Project supported by LIFE EU Programme

H·REII

Heat Recovery in Energy Intensive Industries

www.hreii.eu

Background and objectives

The H-REII - Heat Recovery in Energy Intensive Industries (LIFE08 ENV/IT/000422) project, co-financed by the European Commission's LIFE+ programme, was launched in Brescia in 2008 with the aim of developing a pilot model for an approach to process heat recovery in energy intensive industries based on existing technologies ready for widespread industrial use, and thus helping to promote policy and governance measures to eliminate or reduce the barriers that have in fact obstructed its quick adoption so far.

It is the first Italian pilot project to pursue the aim of mapping the potential for heat recovery from effluents in energy intensive industries using the ORC (Organic Rankine Cycle), with generators sized between 0.5 MWe and 5 MWe.

H-REII springs from the realisation that the main obstacles to the installation of heat recovery systems in energy intensive industries are for the most part not technological but arise from the lack of specific policies, a deficit in training and knowledge of the opportunities available for the various industrial processes, the general reluctance in some industrial sectors to introduce what are seen as non-core technologies into the production process, and problems of accessing the finance required for often huge investments, especially at the present time of deep economic crisis.

Partner

The project partners are the AIB (Associazione Industriale Bresciana - The Industrial Association of Brescia), CSMT (Centro Servizi Multisettoriale e Tecnologico - Multisector and Technological Service Centre), FIRE (Federazione Italiana per l'uso Razionale dell'Energia - Italian Federation for Rational Energy Use), the Province of Brescia and Turboden, the project leader.

clean energy ahead
TURBODEN
A PRATT & WHITNEY POWER SYSTEMS COMPANY

Turboden is a European leader in the production of ORC (Organic Rankine Cycle) turbogenerators for the generation of electricity and cogeneration of electricity and heat from renewable sources such as biomass, geothermal energy, solar thermal electricity and the recovery of waste heat from industrial processes, engines and gas turbines. In 2009 it became part of Pratt & Whitney (a UTC company), world leader in the design, construction and maintenance of aircraft and rocket engines and industrial gas turbines. Today Turboden is part of the Pratt & Whitney Power Systems (PWPS) division, developing ORC solutions for the eneration of electricity from renewable resources (biomass, geothermal energy and solar thermal electricity) and heat recovery all over the world. Turboden currently has about 250 plants in more than 25 countries, with an offering between 200kW and 10MW for standard units and up to 15 MW for customised solutions.

C.S.M.T. GESTIONE
centro servizi multisettoriale e tecnologico

CSMT is a non-profit research and technology transfer centre that promotes cooperation between the worlds of research and industry through a series of activities, including applied technical training, applied research, research projects with European and national funding and the organisation of events and conferences. Its activities are run by a technical staff assisted by university researchers involved in the various project and laboratory operations. Its premises - near the engineering campus of the University of Brescia, with which CSMT works closely - has both heavy and light laboratories in operation. The building also contains several teaching rooms and spaces to accommodate research spin-offs or technological start-ups.

FIRE

FIRE, Federazione Italiana per l'uso Razionale dell'Energia, is an independent, non-profit technical and scientific association founded in 1987 to promote efficient energy use, supporting those working in the field through its institutional activities and the services it provides and promoting the positive evolution of the legal and regulatory framework. FIRE has been running the network of energy managers identified under Italian Law 10/91 on behalf of the Ministry of Economic Development on a not-for-profit basis since 1992, registering their appointment and promoting their role through a variety of initiatives.

