The Abrasive Water Jetting (AWJ) process produces wastewater composed of a mixture of residue from the materials that are being cut and the abrasive material used for cutting. The quantity of abrasive material produced in the waste is high in comparison with the quantity of residue but, while the abrasive material is non-toxic, the residue can be hazardous. Some WJ cutting machine manufacturers have carried out trials for recycling and re-using the abrasive material but, because of the complicated process for managing the waste produced, waste management costs are very high. Ice Jet technology uses ice particles made from running water or freshwater to cut material. When the ice particles cut the material they melt and go into the water tank of the machine. By filtering this water and re-entering it into the pump, the pressurised water can be used again.

Objectives

The main objective of ICEJET project was to develop a pilot plant that would demonstrate the technical feasibility of the ice jet technology for cutting different material groups that have been classified according to their characteristics. The ice jet technology aims to substitute the currently used abrasive water jet technology. The principal difference is that ice jet works with water ice particles while in abrasive water jet technology the abrasive part is mineral garnet. As a result, the ice jet cutting process was expected to drastically
reduce the amount of waste generated. ICEJET also aimed to design and develop a water recycling system, as well as establish a easy and cost-effective way to implant it. This methodology would push end users to acquire good habits of reusing the water in their processes. A methodology would also be developed for facilitating the management of waste produced during the WJ cutting process. This methodology will encompass the different steps of waste management such as fulfilling the conditions for waste spills in order to reduce costs, methods and reducing the humidity of the waste, so it lies between established levels. Lifecycle analysis were also foreseen, taking in the social, environmental and economical aspects of ice jet technology. The prototype would be validated and the technical and economical feasibility plant established. A validation centre would then be planned on the basis of the results of the project. This centre would be part of the network that the Commission is creating within the EU System for the Environmental Technology Verification. Finally, the project would contribute to the implementation of the European Action Plan for Environmental Technologies (ETAP) in order to spread its use all over Europe while at same time improving the cutting process in developing countries.

Results

The ICEJET project developed an environmentally friendly Ice Jet Technology that uses fewer natural resources, thus minimising waste production and saving costs.

In order to boost its uptake by the market, the project also set parameters for different materials and applications using the ice jet technology as well as defining working application areas. It also carried out a lifecycle analysis of the technology and compared its performance with that of the abrasive water jet technology.

The results of this LCA showed that, in comparison with water jets, ice jet technology has a higher cutting efficiency and can reach more application fields due to the possibility of making the machine thicker. It also allows for the use of more complex components at a higher standard of quality than pure WJ.

The LCA conclusions have been compiled in a series of guidelines for the use of the Ice Jet technology, which also includes a methodology for economically viable implantation of the technology and the management of the waste spill.

The project also made a great contribution to the development of the EU System for Environmental Technology Verification by defining the requirements for taking part in the European Network of Verification Centres within the potential thematic area “clean technologies including waste and resource recycling”. A thematic verification centre, qualified testing laboratories and national, regional or sectoral contact points could then included in one of the structures envisaged for the EU Network for the Environmental Technology Verification System.

Due to the big marketability potential of the Ice Jet Technology, the project has generated a great amount of interest within the industrial sectors concerned.

Further information on the project can be found in the project's layman report (see "Read more" section).
Environmental issues addressed:

Themes

Environmental management - Life Cycle Assessment-Management
Waste - Industrial waste
Waste - Waste reduction - Raw material saving

Keywords

life-cycle management, alternative technology, industrial waste, waste reduction

Natura 2000 sites

Not applicable

Beneficiaries:

Coordinator Fundación Fatronik
Type of organisation Research institution
Description The co-ordinating beneficiary, Fundación Fatronik, is a private non-profit research centre established in 1986. Originally set up to provide technological support to local machine-tool builders, FATRONIK–Tecnalia has now expanded its role in innovation and technological development.

Partners Ad Hoc Desarrollo Sostenible S.L., Spain
University of Ljubljana–Laboratory of Alternative Technologies, Slovenia IAM-CUT SL, Spain

Administrative data:

Project reference LIFE08 ENV/E/000167
Duration 01-JAN-2010 to 31-DEC-2012
Total budget 1,614,125.00 €
EU contribution 763,962.00 €

Project location
País Vasco (España) Pomurska (Slovenia)
Podravská (Slovenia) Savinjska (Slovenia)
Koroska (Slovenia) Zasavska (Slovenia)
Spodnjeposavska (Slovenia)
Gorenjska (Slovenia)
Notranjsko-kraska (Slovenia)
Goriska (Slovenia)
Obalno-kraska (Slovenia) Jugovzhodna
Slovenija (Slovenia)
Osrednjeslovenska (Slovenia)
Associated Slovenia (SLO)

Read more:

Project website  Project's website
Publication: Layman report Title: Layman report Year: 2013 No of pages: 13
Publication: Research findings Title: "Ice Jet environmental technology pilot plant, for drastically reducing waste produced by abrasive water jet cutting techniques" (768 KB) Year: 2012 No of pages: 7
Publication: Technical report Title: Project's Final technical report Year: 2013 No of pages: 36

Video link  Link to the project's videos on youtube
Video link  "European LIFE+ Project LIFE08 ENV/E/000167 ICEJET" (12')