or the typical industrial sector where the wastewater is originated.

For example, the petroleum wastewater is typically treated by API basins, where a oil-liquid separation takes place, flotation, biological treatment, and in some cases tertiary treatment (chemical oxidation, activated carbon adsorption, reverse osmosis) in order to reduce to larger extent organic micropollutants. As far as API basins and flotation are concerned, it must be pointed out that in such treatment the ambient air pollution can arise due to a direct presence of hydrocarbons on the surface of treated water. From this point o view it is very important to cover the basins providing a flux of inert gas (like nitrogen) with collection and treatment of the exhaust gas, in most cases by thermal oxidation.

From a general point of view it must be considered that an industrial wastewater has to be characterised in order to define the optimal treatment chain: the most important points of such characterization includes:

a) presence of particulate and/or colloidal matter;

b) presence of volatile compounds;

c) concentration of soluble and total COD and BOD_5;

d) presence of specific organic micropollutants and/or metals;

e) concentration of nutrients, with specific attention to nitrogen and phosphorus;

f) presence of mineral oils.

Before any biological treatment it is crucial to eliminate the most of the pollutants with simple and not expensive process, like liquid-liquid separation (mineral oils), stripping (volatile compounds), flocculation (fine and colloidal particulate). After such treatment it should be evaluate the residual COD and BOD_5 concentration in order to understand the biodegradability of the wastewater and the expected biomass (sludge) production. The biological process should be eventually integrated with nitrogen removal, with integrated process of denitrification – nitrification). Many different process can be adopted also for nitrogen removal.

Regarding removal of heavy metals, the most used processes are based on oxidation considering that generally the metals oxidised forms are not soluble. Other options are of course feasible like use of sulphurs (metal sulphur are normally very insoluble) or use of alternative chemicals in order to capture metals. The process should be completed with separation of the precipitates normally present in very fine forms, not very easily settleable.

Tertiary treatments can be considered when specific targets (like for example requirements for water reuse) should be observed.

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
06 GB WADA 0G9Z	Electrochemical water treatment - contaminant removal	A Welsh company	

32.2 TR 2: Technologies for treatment of industrial waste streams

BBS code : *07 GR HFHF 0IIT*

Comments about BAT

This second TR is quite undetermined too. The broad industrial sectors, including production of pesticides, metallurgy, tanneries, chemical industries, dyers, storage and processing of petroleum products, practically cover all the technologies which could be used to get rid of such wastes.

It must be pointed out that waste treatment has two important goals:

a) the treatment should be able to preliminarily recover materials/fluids thus reducing the quantity of waste to be disposed. The possible reuse of secondary raw materials could be an important additional benefit;

b) after treatment the final residues should be in such a form, physical, chemical and biological, that final disposal can be conducted without detrimental effects to the humans and the environment.

Waste characterization should be the first step of waste management. The following items should be assessed:

a) physical form (liquid, sludge, solid) and granulometry for granular wastes;

b) organic or inorganic matrix;

c) presence of biological matter;

d) possibility of odour production due to biological activity or presence of volatile compounds;

e) if the waste is an equipment (like waste electrical and electronic equipment) or a vehicle at the end of life it should be treated in order to recover fluids and other metals (among them also precious ones) to be separately treated for recovery.

Sludge wastes, basically inorganic, should be treated in order to reduce possibility of metal leaching in landfill disposal. Such treatments are known as solidification-stabilization processes and generally they are based on mixing of the waste with lime and/or cement. A liquid inorganic waste should be previously treated to precipitate metals and separate them as inorganic sludge.

Granular wastes should be previously investigated to assess pollutants leachability. If the leaching test evidences metal release then the granular waste should be treated accordingly to sludge. Before mixing with the chemicals, shredding could be required to increase process efficacy.

Organic wastes are normally treated by thermal process, which could be incineration, gasification, thermal desorption. Such processes could be included in integrated process where also thermal drying is included. In this case the best option is to use the sensible heat of the exhaust gas deriving from incineration/gasification to produce steam for drying. The key for choosing incineration or gasification is essentially linked with the calorific value of the waste. Gasification is preferable when calorific value is quite high, not lower than 25.000 kJ/kg. Such processes include energy recovery and a flue gas treatment sections to be able to respect the very stringent limits for gas emissions. Thermal desorption is normally conducted by rotary kiln furnaces and is used for decontamination of inorganic wastes heavily polluted by organics, especially hydrocarbons. The typical case is a contaminated soil.

List of Technology Offers (TOs) from BBS Database

BBS code	**Title**	**Enterprise**	**IRC**

06 GB WADA 0G9Z	Electrochemical water treatment - contaminant removal	A Welsh company	

32.3 TR 3: Efficient installations for hospital/ medical waste management

BBS code : *07 GR HFHF 0IIU*

Comments about BAT

Improper management of discarded needles and other sharps can pose a health risk to the public and waste workers. For example, discarded needles may expose waste workers to potential needle stick injuries and potential infection when containers break open inside garbage trucks or needles are mistakenly sent to recycling facilities. Janitors and housekeepers also risk injury if loose sharps poke through plastic garbage bags. Used needles can transmit serious diseases, such as HIV and hepatitis.

The treatment is any method, technique, or process designed to change the biological character or composition of any medical waste so as to reduce or eliminate its potential for causing disease.

The treatment technologies include incineration, steam autoclaving, chemical and mechanical treatments, noniodizing radiation (microwave irradiation, radiofrequency irradiation) and gamma irradiation.

Microbial inactivation refers to the effects of physical or chemical processes that render microorganisms incapable of multiplication. Such processes may either kill the organisms or injure them to the extent that effective repair and subsequent growth is not possible. Level I microbial inactivation destroys most disease causing microorganism. It indicated kill of at least 10^5 vegetative bacteria and fungi, fungal spores and viruses. It implies the inability to inactivate mycobacteria and bacterial spores. It may be accomplished by a variety of physical or chemical processes. It is similar to disinfection which is defined in terms of performance requirements base upon standard test methods for each major group of microorganisms other than bacterial spores. Level II microbial inactivation is defined as significant inactivation of all microorganisms with the exception of bacterial spores. This indicates the inactivation of at least 10^5 mycobacteria in addition to Level I inactivation. It implies a measure of "tuberculocidal" activity. Level III indicates the kill of microbial life forms as evidenced by the inactivation of at least 10^4 indicator spores which have death curves similar to human pathogenic spores. Thus, *B. subtilis* spores may be used to indicate Level III microbial inactivation for moist heat treatment, since they also exhibit thermal death data similar to species of the pathogenic spore-forming *Clostridium*. Level IV indicates the kill of microbial life forms as evidenced by the inactivation of 10^6 bacterial indicator spores recognized as most resistant to the treatment process. For example, the inactivation of at least 10^6 spores of the bacterium *B. stearothermophilus*, recognized as most resistant to moist heat, is an indication of Level IV inactivation by steam autoclaving.

