

# Promotion of innovative energy technologies in the glass industry by the European Commission<sup>1)</sup>

Werner Bahm

Fachinformationszentrum Karlsruhe GmbH, Karlsruhe (Germany)

## 1. Introduction

The energy consumption in Europe is steadily increasing in industrial, transport, domestic and tertiary sectors. This growing demand constitutes a challenge requiring all-European measures. The European Union, on the one hand, imports some 50% of its energy demand and, on the other hand, exports equipment and services in the energy sector, thus, increasing its economic capabilities and the balance of payments.

The recent United Nations' Climate Conference in Berlin (Germany) has demonstrated the importance of the protection of the environment and the difficulties to achieve international agreements, in particular between industrialized and developing countries. CO<sub>2</sub>, SO<sub>2</sub> and NO<sub>x</sub> emissions being linked to the provision and consumption of energy pollute the environment in a way which in the long term will lead to severe worldwide consequences.

New and innovative energy technologies can essentially contribute to master these challenges. The THERMIE programme of the European Commission, Directorate General for Energy (DG XVII), aimed at the promotion of efficient and environmentally sound energy technologies plays an important role in this connection. In order to achieve its objectives THERMIE focuses essentially on three types of activities:

- a) financial support for energy technology projects,
- b) associated measures such as seminars, workshops, studies and brochures,
- c) co-ordination between national and European actions.

In the time span of 1991 to 1994 a total of 700 mill. ECU was attributed to demonstration projects and associated measures on the areas

- rational use of energy in the sectors industry, buildings and transport;
- renewable energies such as wind, solar, biomass, geothermic etc.;
- solid fuel;
- hydrocarbons.

Depending on the type of project, be it innovative which means that it is the first application of a technology, or be it disseminating which means that it has already been put into practise but under different technological and economic conditions, up to 40% of the eligible project cost can be contributed through the THERMIE programme.

For the execution of associated measures the OPET-network (Organizations for the Promotion of Energy Technologies) was put into operation comprising 49 public and private organizations all over the European Union. Since 1991 this network has been represented in Central and East European countries by 14 so-called European Energy Centres. The main tasks of the OPET are the evaluation of market potentials for individual energy technologies, the co-management of projects sponsored by the European Union, the dissemination of information on energy technologies and project results, the promotion of cooperation with national, regional and local organizations in their respective countries and the industrial cooperation with countries outside the EU.

## 2. THERMIE activities in the glass industry sector

The annual production of glass manufacturers in the European Union (EU12) is some 23 mill. t (numbers for EU15 are not available yet) equivalent to a turnover of some 20 billion ECU. The energy consumption of 5500 Mtoe ( $\approx$  230 PJ; Mtoe = Mt oil equivalent) is equal to 0.5% of the total energy consumption of the European Union. Depending on the glass product, energy represents between 15 and 25% of the total production costs, which means that there is an economic as well as an environmental incentive to save energy through the invention of efficient technologies.

### 2.1. Demonstration projects

In the framework of the THERMIE programme eleven projects were approved by the European Commission, all of them aimed at the improvement of energy efficiency and the reduction of emissions. A list is presented in table 1. The potential energy savings to be achieved

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Table 1. Projects related to the glass industry sector and promoted by the European Commission, Directorate General for Energy (DG XVII)

project number <sup>2)</sup>	project leader <sup>2)</sup>	project title <sup>2)</sup>
IN/76/90	IR-UK	Improved energy efficiency of large scale reciprocating compressor plant by air intake cooling and optimum pressure bail
SE/109/90	DK	Glass shelter of courtyard, other solar energy and energy-saving measures
IN/105/91	ES	Regenerative burners novel application: glass refiners
IN/90/91	PO	Low-emission, low-cost melting tank for superior lead crystal
BM/168/92	FR	End-use of landfill gas for glass house heating
IN/63/92	DE	Continuous drying and preheating of feed material for a glass melting furnace with heat from exhaust gases
IN/64/92	IT	Radiant self-recovering tubes furnace for glass tempering
IN/8/92	FR	New corrugated checkers and double regeneration on a glass melting furnace
INn/301/93	UK	Vertical glass melter
IN/470/93	NL	Energy saving by introduction of eco-raw material, upgraded from old picture tube glass in the production of cone glass
SE/104/93	NL	Glass roof integrated PV system at the national environmental education center "De Kleine Aarde" in Bostel

<sup>2)</sup> Original designations under which the individual projects are entered in the CORDIS Data Base of the European Commission.

by these projects range up to 40%, and considerable reduction of harmful emissions such as SO<sub>2</sub>, NO<sub>x</sub> and CO<sub>2</sub> is expected to be achieved. A few of the projects are already finalized, but the majority is still going on. In one case only a failure due to technical problems has been reported.