Associazione Industriale Bresciana

At over one hundred years old, Associazione Industriale Bresciana (AIB), founded on 14 April 1897, is Italy's oldest industrialists' association. It has more than 1,200 member companies from the local area, employing a total of about 61,000. The Association represents Brescia's industrialists at all levels where the protection of their interests is relevant, both in general and individually. With various operating areas, it offers firms assistance and advice in fields such as industrial relations, personnel management, employment, environmental and safety legislation, advertising and relations with the press, training, education, credit and finance, internationalisation, tax and corporate law, community relations, trademarks, patents and contract law, innovation and energy. Last but not least, thanks to the services offered by its Research Centre the Association is considered an important point of reference for the local business community, through the production of economic surveys on Brescia's manufacturing sector and the publication and processing of statistics on various aspects of the Province's socio-economic conditions.

PROVINCIA DI BRESCIA

The Province of Brescia is the largest in the Lombardy region, 4,784.36 km² in area with a population density of about 264 residents per km², and it constitutes one of Italy's most important industrial districts. The H-REII project has actively involved the Energy department, competent for measures to promote and encourage the use of renewable energy sources and energy saving, and the Environment department, responsible for the issue, renewal and review of Integrated Environmental Authorisations (AIA).

Milestones

The project's main milestones can be summarised as follows:

1 Establishment of a Monitoring Centre involving the project partners and other major stakeholders from industry, local government and the universities, with the aim of discussing heat recovery as a potential measure for implementation in order to increase the energy efficiency and environmental compatibility of industrial processes.

2 Definition and classification of "energy intensive industries" and the drawing-up of a list of companies classifiable as "energy intensive", which were then assigned a compatibility rating on the basis of the feasibility of a heat recovery system (considering parameters such as the presence of heat recovery in internal processes, access to the heat source without procedures which would be invasive for the industrial process, the process's annual operating hours and the technical parameters and quality of the heat source). To conclude, the most promising industrial sectors for installation of heat recovery systems were identified (steel, glass, cement, non-ferrous metals and oil&gas).

3 Performance of preliminary energy audits to test the audit model developed ad hoc for the project, followed by 50 audits in Italy and the same number in Austria ("replicable" approach).

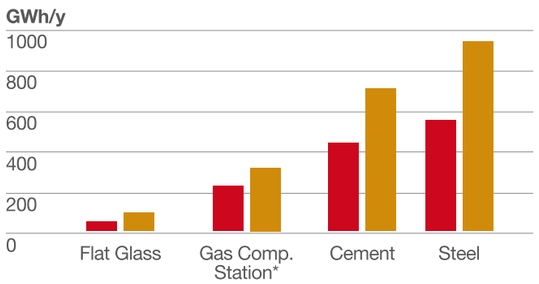
4 Estimate of the potential of the various sectors studied, by extending the potential measured and estimated for one or more firms to an entire industrial sector. This was done with the aid of the emission quotas assigned by the EU-ETS (Emission Trading Scheme), since they are assigned on the basis of each firm's annual output and can thus be considered more or less proportional to its energy consumption. The maximum estimated potential for the sectors studied, which is without doubt an underestimate, is about 2 TWh of electricity produced annually for Italy, corresponding to about 798 kton of avoidable CO_2 per annum.

5 Promotion of heat recovery at the regulatory and policy level, through adoption of the current standards and production of a model for the environmental and energy authorisation process for heat recovery plants, with the aim of bringing uniformity to an unclear, fragmentary regulatory scenario.

6 Proposal of guidelines for amendment of the existing BREFs, with the addition of heat recovery to the BREFs for cement and energy efficiency.

7 An intense promotional campaign to present and raise awareness of the project activities through the Confindustria energy efficiency road show in various Italian provinces, workshops, lectures, working groups, technical and institutional seminars, participation at trade fairs, and articles and papers in the domestic and international general and specialist press.

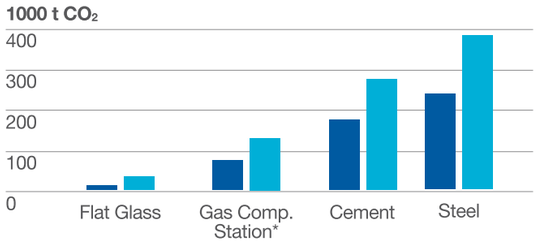
POTENTIAL ENERGY SAVING IN ITALY AT 5000h/year - 8000h/year



GRAPH 1: Potential for energy saving in Italy (in terms of electricity generated, in GWh) in the industries currently being investigated by the H-REII Project. [Source: HREII project database].