The treatment of medical waste is intended to render the waste non-infectious or less infectious prior to disposal. The effectiveness for the treatment may be measured by the kill of inactivation of suitable viable indicator microorganisms in regulated or surrogate medical waste. Surrogate medial waste /unused biomedical products) should be comprised of a variety of materials expected to occur in regulated medical waste, such as plastic, glass, rubber, metal, fabric, paper.

With the exception of gamma irradiation, it is generally accepted that if the treatment process inactivates a specific level of resistant bacterial spores, other types of microorganisms (bacteria, fungi viruses, mycobacteria will also be inactivated. Thus when choosing an indicator organism to use for routine effectiveness testing, the organism should be chosen based on the desired level of treatment the process is expected to achieve.

For treatment technologies relying on thermal inactivation of microorganism 8incineration, steam autoclaving, onon ionizing irradiation) spores of *B. subtilis* can be used to verify Level III microbial inactivation and *B stearothermoplilus* may be used to verify Level IV microbial inactivation.

For treatment technologies that rely on chemical inactivation of microorganisms, spores of *B. stearothermophilus* may be used to determine the level of treatment achieved for Level III, and for Level IV. *B. stearothermophilus* provides a measure of resistance to chemical inactivation very similar to that of *B. subtilis*, and may be readily revovered and isolated from medical waste treatment systems due to its thermophilic growth property.

Indicator organisms for gamma irradiation treatment of medical waste have not been tested or verified. Some viruses appear to be the most resistant organisms for this technology. However, animal viruses are difficult to use as indicator organisms because of their extensive maintenance requirements in the laboratory.

Indicator spore strips and spore suspensions should be purchased from reputable suppliers. When the organisms are received the packaging and containers should be visually inspected and the date or receipt, lot number and expiration date recorded in a log book. The log book should be maintained for inspection by the individual responsible for quality assurance for the facility. After being logged into the system, all spores should be refrigerated (2 – 8 °C) or stored under other recommended conditions until used.

In the following table the frequency of efficacy testing is shown.

Technology	Recommended Frequency
Incineration	Quarterly, unless procedures change or repairs are made to the equipment
Steam Autoclaving	Bi-weekly, unless procedures change or repairs are made to the equipment
Chemical Disinfection	Bi-weekly, unless procedures change or repairs are made to the equipment
Microwave	Bi-weekly, unless procedures change or repairs are made to the equipment
Radiofrequency	Bi-weekly, unless procedures change or repairs are made to the equipment

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
06 SI SIJS 0FZN	Highly efficient biological waste decomposition and humification	A Slovenian company	

32.4 TR 4: Treatment of Animal By-Products

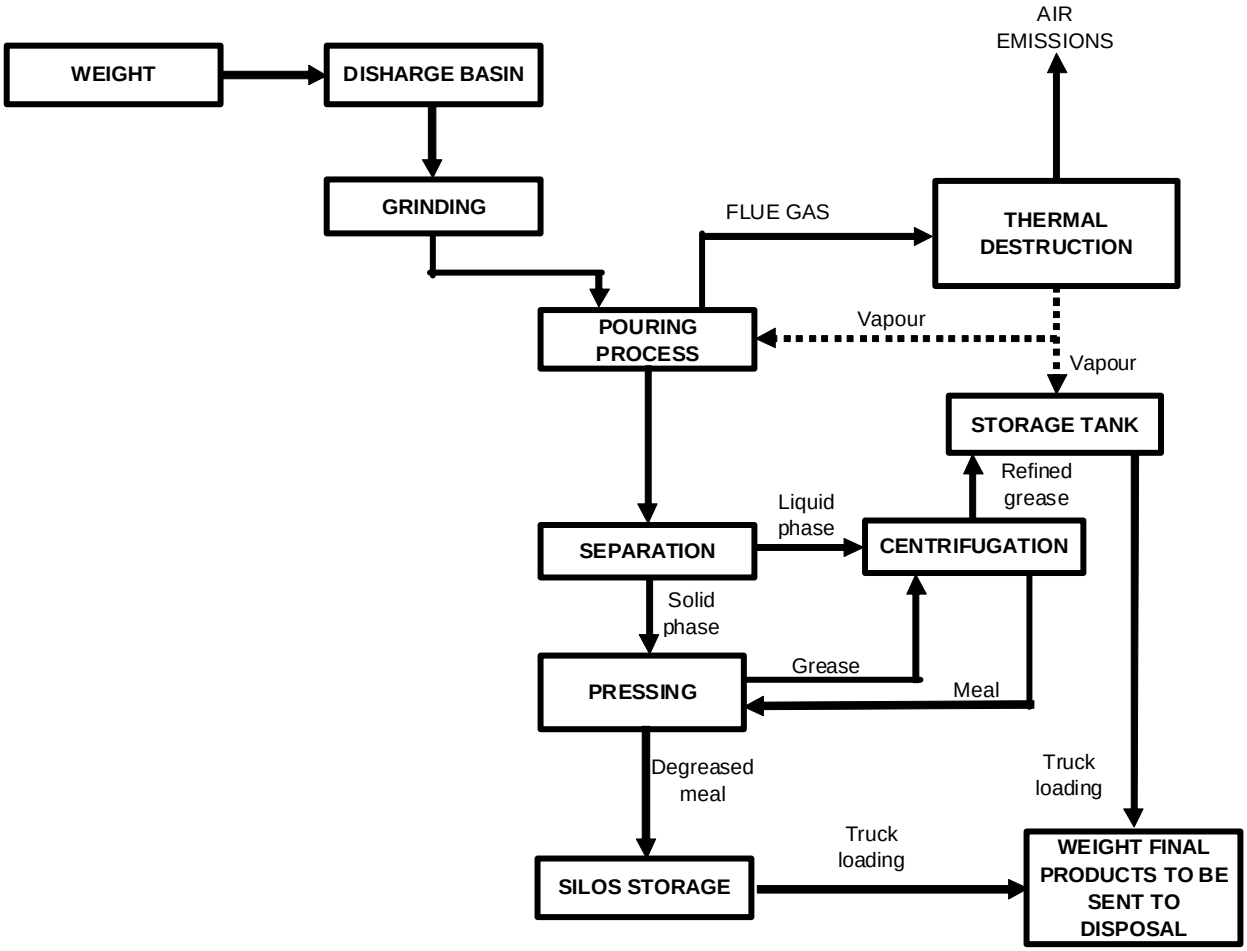
BBS code : *07 GR HFHF 0HIR*

Comments about BAT

The TR clearly describes the cycle which is generally used for these types of residues. It should be preliminary observed that this matter is covered by the Regulation (EC) No 1774/2002 of the European Parliament and of the Council of 3 October 2002 laying down health rules concerning animal by-products not intended for human consumption. In this framework we have to distinguish among category I, II and III.