The total financial support for all of these projects amounts to some 3.7 mill. ECU. More information on the specific objectives and on the current status may be obtained from the European Commission, Directorate General for Energy (DG XVII).

### 2.2. Associated measures

Considerable emphasis has been placed on the dissemination of information relating to efficient energy technologies for the glass melting process and the means of reduction and controlling of emissions. In order to ensure that the information requirements of the glass industry are accommodated, in particular those of small

and medium enterprises, the THERMIE Glass Marketing Group has been created. It comprises representatives of the European Commission, Directorate General for Energy (DG XVII); CPIV (Comité Permanent des Industries du Verre); OPET; and glass experts from several member countries.

The first step involved the creation of an inventory of European efficient technologies in the glass production process comprising the following actions:

a) a European seminar on "New Technologies for the Rational Use of Energy in the Glass Industry", February 4 to 6, 1992, Wiesbaden (Germany), organized by the Fachinformationszentrum (FIZ) Karlsruhe and the German Society of Glass Technology (DGG) which gathered more than 200 experts from 18 countries and proved to be an effective tool for the presentation and exchange of information [1];

b) a study on "Energy Technology in the Glass Industry Sector", prepared by the Energy Technology Support Unit (ETSU) of the Atomic Energy Agency (AEA), Harwell (Great Britain), providing a survey of current energy technology and an assessment of future trends in the glass industry throughout the European Union. The essential technical chapter of this study has been translated from English into French, German, Italian and Spanish [2].

The next step focused on the small and medium enterprises and involved four actions dealing with various aspects of energy efficiency in the glass melting process plus measurement and control of emissions:

- a regional workshop on "Energy and Environmentally Sound Glass Melting Processes", June 25, 1993, Venice (Italy), organized by FIZ Karlsruhe and Stazione Sperimentale del Vetro, Murano [3];
- a regional workshop on "Energy Management in Small and Medium Glass Fabrication Plants", May 26 to 27, 1994, Rouen (France), organized by FIZ Karlsruhe, the Technical Committee 23 of the International Commission on Glass (ICG) and L'Agence de l'Environnement et la Maîtrise de l'Énergie (ADEME), represented by Mr. Métayer (consultant);
- a study on "Efficient Energy Technologies in Domestic Glass Production", elaborated by the Fraunhofer Institute for Systems Analysis and Innovation Research, ETSU, and FIZ Karlsruhe [4];
- the THERMIE newsletter related to the glass industry sector, prepared by the OPET EUROPLAN and advised by the THERMIE Glass Marketing Group [5].

In connection with information transfer to Central and East European countries two workshops and one training course were organized:

- a workshop on "Rational Use of Energy in Glass Melting Processes", May 12 to 14, 1993 Gus'-Hrustal'ny (Russia), organized by FIZ Karlsruhe, the Technical Committee 23 of the International Commission on Glass (ICG), and the Russian Glass Society [6];

- a workshop on "Energy Efficient and Environmentally Sound Technologies for Glass Melting Processes", September 27 to 29, 1993, Lazne Sedmihorky (Czech Republic), organized by FIZ Karlsruhe, the German Society of Glass Technology (DGG), and the Czech Glass Society;
- a training course on "Measuring Methods for the Determination of Energy Balances and Emissions", September 3 to 16, 1994, The Netherlands and Germany, organized by TNO, Institute for Applied Physics (The Netherlands), the German Society of Glass Technology (DGG), Stazione Sperimentale del Vetro (Italy) and FIZ Karlsruhe. A group of eight selected Russian glass experts from the Russian glass industry and professional organizations were trained on measurement methods on site in Dutch and German glass production plants.

In the third step the field of activities has been enlarged beyond the glass production process by considering the use of the glass product itself, i.e., windows, as a measure of energy conservation. In this context a study is being elaborated in cooperation of CPIV and FIZ Karlsruhe on "Major Energy Savings, Environmental and Employment Benefits by Double-Glazing and Advanced Double-Glazing Technologies". The main target of this study is to investigate the potential of energy saving and reduction of CO<sub>2</sub> emissions by the use of advanced glazing in buildings and to analyze the employment effect achievable by a long-term programme of window upgrading. It will be available by October 1995.

