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Appraisal for options of solid recovered fuel (SRF) utilisation within the UK

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Abstract

In view of the rising prices of non-renewable fossil fuels and regulatory obligations affecting waste management, interest is growing for the use of waste derived fuels in energy intensive facilities in Europe. However, major concerns with the use of such fuels include the quality of fuels, its source of generation, gaseous emissions and public acceptability. This paper presents the various production methods for solid recovered fuels (SRF) from municipal solid waste (MSW) and the potential options for its use in the UK.

SRF can be produced by mechanical biological treatment (MBT) methods using bio-drying process or by extensive mechanical treatment. MBT involves a series of mechanical and biological steps, depending upon the input waste properties, aimed at producing an SRF. SRF compositions vary according to the application and can comprise of paper, plastic, wood, textile and organics. The European Technical Committee CEN/TC 343 “Solid Recovered Fuels” classifies SRF on the basis of net calorific value (NCV), chlorine content and mercury content. This classification system was prepared after extensive consultation with end-users.

In the UK, the main potential outlets for MSW derived SRF include cement kilns, power plants, industrial boilers (such as pulp and paper mill), dedicated SRF incineration facilities and advanced thermal treatment plants (such as gasification and

pyrolysis). Cement kiln operators prefer high NCV fuel, however, in spite of its lower CV in comparison to other waste derived fuels (like liquid solvents, tyres and MBM), it remains attractive due to its biomass fraction and cheap availability. Power plants are much more concerned with the biomass fraction, as it may bring revenues for them in the form of Renewable Obligation Certificates (ROCs). Similarly, gasification and pyrolysis techniques are also eligible for ROCs, but these are still not fully proven in the UK. The use of SRF is also of interest because of its potential to reduce greenhouse gas emissions, as the biomass rich fraction is considered 'carbon neutral'. Thus, this assists energy facilities to meet the EU Emissions Trading Scheme targets. However, the application of SRF is not straightforward as legislation exists at EU and National level, which users need to comply with. In addition, technical, environmental and economic issues need to be addressed. On the other hand if more SRF can be used then this will greatly help the UK meet its obligations under the Landfill Directive and the mitigation of greenhouse gases.

1. Introduction

There is wide debate in the UK around the use of solid recovered fuels and the benefits these offer in contrast to mass burn incineration and other forms of municipal waste treatment. On the one hand it is argued that it is unnecessary and costly to manufacture SRF whilst others argue that the MBT processes being used to create SRF are flexible systems that will not impact upon aims to recycle.

The debate largely though rests in the EU where until SRF is acknowledged as a product in its own right (or is regulated like any other fuel in terms of emissions etc) and its use is deemed a recovery operation will the power sector and other industrial users look seriously at its use and create a significant demand.

2. Drivers

There are a complex range of factors influencing the use of SRF in the UK many common to the European experience and these are in the process of evolving as policy and the economic environment change. In particular the EU considers that SRF manufactured to a specification still remains a waste (and therefore has to be regulated as such) despite the fact that many have argued it should be defined as a recovery operation and treated more like a natural fuel. Indeed this is perhaps one of the drivers behind the creation of an EU standard for SRF (CEN 343), which aims to establish a quality procedure for its specification and testing; in effect demonstrating that it can be consistently manufactured to a specification resembling raw fuels.

For the users of SRF factors such as the Waste Incineration Directive (as SRF remains a waste) (2000/76/EC), the EU Emissions Trading Scheme (Defra, 2003), and the Large Combustion Plant Directive (2001/80/EC) place both an incentive and barrier to its use in terms of the regulatory controls and costs they impose on the user and the financial benefits these fuels provide in terms of negative gate fees, substitution of fossil fuels and mitigation of greenhouse gas emissions due to their biomass content.

Further regulations under the Integrated Pollution Prevention and Control permitting scheme (1996/61/EC) also apply and more specifically the UK Environment Agency has specific guidance for industry know as the Substitute Fuels Protocol (.

However, at present one of the most pressing demands for SRF outlets in the UK comes from the waste management sector, the suppliers, as they search for technologies to divert organic wastes from landfill (one of which is MBT with SRF production –see later) and meet the Landfill Directive (1999/31/EC). The UK has historically had a higher dependence on landfill for disposal than some states in the EU largely due to its low cost; but this now has to change as the consequences for Local Authorities who don't meet the landfill diversion targets are severe; apart from the rising cost of landfill (due to tax and increasing regulatory operating costs) the Government in England (Scotland and Wales have adopted a different approach) intends to impose a fine of £150 (€210) per tonne for any biodegradable municipal waste (BMW) landfilled over the allotted allowances (it is assumed by DEFRA in England that MSW contains 68% organic content). Whilst an internal market for trading allowances has been created in England so that Authorities with excess allowances can sell these to Authorities with insufficient allowances there is still a price to be paid. Indeed the overall cost of treatment in the UK is set to rise rapidly by at least 2 to 3 times the current rates for landfill.

The critical target dates arise in 2010, 2013 and 2020, when landfilled quantities have to reduce to 75%, 50% and 35% of there 1995 levels. This represents

5, 9 and 12 million tonnes of MSW (at 3% waste growth and 3% recycling growth). Whilst recycling is increasing in the UK (2005>25%) and contributing to the diversion practically all Local Authorities will have to procure waste treatment technologies after 2010 to meet these targets.