The materials listed in category I should be either directly disposed of as waste by incineration in an incineration plant or processed in a processing plant approved, where the resulting material shall be permanently marked, where technically possible with smell, and finally disposed of as waste by incineration or by co-incineration in an incineration or co-incineration plant approved. Therefore, the materials included in category I must be finally incinerated and any treatment aimed to recover something as compost or usable material is not allowed.

In the following figure a typical flow sheet for such a process is reported.



The Italian company which is leader in this sector is: ILSAP (www.ilsap.it) 04010 via Capograssa, 996 - Borgo S. Michele (Latina), tel. +39-0773-25371.

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
08 AT 0111 0ITG	Next generation biomass gasification power plant with increased efficiency	An Austrian SME	CIP- Network AUSTRIA (EEN)
08 DE 18A5 0ICX	Integrated process for the recycling of waste	A German research institute	ESIC Sachsen-Anhalt (EEN)
08 CZ 0744 0IQ5	Reactor for processing of municipal, biodegradable waste (BDW), including subsidiary animal products	A small Czech company	BISONet (EEN)

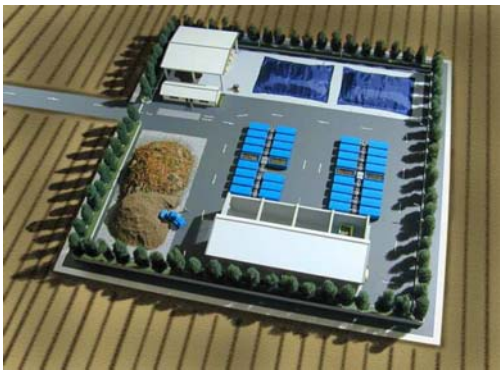
32.5 TR 5: Mobile composting units/plants

BBS code : *07 GR HFHF 0HIT*

Comments about BAT

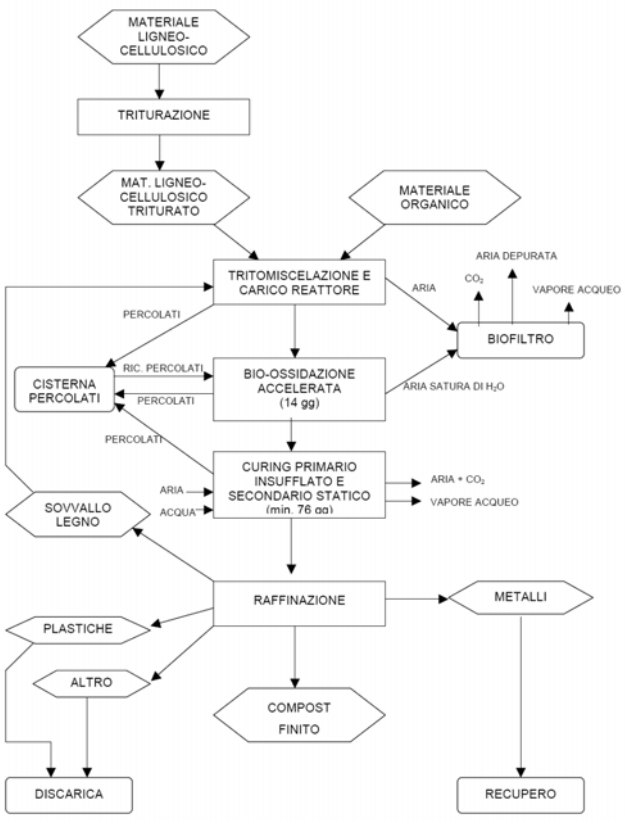
Many companies can be contacted. Among them Entsorga Italia S.r.l. (www.entsorga.it) Strada per Castelnuovo S. 7 15057 Tortona (Al), tel. +39-0131-811.383.

The following picture describes the typical arrangement of the area for a mobile composting plant.



Areal view of a composting plant using mobile units

The following picture describes the process flow sheet.



Typical flow sheet of a composting plant

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
07 SE WSIV 0HZ1	Bioreactor with multiple functions for treatment of bio waste (composting, sludge treatment, dewatering and wastewater treatment)	A Swedish company	IRC Western and Southern Sweden/Iceland
07 DK DKEC 0IWC	State-of-the-art anaerobic digestion and composting	A Danish SME	IRC Denmark

32.6 TR 6: Treatment of solid/ liquid waste and residues from food and agricultural processing units for the production of usable energy

BBS code : *07 GR HFHF 0IIW*

Comments about BAT

Anaerobic digestion of agricultural wastes is a quite common practice in Europe especially in Germany, Denmark, Austria, Sweden, Switzerland and Italy. There are more than 3.000 anaerobic digesters working with animal manure. As far as Italy is concerned, the two most important company involved in anaerobic digestion is Centro Ricerche Produzioni Animali (Reggio Emilia) (www.crpa.it). Technologies should include a preliminary grinding of animal wastes up to a size of 12 mm and a mixing with other liquid organic wastes before feeding the anaerobic digester. Digestion can be carried out either with dry processes when the total solids concentration is higher than 20 % or with wet digestion when slurry is liquid, i.e. with solid concentration lower than 10 %. Reactors are generally vertical cylinders but sometimes also horizontal shape can be adopted especially for dry digestion systems. A specific item of the reactors is the possibility to have the cover that could be inflated and therefore the volume of the reactor not occupied by liquid is variable. An important part of the digester is the feeding system.

Centro Ricerche Produzioni Animali s.p.a.