### 3. The Fourth Framework Programme of the European Union for Research and Technological Development

With the approval of the Fourth Framework Programme the European Commission has made a further step versus the necessary integration of research, development and demonstration of innovative technologies, systems and products. It continues the priorities of the research policy of the European Union up to 1998 and has been assigned a total budget of 12 to 13 billion ECU to be used for research, development and demonstration projects, cooperation with countries outside the EU, dissemination of achieved results, education and mobility of research personnel. The programme part "Non-nuclear Energies" comprises R&D-programmes (JOULE) and demonstration programmes (THERMIE) as well as associated measures which up to now have been executed by the OPET network. A total budget of some 1 billion ECU has been approved for the JOULE-THERMIE programme.

The area "Rational Use of Energy in the Industry" of the THERMIE Type A Actions (demonstration projects) is subdivided as follows [7]:

a) Efficient use of energy in the industry. For energy-intensive industrial sectors such as the glass industry the following priorities have been determined:

- improvement of melting and firing furnaces, including new design and/or incorporating the most advanced technologies for burning and operation;
- use of advanced heat exchangers and high-temperature insulation materials;
- most energy-efficient shaping, casting, forming and coating technologies, reducing the production of waste materials;
- new separation and distillation technologies as well as innovative catalysts and improved reactors/furnaces.

b) Reduction of environmental pollution:

- new melting furnaces or improvement of existing plants, incorporating the most advanced technological solutions for recycling of materials;
- new feedstock sorting and selection technologies to improve the quality and quantity of usable wastes;
- new energy recovery technologies using recycled materials, where the environment impact is minimized;
- energy-efficient technologies for the recovery of additives and/or by-products, and also those for the recovery of process water;
- electricity production equipment using waste heat of effluent gases, and incorporating filters and precipitators of new design excluding the use of CFCs (fully halogenated chlorofluorocarbon);
- new schemes for the recovery of materials from effluents, improving the overall energy efficiency.

Accordingly the following THERMIE Type B Actions for the glass industry sector have been envisaged:

a) technical evaluations of

- energy-saving potentials by oxy-fuel firing in small continuous glass furnaces and pot furnaces,
- use of pelletized raw materials in small and medium enterprises for the reduction of energy consumption and emissions,
- new energy-efficient pot furnace designs and semi-continuous pot furnaces;

b) assessment of energy-saving technologies in the glass industry;

c) follow-up investigations of the study on benefits of double-glazing and advanced double-glazing.

The first deadline for the submission of THERMIE Type A proposals was the 24 March 1995. The next call for proposals is expected in autumn 1995. Applications for the THERMIE Type B Actions can be put forward to the Directorate General for Energy (DG XVII), at any time until end of 1997.

Due to the limited available budget and the fact that the glass industry sector is only one of eleven industrial sectors to be considered only part of the mentioned associated measures are likely to be approved. It is anti-

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ipated, however, that the European Commission, Directorate General for Energy (DG XVII), will continue to promote projects and associated measures related to the glass industry sector.

### 4. References

- [1] European Seminar on Improved Technologies for the Rational Use of Energy in the Glass Industry, Wiesbaden (Germany) 1992. Proc. (Available from: Fachinformationszentrum (FIZ) Karlsruhe, P.O. Box 24 65, D-76012 Karlsruhe.)
- [2] Energy Technology Support Unit (ETSU): Energy Technology in the Glass Industry Sector. Final rep. Harwell, Oxfordshire (Great Britain) 1992. (Translations into French, German, Spanish and Italian available from: Fachinformationszentrum (FIZ) Karlsruhe, P.O. Box 24 65, D-76012 Karlsruhe.)
- [3] Commission of the European Communities: Workshop on Energy Efficient and Environmentally Sound Glass Melting Processes, Venice (Italy) 1993. Riv. Stn. Sper. Vetro **24** (1994) no. 5.
- [4] Fraunhofer-Institut für Systemtechnik und Innovationsforschung; Energy Technology Support Unit (ETSU); Fachinformationszentrum (FIZ) Karlsruhe: Energy Efficient Techniques in Domestic Glass Production. Karlsruhe 1994. (Available from: Fachinformationszentrum (FIZ) Karlsruhe, P.O. Box 24 65, D-76012 Karlsruhe.)
- [5] THERMIE Newsletter "Glass Industry Sector" (1994) no. 1.
- [6] Workshop on Rational Use of Energy in the Glass Melting Process, Gus'-Hrustal'ny (Russia) 1993. Proc. (Available from: Fachinformationszentrum (FIZ) Karlsruhe, P.O. Box 24 65, D-76012 Karlsruhe.)
- [7] European Commission, Directorate General for Energy (DG XVII): THERMIE Information Brochure. Ed. 1994/95.

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