By and large the approach taken in the UK is to source long term contracts for waste treatment of between 20 and 30 years often financed through debt with banks, some of which is under written by the Government through the Private Finance Initiative (PFI); effectively project finance. These types of contract however work on the premise that a high proportion of risk is transferred to the private sector including the responsibility for finding outlets for SRF for the duration of the contract. And with current prices high and limited scope for long term contracts this represents a risk that few are prepared or able to take.

In addition to these factors are macro issues, perhaps the most important being the continuing rising cost of fossil fuels making SRF more attractive and the broader debate over climate change and its cost implications. Linked to this is the rising demand for renewable energy, which attracts green energy certificates (renewable obligation certificates (ROCs) that have a value higher than the pool price for electricity) and assists industry to mitigate greenhouse gas emissions.

As regard technical issues these tend to be regarded as simply the cost of the necessary combustion equipment and its regulatory compliance. Co-combustion perhaps represents the greatest challenger as every facility will be different and require different solutions; however, there will be many advantages as much of the infrastructure (generators, transmission lines etc) will be in place. This is also one of the benefits of the CEN standard as this guarantees a fuel with consistent physical and chemical properties; previously this was not always the case.

Finally, in terms of the wider debate on waste management, materials recovery and recycling is the overall public and political sensitivity of facilities utilising waste as a fuel, often lumped together as incineration; this is perhaps the most significant obstacle facing developers as planning and permitting times for energy from waste facilities (EfW) can be lengthy (over 5 years) and for Local Authorities this means that they may well face LATS fines. Mass burn incineration whilst well proven has a tarnished reputation and is the least popular waste treatment option despite some efforts by Government to influence public opinion in its favour. The prospect of using SRF in a wider range of facilities has however not yet been fully tested and the debate in terms of quality, health impacts, substitution of fossil fuels and costs is only just beginning. Indeed there is some indication of support within the Governments recently published Energy Review and it is expected there will be further comment when the new Waste Strategy for the UK is published. Experience suggests however that this will be inconclusive until the EU position on the definition of SRF becomes unambiguous.

3. SRF Production

Because of the above at present there is a low level of SRF production in the UK compared to other industrialised countries in the EU although the potential is significant given the implications of the Landfill Directive as described above; production capacity is perhaps less than 500,000 tpa currently. The potential however is far larger perhaps several million tonnes[1] but until there is sensible alignment between Energy and Waste policy (supply and demand) this remains problematic.

[1] Institute of Civil Engineers (Full Reference?)

Nevertheless, there is a growing interest in the technology needed to produce SRF and MBT in various configurations is being widely promoted. This is due to several reasons including its ability to gain planning permission relatively easily compared to EfW and more recently because the biological processes can be targeted to remove BMW from the MSW (either through biostabilisation of biogas production) rather than just producing a SRF (albeit the residues need to be landfilled as there are only limited applications for use in land restoration).

The aerobic drying systems with either post or pre sorting to remove recyclable materials and contamination are the most common although some systems adopt anaerobic treatment as their biological step, producing SRF from the drier oversize fraction generated at the pre-treatment stage. Several autoclave suppliers also claim the ability to generate SRF.

The ability of these processes to penetrate the market is hampered, however, by the lack of SRF outlets and the risk that they will not materialise as described above.

In terms of fuel quality an increasing number of users are demanding SRF to the CEN 343 standard together with their own site specific requirements for SRF in terms of physical and chemical properties. As many of the MBT manufacturers are EU based this is not something that represents a new challenge but the composition of the incoming waste and the efficiency of the biological treatment (biodrying) and SRF refinement will have an impact upon the quality of the final product, its yield and production costs; with lower heating value, chlorine, ash, moisture, heavy metals and biomass content being the main factors.

4. SRF Outlets

Similarly to the EU potential outlets for SRF use include power generation either through co-firing or dedicated EfW facilities, industrial users who have a high demand for either heat or electricity and more immediately the cement industry.

The cement industry in the UK ranks around 6th in the EU in terms of consumption at around 13 million tonnes per year. It has only recently considered the use for SRF from residual MSW but there is a growing interest together with other substitute fuels including tyres, solvents, sewage sludge pellets and meat and bone meal.

It is estimated that the industries appetite for SRF is between 300,000 and 500,000 tonnes per annum but this depends upon the availability and cost of other fuels compared to SRF and the limits placed upon them by the Secondary Fuels Protocol.

At present there are only limited amounts of SRF generated from MSW utilised (it mainly arises from commercial waste) in the cement sector but again this is forecast to rise in the near future. Indeed projects have been revealed by Shanks ELWA to send SRF from their plant in East London to SRM, a subsidiary of Castle cement and Hills/Entsorga in Wiltshire to the Lafarge cement works at Westbury.

There are a wide variety of opportunities in other sectors with power offering the largest market either as stand alone EfW plants or co-combustion in coal fired power stations.

However, again because of the limitations identified above there is only limited use. Indeed at present there are probably no examples of co-firing SRF and only one or two examples of stand alone boilers; for example Slough Estates generate an SRF but this is largely derived from commercial waste.

There are potentially a number of projects in the pipe line, one innovative one in particular, a gasification plant by Novera which will take SRF from the Shanks ELWA facility and generate renewable electricity for Fords. If this proves successful it will potentially open the market for similar schemes across the country.

There is also now a lot of discussion with other industrial users as energy prices increase and limitation on greenhouse gas emissions are imposed. However, these tend to be commercially sensitive and therefore little is reported in the literature of their progress.

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