Corso Garibaldi, 42 a Reggio Emilia Tel +39 (0522) 436.999

E.-mail: ghielmi@crpa.it

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
07 IT LAUR 0HBU	New concept drying plants for fuel production from biomass	An Italian university team	

32.7 TR 7: Utilization of sand blasting waste

BBS code :

Comments about BAT

Sandblasting is used to clean dirt, corrosion, paint or other coatings from a variety of surfaces. Common industries where sandblasting is applied include shipbuilding and maintenance, transportation bridge maintenance and military operations. Abrasive blasting has been a concern for a number of years in regard to worker safety during the blasting process. Issues of concern include worker exposure to silica dust, extreme noise exposure and mechanical and electrical hazards. The problem presented with the used abrasive blast media is that it may contain materials from the cleaned surface which impart hazardous characteristics to grit. Sandblasting is often used to remove paint from metal and other surfaces. Surface coatings with paint are often necessary to protect from deterioration in the environment, most notably the marine environment. These paints usually contain heavy metals which act as anti-fouling and anti-corrosion agents. In this way heavy metals become part of the abrasive blast media waste. Sand is one of the most common blasting materials because is the least expensive non-reusable media. One problem with the management of this waste stream is that it has often times gone unnoticed as a solid waste and the need for testing for hazardous characteristics has not been recognized. This results in part from the physical appearance of the waste. When silica sand has been used, the waste looks like sand and is therefore not easily recognized by some as a solid waste. This material would be simply spread around the property and treated as additional soil.

In general a number of recycling options are possible for the management of abrasive blast media depending on its physical and chemical characteristics. Spent blasting abrasives have been used as feedstock material in the production of Portland Cement. Used abrasive blast media also has the potential to be used as aggregate in the production of Portland cement concrete and in the production of asphalt concrete for roadways. In such cases the material has to meet the physical and chemical requirements of the manufacturing process. Other options for recycling include recovering some fraction of abrasive blast media for reuse, using as a clean fill material (if clean enough), and using as a drainage material in landfills or septic tanks.

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
06 PL SPUS 0GAZ	Recovery of wastes stabilised in polymer concrete	A Polish company	Poland
06 PL SPIM 0JVM	Innovative technology for treatment of hazardous	A Polish SME	Poland

	waste		

32.8 TR 8: Novel technologies for wastewater and water treatment

BBS code :

Comments about BAT

The TR is very general not focused on a specific problem so many possible technological alternatives can be suitable depending on the specific case considered.

As regard as the three possible solutions proposed for wastewater treatment a short analysis is presented in the following:

Disinfection – Ozone and UV treatment

Chlorine has been used extensively as a disinfectant against waterborne pathogens. However, a major drawback associated with the use of chlorine as a disinfectant is its potential to react with organic matter to form a number of disinfection by-products (DBPs). Some of these DBPs have been linked to cancer and reproductive defects. Due to these health concerns, more stringent limits are considered for maximum allowable concentrations of DBPs that can be present in treated drinking water. Two approaches are commonly used to reduce the formation of DBPs during drinking water treatment. The first approach consists of using a non-chlorine-based disinfection process as a 'primary' disinfectant prior to chlorine addition as a 'secondary' disinfectant. The overall disinfection efficiency remains the same, however the amount of chlorine needed is significantly reduced. Therefore, the quantity of DBPs formed is comparatively lower. The second approach consists of reducing the amount of organic matter in the raw water prior to chlorination using a combination of chemical and physical processes (e.g. coagulation/flocculation and filtration).

An alternative group of technologies that can potentially be used to minimize the formation of DBPs are the advanced oxidation processes (AOPs). In AOPs, hydroxyl radicals (.OH) are formed. These radicals are extremely reactive and are capable of oxidizing the organic matter in raw water sources As a result, AOPs have been documented to reduce the total organic carbon (TOC) concentration and the DBPs formation potential of raw source water. The most common process used to generate (.OH) is through the use of combined catalytic oxidants such as ozone-ultraviolet (O3-UV), hydrogen peroxide-ultraviolet (H2O2-UV) and hydrogen peroxide-ozone (H2O2-O3). Although all 3 of the above processes can produce (.OH) radicals, the O3-UV process provides the maximum yield of (.OH) per oxidant and seems to be the most promising.

Reverse osmosis

Reverse osmosis (RO) is a process which uses a membrane under pressure to separate relatively pure water (or other solvent) from a less pure solution. When two aqueous solutions of different concentrations are separated by a semi-permeable membrane, water passes through the membrane in the direction of the more concentrated solution as a result of osmotic pressure If enough counter

pressure is applied to the concentrated solution to overcome the osmotic pressure, the flow of water will be reversed. Water molecules can form hydrogen bonds in the RO membrane and fit into the membrane matrix. The water molecules that enter the membrane by hydrogen bonding can be pushed through under pressure. Most organic substances with a molecular weight over 100 are sieved out, i.e., oils, pyrogens and particulates including bacteria and viruses. Salt ions, on the other hand, are rejected by a mechanism related to the valence of the ion. Ions are repelled by dielectric interactions; ions with higher charges are repelled to a greater distance from the membrane surface. Monovalent ions such as chloride ions will not be rejected as efficiently as, for example, divalent sulfate ions. The nominal rejection ratio of common ionic salts is 85 - 98%.

The majority of the commercially manufactured RO membranes are made from cellulose acetate, polysulfonate, and polyamide. Many other kinds of membrane made of a single polymer or a copolymer are also available for specific purposes. The membrane consists of a skin about 0.25 microns and a support layer about 100 microns. The skin is the active barrier and primarily allows water to pass through.

A major problem in operating RO systems is concentration polarization or fouling which is the gradual build up of rejected solute on the feed side, immediately adjacent to the membrane. A flush cycle is often used to reduce build up. The spiral wound construction is less susceptible to fouling than that of the hollow fiber unit. A membrane module lasts two to three years on the average. The shut down procedure for non-working hours should assure that minimum flow and operating pressures are continued with a timed internal flush cycle.

The amount of dissolved solids in water produced by reverse osmosis is approximately a constant percentage of those in the feed water. For example, when the feed water contains 300 ppm total dissolved solids (TDS), the product water may have 15 to 30 ppm (95% and 90% rejection ratio respectively). A RO system design is based on a certain range of feed water TDS, the percentage of rejection and percentage of recovery desired. For a given system, the higher the percentage of recovery or the lower the percentage of rejection, the poorer the quality of product water becomes. A RO water purification system with a deionizer and/or several modules connected in series can produce water containing less than 0.1 ppm TDS.