* considering only base load stations

POTENTIAL CO_2 EMISSION AVOIDANCE IN ITALY AT 5000h/year - 8000h/year



GRAPH 2: Potential for CO_2 emission avoidance in Italy in the industries currently being investigated by the H-REII Project. [Source: HREII project database].

* considering only base load stations

Italy	At 5000h/year		At 8000h/year	
	Potential Energy Saving [GWh/year]	Potential Emission Avoidance [ktons CO_2]	Potential Energy Saving [GWh/year]	Potential Emission Avoidance [ktons CO_2]
Flat Glass	47	17	76	27
Gas Comp. Station*	220	79	352	126
Cement	423	171	677	274
Steel	572	232	916	371
Total	1.263	499	2.021	798

Table summarising the potential for energy recovery in Italy (in terms of electricity generated, in GWh) and CO_2 emissions which could be avoided in the industries currently being investigated by the H-REII Project. [Source: HREII project database].

* considering only base load stations

Results

The H-REII project has revealed the potential of a new industrial sector in the so-called “white economy”, in which Italy certainly enjoys a leading position.

Its findings are now supported by national policy documents such as the Italian 2011 Action Plan for Energy Efficiency, where the recovery of waste heat is included amongst the most effective measures for improving energy efficiency, classified as “IND- 5 - refrigeration, inverters, boiler replacement, heat recovery”, with more than 47% of the annual energy saving forecast for 2016 for industry as a whole [Source: PAEE Italia 2011].

In the guidelines for its new regional environmental energy programme (“PEAR”), the Lombardy Regional Authority has identified process heat recovery as a measure for improving the energy efficiency of processes and products [Source: Lombardy Region, Council Resolution no. IX/3508, 23/05/2012 session].

Moreover, the Energy Efficiency Certificate mechanism, as revised by the Italian Electricity and Gas Authority (AEEG) at the end of 2011, specifically recognises heat recovery as an eligible sector and introduces, as has already been done in other sectors, a multiplication coefficient (tau coefficient = 3.36) which awards a larger number of Certificates to projects using these applications. [Source: AEEG deliberation EEN 9/11 of 28 October 2011].

These values have potentially improved the economic feasibility of a number of industrial heat recovery projects, which are by their nature complex and usually involve investments of several million Euro, but the uncertainty arising from the lack of a stable, lasting regulatory framework is one of the obstacles to the full development of this sector.

Benefits

A large number of environmental, industrial and innovation factors have emerged, and through the development of the project they clearly indicate that the recovery of heat from energy-intensive industrial processes is:

- The opportunity for greater environmental and energy sustainability of industrial processes, with positive repercussions in terms of greater competitiveness.
- An effective means for the achievement of national energy efficiency and environmental protection targets.
- The opportunity for developing industrial policy tools that give new stimulus to investment in production sectors, capable of involving various players within the supply chain.
- The possibility of promoting specific research and development projects to consolidate a national position of leadership, with significant export potential.

Continued...

The need to extend the pilot model developed in Italy with the H-REII project to the European level recently led to the creation of the H-REII DEMO project, co-financed by the European Commission's LIFE+ programme (LIFE10 ENV/IT/000397).

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TURBODEN
Coordinatore del progetto e partner tecnologico
Project's coordinator and technologic partner

www.turboden.it

CSMT, Centro Servizi Multisettoriale e Tecnologico
Partner scientifico
Scientific partner

www.csmt.it

FIRE, Federazione Italiana Uso Razionale Energia
Partner scientifico
Scientific partner

www.fire-italia.org

AIB, Associazione Industriale Bresciana
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Istitutional partner

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