Membranes

A wide range of membrane processes, i.e. microfiltration, ultrafiltration, nanofiltration and reverse osmosis may be employed for water and wastewater treatment. The selection of an appropriate membrane depends on the desired level of COD. The tighter the membrane the more removal of organic materials is expected. Micro filtration membranes with pore sizes around 0.2 □m can reduce the COD by an average of 60%. The removal of organic matters by ultrafiltration process is in the range of 90 - 96% of influent COD while for nanofiltration process is reported a COD removal of 70-98 % depending on the feed and operating conditions. It was found that microfiltration process followed by nanofiltration for textile wastewater results in an acceptable permeate for water reuse. Moreover many researchers have combined ultrafiltration and reverse osmosis membranes to obtain a product with higher quality. Moreover, the combination of membranes with other separation processes such as activated sludge, provides higher COD removal compared to each of the processes separately. Membrane processes are used for treating

wastewaters from different resources both municipal and industrial (textile, leather processing, ceramic industry, pulp and paper industry, diary industry etc..).

It is proved that membranes have the ability to reduce the COD of various wastewaters from different resources. However the results of the process depend not only on the feed characteristics but also on the membrane characteristics that can reach an high degree of specifications for the case under examination.

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
06 DE NRXE 0FBR	Compact ship waste-water purification unit	A German company active in wastewater treatment	

32.9 TR 9: Sewage sludge management

BBS code :

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
06 DE NRXE 0FBR	Compact ship wastewater purification unit	A German company active in wastewater treatment	
BIRC/E/231103	Highly concentrated and stabilised microorganisms for environmental cleaning	A spin-off of a Brussels Industrial Engineer School	IRC BELGIUM
06 IT LAUR 0E5W	Carbonaceous adsorbent from sewage sludge and their application in wastewater activated sludge system	An Italian university spin-off	IRC LOMBARDIA

33. List of providers

Enterprise	Mission	Contacts

Idrocentro	Plumbing products, water treatment, alternative energy	tang. Torino, uscita La Loggia, ss per Saluzzo km. 29, Torre San Giorgio (Cn) tel. 0172.9121 fax 0172.96075 Freephone: 800 577385 www.idrocentro.com info@idrocentro.com cussino@idrocentro.com IRC ALPS

RDP for Northern Greece (Region of West Macedonia):"Waste management and clean energy technologies"

34. Abstract

Waste management is the main field addressed in the RDP of the National Documentation Centre (IRC Hellenic), although the fields of energy efficiency and emissions control are also identified as areas with potential demand for environmental and renewable energy technologies in Northern Greece in the Region of West Macedonia.

In the last 15 years, despite the Kyoto Protocol, Greece has seen an increase in the air pollutants it passes into other regions, due to meteorological conditions, by roughly 30%.

There are many studies related to the effects of environmental pollution in Western Macedonia, such as the research work of Sichletidis et. Al. (2005) in which was demonstrated a detrimental effect of the indoor and outdoor environmental pollution effects on the respiratory system of children.

The main pollutants of the domestic environment, when wood, diesel or gas are used for heating and cooking, are CO and NO2.

The country needs to explore alternative energy forms, to be progressively independent from the lignite, that is an expensive and polluting fuel, and must be supported in programs related to energy saving and growth of Renewable Energy Sources.

Moreover, the Greek national Legislation has been completely harmonized with the legislation of the European Commission and its directives.

In Greece, emphasis is put on the construction of infrastructure works for the environment, which are organized on the basis of six-year action programmes. The Operational Programmes "Environment", the Environmental Programmes financed by the Cohesion Fund of the European Union, and the environmental actions carried out under the framework of Regional Operational Programmes or Sector Operational Programmes, constitute the core of Greek environmental policy.

More specifically, the basic axis of environmental policy is the Operational Program "Environment 2000-2006". Its basic aims as described are: a) the protection, administration, upgrading and promotion of the natural environment; and b) attuning with European environmental policy and national directions and commitments, and the observance and application of the obligations deriving from these, as far as the environment and development are concerned.

Environmental companies will carry out the development work which is needed by the polluting companies of the region in search of environmental technologies. Any agreed developments in this RDP can be carried out by Greek SMEs, preferable SMEs in the Region of West Macedonia, together with the foreign partners. It is important to notice that there is local expertise and

experience available in the implementation and adoption of foreign technologies and in construction.

35. Overview of TRs

TR No.	Company description	Request brief
01	A Greek governmental organization in the Region of West Macedonia, active in the field of technology transfer	It's seeking innovative technologies for the utilization of fly ash, produced by the thermoelectric plants of the Public Power Corporation, for the development of refractory bricks
02	A Greek governmental organization in the Region of West Macedonia, active in the field of technology transfer	The organization is seeking innovative technologies for the utilization of fly ash, produced by the thermoelectric plants of the Public Power Corporation, for the development of concrete materials for buildings
03	A Greek governmental organization in the Region of West Macedonia, active in the field of technology transfer	It's seeking low cost innovative technologies for the retention of fly ash, produced by the thermoelectric plants of the Public Power Corporation
04	A Greek governmental organization in the Region of West Macedonia, active in the field of technology transfer	The organization is searching for innovative technologies for energy recovery from wastes
05	A Greek governmental organization in the Region of West Macedonia, active in the field of technology transfer	The organization is seeking for partners for a local company for collaboration in the area of solar energy
06	A Greek governmental organization in the Region of West Macedonia, active in the field of technology transfer	It's seeking a collaboration to develop and establish a factory that will design, manufacture and distribute small wind turbines in the power range between 1kW to 5kW

35.1 TR 1: Utilization of fly ash for the development of refractory bricks

BBS code : *07 GR IHND 0IEU*

Comments about BAT

See comments about next TR

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
05 GR IHCR 0C39	Utilisation of industrial by-products and industrial wastes for manufacturing of new ceramic products	A Greek technological development company	Greece
06 NL NLSE 0GCS	Technology for processing fly-ash and industrial residues into useful end products	A Dutch company	The Netherlands
07 DE DSBT 0J3H	Baking bricks with high thermal insulation	A german Institute	Germany

35.2 TR 2: Utilization of fly ash for the development of concrete products

BBS code : *07 GR IHND 0IEV*

Comments about BAT

Fly ash is one of the residues generated in the combustion of coal. Fly ash is generally captured from the chimneys of power generation facilities, whereas bottom ash is, as the name suggests, removed from the bottom of the furnace. In the past, fly ash was generally released into the atmosphere via the smoke stack, but pollution control equipment mandated in recent decades now require that it be captured prior to release. Depending upon the source and makeup of the coal being burned, the components of the fly ash produced vary considerably, but all fly ash includes substantial amounts of silica (silicon dioxide, SiO2) (both amorphous and crystalline) and lime (calcium oxide, CaO). Fly ash is commonly used to supplement Portland cement in concrete production, where it can bring both technological and economic benefits, and is increasingly finding use in synthesis of geopolymers and zeolites.

In the past, fly ash produced from coal combustion was simply entrained in flue gases and dispersed into the atmosphere. This created environmental and health concerns. Prompted laws have reduced fly ash emissions to less than 1% of ash produced. Worldwide, more than 65% of fly

ash produced from coal power stations is disposed of in landfills. In India alone, fly ash landfill covers an area of 40,000 acres (160 km²).

The recycling of fly ash has become an increasing concern in recent years due to increasing landfill costs and current interest in sustainable development. Other environmental benefits to recycling fly ash includes reducing the demand for virgin materials that would need quarrying and substituting for materials that may be energy-intensive to create (such as Portland cement).

The reuse of fly ash as an engineering material primarily stems from its pozzolanic nature, spherical shape, and relative uniformity. Fly ash recycling, in descending frequency, includes usage in:

- Portland cement and grout;
- Embankments and structural fill;
- Waste stabilization and solidifaction;
- Raw feed for cement clinkers;
- Mine reclamation;
- Stabilization of soft soils;
- Road subbase;
- Aggregate;
- Flowable fill;
- Mineral filler in asphaltic concrete;
- Other applications include cellular concrete, geopolymers, roofing tiles, paints, metal castings, and filler in wood and plastic products.

Portland cement

Owing to its pozzolanic properties, fly ash is used as a replacement for some of the Portland cement content of concrete. The use of fly ash as a pozzolanic ingredient was recognized as early as 1914. As pozzolan greatly improves the strength and durability of concrete, the use of ash is a key factor in their preservation.

Fly ash replace up to 30% by mass of Portland cement, and can add to the concrete's final strength and increase its chemical resistance and durability. The replacement of Portland cement with fly ash also reduces the greenhouse gas signature of concrete, as the production of one ton of Portland cement produces approximately one ton of CO2. Since the worldwide production of Portland cement is expected to reach nearly 2 billion tons by 2010, replacement of 30% of this amount by fly ash could dramatically reduce global carbon emissions.

Embankment

Fly ash properties are somewhat unique as an engineering material. Unlike typical soils used for embankment construction, fly ash has a large uniformity coefficient consisting of silt-sized particles. Engineering properties that will affect fly ash's use in embankments include grain size

distribution, compaction characteristics, shear strength, compressibility, permeability, and frost susceptibility.

Soil stabilization

Soil stabilization involves the addition of fly ash to improve the engineering performance of a soil. This is typically used for a soft, clayey subgrade beneath a road that will experience many repeated loadings.

Asphalt concrete

Asphalt concrete is a composite material consisting of an asphalt binder and mineral aggregate. Fly ash can typically be used as a mineral filler to fill the voids and provide contact points between larger aggregate particles in asphalt concrete mixes. This application is used in conjunction, or as a replacement for, other binders (such as Portland cement or hydrated lime). For use in apshalt pavement, the fly ash must meet mineral filler specifications outlined in ASTM D242. The hydrophobic nature of fly ash gives pavements better resistance to stripping. Fly ash has also been shown to increase the stiffness of the asphalt matrix, improving rutting resistance and increasing mix durability.

Geopolymers

More recently, fly ash has been used as a component in geopolymers, where the reactivity of the fly ash glasses is used to generate a binder comparable to a hydrated Portland cement in appearance and properties, but with dramatically reduced CO2 emissions.

Roller compacted concrete

Another new application is using fly ash in roller compacted concrete dams.

Bricks

Ash bricks have been used in house construction in Windhoek, Namibia since the 1970's. There is, however, a problem with the bricks in that they tend to fail or produce unsightly pop-outs. This happens when the bricks come into contact with moisture and a chemical reaction occurs causing the bricks to expand. New technologies are going to be explored in order to make the process more environmental friendly.

a. Environmental problems

Fly ash, like soil, contains trace concentrations of many heavy metals that are known to be detrimental to health in sufficient quantities. These include nickel, vanadium, arsenic, beryllium, cadmium, barium, chromium, copper, molybdenum, zinc, lead, selenium, uranium, thorium, and radium. Though these elements are found in extremely low concentrations in fly ash, their mere presence has prompted some to sound alarm.

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
05 GR IHCR 0C39	Utilisation of industrial by-products and industrial wastes for manufacturing of new ceramic products	A Greek technological development company	Greece
06 NL NLSE 0GCS	Technology for processing fly-ash and industrial residues into useful end products	A Dutch company	The Netherlands
07 DE DSBT 0J3H	Baking bricks with high thermal insulation	A german Institute	Germany

35.3 TR 3: Low cost technologies for the retention of fly ash

BBS code : *07 GR IHND 0IEW*

Comments about BAT

During combustion processes, solid waste may be generated. Such solid waste is typically called "ashes" Two types are usually present; one called "bottom ash, typically recovered at the bottom of the combustion chamber and another called "fly ash" that is smaller and flows with the combustion fumes. This latter one is usually recovered with flue-gas cleaning equipment. Such flue-gas cleaning equipment is not only applicable to fly ash but also to extract from the other pollutants flue-gas. In doing so, different types of waste can be generated. Combustion ashes and flue-gas cleaning residues are one of the main waste stream treated by stabilisation and solidification processes, either in the combustion plant (e.g. in some incinerators), or on waste treatment facilities. Other methods are vitrification, purification and recycling of some components (e.g. salts). Another method for treating combustion ashes involves the fusion of ash by plasma at very high temperature in order to vitrify the structure. One installation exists in France with a total treatment capacity of 3.5kt per year.

For dedusting off-gases from coal combustion plants, BAT is considered to be the use of electrostatic precipitator (EPS) or a fabric filter, where fabric filter archives normally emission levels well below 5 mg/Nm^3. Furthermore, the best levels of Hg control are generally achieved by emission control systems that use fabric filters. Cyclones and mechanical collectors alone are not BAT, but they can be used as a pre-cleaning stage in flue-gas path.

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
07 AT ATBI 0H5V	Innovative process and device	An Austrian university institute in	Austria

	for the treatment of fly ash for instant usability in the concrete industry	cooperation with an Austrian operator of power plants	

35.4 TR 4: Suitable technologies for energy recovery from wastes

BBS code : *07 GR IHND 0IEX*

Comments about BAT

For the preparation of waste to be used as fuel, BAT is to:

1) try to have a close relationship with the waste fuel user in order that a proper transfer of the knowledge of the waste fuel composition is carried out;
2) have a quality assurance system to guarantee the characteristic of the waste fuel produced;
3) manufacture different type of waste fuels according to the type of user (e.g. cement kilns, different power plants), to the type of furnace (e.g. grate firing, blow feeding) and to the type of waste used to manufacture the waste (e.g. hazardous waste, municipal solid waste);
4) when producing waste fuel from hazardous waste, use activated carbon treatment for low contaminated water and thermal treatment for highly polluted water;
5) when producing waste fuel from hazardous waste, ensure correct follow up of the rules concerning electrostatic and flammability hazards for safey reasons.

For the preparation of solid waste fuels from non-hazardous wastes, BAT is to:

1) visually inspect the incoming waste to sort out the bulky metallic and non-metallic parts. The purpose is to protect the plant against mechanical destruction;
2) use magnetic ferrous and non-ferrous metal separators. The purpose is to protect the pelletisers as well as fulfill the requirements of the final users;
3) make use of the NIR (near infra-red) technique for the sorting out of plastics. The purpose is the reduction of organic chlorine and some metals which are part of the plastics;
4) use a combination of shredder systems and pelletisers suitable for the preparation of the specific size waste fuel.

For the preparation of solid waste fuel from hazardous waste, BAT is to:

1) consider emissions and flammability hazards in case a drying or heating operation is required;
2) consider carrying out the mixing and blending operations in closed areas with appropriate atmosphere control systems;
3) use bags filters for the abatement of particulates.

For the preparation of liquid waste fuels from hazardous waste, BAT is to:

1) use heat-exchange units external to the vessel if heating of the liquid fuel is required;

adapt the suspended solid content to ensure the homogeneity of the liquid fuel.

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
06 AT ATCA 0FAS	Low Temperature Conversion (LTC) - a revolutionary energy and fuel production process from organic wastes, biomass or brown coal	An Austrian SME	IRC Austria (Bernhard Jauch)

35.5 TR 5: Production of innovative solar energy systems for heating and cooling applications

BBS code : *07 GR IHND 0IEZ*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
05 GB EAST 0BT3	Innovative solar technology combining power, heat and cooling systems	A UK-based company	East of England IRC
05 FR FMCP 0DGW	Solar-air-type collector for secondary homes	A French SME specialised in renewable energies	
06 DE NDAT 0EHM	Natural power unit combines wind and sun energy	A small German company	

06 PT PTIE 0EWE	Innovative solar thermal system using building louvre shading devices	A Portuguese university	
07 IL ILMI 0HNQ	New solar energy system for hot water	A well known Israeli manufacturer in the solar energy industry	
07 IT IRCT 0HBR	An Italian SME operating in electrical engineering. and photovoltaics	Solar tracking system for rooftops and ground mounting	
05 ES SSIT 0D2S	A Spanish company from the Canary Islands	Two-axis solar tracking systems for solar energy applications (thermal and photovoltaic solar energy)	

35.6 TR 6: Development and establishment of a factory for the design and manufacture of small wind turbines (power range 1 kW to 5 kW)

BBS code : *07 GR IHND 0IF0*

Comments about BAT

Not available

List of Technology Offers (TOs) from BBS Database

BBS code	Title	Enterprise	IRC
06 DE NDAT 0EHM	Natural power unit combines wind and sun energy	A small German Company	
06 NL NLSY 0FFB	Soundless and high-output Venturi wind turbine technology for urban areas	A small Dutch company	

36. List of providers

Enterprise	Mission	Contacts
Accomandita Tecnologie Speciali Energia s.p.a	Solar technologies	via s.Giuseppe 19, 43039 Salsomaggiore Terme (Pr) tel. 0524.523668 0524.522145 www.accomandita.com infosolare@accomandita.com IRC IRENE (Bologna)
Alternative Advanced Energy	Solar energy and biomass	Torre San Giorgio (CN) tel. 0172.912392 fax 0172.96122 www.alternativeadvancedenergy.it info@aae-italia.it IRC ALPS
AltrEnergie p.s.c.a.r.l.	Energy saving and RES use	via Messina 37, 09126 Cagliari tel. 070.304644 segreteria 368.7684995 fax 178.6038644 www.altrenergie.it info@altrenergie.it IRC CIRCE - Sardegna
Asja.biz	RES and clean energy	Via Ivrea 70, 10098 Rivoli (TO) tel. +39.011.9579211 fax +39.011.9579241 www.asja.biz info@asja.biz; amm@asja.biz IRC ALPS
A.S.T. Area Servizi Termologici	Solar thermal and RES plants installation	Via Erbosa 76, 59100 Prato (PO) tel. 0574.433285 fax 0574.433285 www.astprato.com areabioclima@ticali.it IRC RECITAL
B & B Hydra Solar s.r.l.	Hydraulic and solar technologies	Via B. Buozzi 16, 46036 Revere (Mn) tel. 0386.467310-1 ; fax 0386.847335 www.bebhydrasolar.com IRC LOMBARDIA
Bonazzi s.r.l.	RES (solar thermal, PV)	Via del commercio 2, 26026 Pizzighettone (Cr) tel. 0372.744612 fax 0372.730363 www.bonazzisrl.com info@bonazzisrl.com IRC LOMBARDIA
Eliosistemi	Aeolian energy	Via Appia Nuova 669, 00179 Roma tel. 06.7811759 fax 06.78395197 cell. 337.802536 (ing. Giorgio Piccinetti) IRC CIRCE
ESA Energia Solare	RES (solar thermal,	via Cellina 1, 33080 Porcia (Pn) tel. 0434.923202 fax 0434.590991

Applicata s.r.l.	PV)	www.esaenergie.it info@esaenergie.it IRC IRENE
Esatermo s.r.l.	RES (solar thermal, PV) and eolia energy	C.da Fortugno km.2, 97100 Ragusa tel. 0932.667061 fax 0932.667468 www.esatermo.it IRC MEDIA
E.S.I. Energia da Sistemi Integrati	Project and realize RES plants	Piazza del principe 4, 16126 Genova tel. 010.8685751 010.8685780 fax 010.8631606 info@esi-italia.com www.esi-italia-com IRC ALPS
Fabersol	Renewable energies	via della Lastruccia 5 (ex via de' Trebbi), Prato tel. 338.2564605 www.fabersol.it info@fabersol.it IRC RECITAL
Gaia Energy	Renewable, PV and aeolian energy	via Borsellino 116, 80025 Casandrino (Na) tel. 081.5056412 081.8334510 081.13073556 fax 081.3958265 081.5052912 www.gaiaenergy.it info@gaiaenergy.it IRC IRIDE
G-tek	Renewable energy plant and dispositives	via G.Puccini 10, 41012 Carpi (Mo) tel. 059.687214 fax 059.689491 www.sole.gtek.it gtek@gtek.it IRC IRENE (Bologna)
Gimar di Maria Rosa Morrone	Solar panels	via Roma 48, Nocera Inferiore (Sa) tel. 081.925020 fax 081.920726 IRC IRIDE
Green Solar s.r.l.	Renewable energies	Via C.Colombo 10, int. 3, 44044 Cassana (Fe) tel. 0532.769722 cell. 347.2249858 fax 0532.711000 www.greensolar.it greensolar@greensolar.it IRC IRENE (Bologna)
Heliant s.r.l.	Thermal energy, PV and solar energy	via Orvieto, 19 (Vitali Park) - Torino (TO) tel 011 2166697 fax 011 2217818 www.heliant.it raffaele@heliant.it (Raffaele Vavalà) marco@heliant.it (Marco Vavalà) IRC ALPS
Idrocentro	Plumbing products,	Tang. Torino, uscita La Loggia, ss per Saluzzo km.

	water treatment, alternative energy	29, Torre San Giorgio (CN) tel. 0172.9121 fax 0172.96075 www.idrocentro.com info@idrocentro.com cussino@idrocentro.com IRC ALPS
Kloben sas	Solar panel and heating systems	Turco Group S.r.l. - Via dell'Artigianato, 58 - Bovolone 37051 Verona (Italy) Tel. +39 045 7971966 e-mail: info@kloben.it www.kloben.it info@kloben.it IRC IRENE - Veneto
La Combustione	Heating, solar energy systems, water treatment, geotermal energy	via Raffaello 21, 31021 Mogliano Veneto (Tv) tel. 041.5937025 fax 041.5971234 www.lacombustione.it info@lacombustione.it IRC IRENE (Veneto)
Reseda onlus	Ecology, RES, environmental protection	via Lombardia 19, 00045 Genzano di Roma (Rm) - Italy tel. 06.9364170 fax 06.9364170 www.resedaweb.org segreteria@resedaweb.org IRC CIRCE
Rizzi Energy s.p.a.	Systems for energy saving, heat recovery	via Nespolo 6, 25030 Adro (fraz. Torbiato) (BS) tel. 030.7356336 030.7356761 030.7450551 fax 030.7450547 www.rizzienergy.com rizzi@rizzienergy.com IRC LOMBARDIA
Rossato Group	Heating systems and solar thermal plants	via Napoli 50/52, 04014 Pontinia (Lt) tel. 0773.848778 fax 0773.844051 www.rossatogroup.com info@rossatogroup.com IRC CIRCE
Sakeo Changed name in: Espe Srl	Electric plants, renewable energy plant and technologies	Via Cappello, 12a 35010 San Pietro in Gu' (PD) –I TALY Tel +39 049 945 50 33 Fax +39 049 045 50 22 E-mail: espe@espe.it Web: www.espegroup.eu IRC IRENE – Veneto
S.E.R. Sistemi Energie Rinnovabili	Renewable energy	via Ungaretti 4, 24040 Casirate d'Adda (Bg) tel. 0363.700515 fax 0363.957125 www.s-e-r.it info@s-e-r.it

		IRC LOMBARDIA
S.E.S.A. s.p.a.	Clean energy, waste treatment, depuration and waste mangement plants	Società Estense Servizi Ambientali via Comuna snc, 35042 Este (PD) via Principe Amedeo 43/A, 35042 Este (PD) tel. 0429.612711 fax 0429.612748 www.sesaeste.it info@sesaeste.it IRC IRENE
Solarwall		Via vittime del Vajont 6, 10024 Moncalieri (To) tel. 011.6474551 fax. 011.6470912 www.solarwall.it info@solarwall.it IRC ALPS
Soltek s.r.l.	Solar heating systems, solar collectors	via Ferrovia 2, 84083 Castel San Giorgio (Sa) tel. 081.9536029 cell. 339.2013225 fax 081.9536029 www.soltek.it info@soltek.it IRC IRIDE
Sunerg Solar s.r.l.c	Aeolian, PV and solar thermal enrgies	via Donnini 51, loc. Cinquemiglia, Città di Castello (Pg) tel. 075.854327 075.8540018 fax 075.8648105 www.sunergsolar.com IRC RECITAL
Sunservice s.a.s	Project, production and installation of solar, PV and aeolian systems (panels, generators, etc.)	zona industriale Predda Niedda sud str. 11, 07100 Sassari tel. 079.260040 fax 079.2678268 www.sunservice.biz deborah@sunservice.biz (Deborah Palmas) IRC CIRCE (Sardegna)
Suntek srl	Soar and renewable energy plants	Via delle fabbriche 2, 39031 Brunico (Bz) tel. 0474.556022 fax 0474.556024 www.suntek.it info@suntek.it IRC IRENE – Veneto
Technosolar s.n.c. di Antonino Calarco & C.	Aeolian, PV and solar thermal enrgies	Via 1°maggio 19, 46030 San Giorgio da Mantova (MN) tel. 0376.271711 fax 0376.270435 www.tecnosolar-energia.it tecnosolar@tecnosolar-energia.it IRC LOMBARDIA
Teleriscaldamento Cogenerazione Valtellina Valchiavenna Valcamonica s.p.a.	Thermal heating, electricity plant, clean and renewable energy plant and systems	via Polveriera 50, Tirano (So) www.teleriscaldamento.valtline.it wrighini@tcvvv.it (Walter Righini) IRC LOMBARDIA

Terra Solar technology	Solar and PV systems and acessories	tel. 06.90281490 fax 333.5095296 www.terrasolartek.com terrainforma@terrasolartek.com info@terrasolartek.com IRC CIRCE
Thermomax	Solar collectors, solar thermal plants	via Santa Vecchia 71/a, 23868 Valmadrera (Lc) tel. 0341.551855 fax 0341.551854 www.thermomax.it thermomax@thermomax.it IRC LOMBARDIA
Velux Italia spa	Solar thermal and energy saving systems	via Strà 152, 37030 Colognola ai Colli (Vr) tel. 045.6173666 fax 045.6150750 www.velux.it IRC IRENE - Veneto