

Project Information



Subject: Erection, Operation and Optimisation of the Heat Utilisation of an MCFC

Applicant: Stadtwerke Bielefeld GmbH
Schildescher Str. 16
33611 Bielefeld

Project Duration: 12.02.1999 – 31.12.2001

Project Partner: MTU AG Friedrichshafen

Contact: Dr. Ingo Kröpke
Tel.: 0521-51-4011
Ingo.kroepke@stadtwerke-
bielefeld.de



Description of Project/Working Programme:

The whole project encompasses the installation of the world's first customer plant for a molten carbonate fuel cell for power/heat co-generation. Together with the project partners BEB and Mobil, major domestic gas suppliers, Stadtwerke Bielefeld at constructing this fuel cell system. Important operational experience is being gathered in the characterisation and further development of the molten carbonate fuel cells. The experience of the commissioning and the first year of operation has already led to considerable modifications and improvements of the MTU fuel cell plants. The plant currently generates 150 – 200 kW electrical power with an impressive net efficiency of 47%.

Within the framework of the assisted project a suitable heat exchanger system has been developed which exploits in two stages the waste heat generated by the molten carbonate fuel cell (MCFC). Initially high-grade process steam is generated and then the residual heat is fed into the district heating network. It is intended to test what influences the utilisation of waste heat exercises on the fuel cell's operation, or how an appropriate control and regulation unit is to be set up.

One focus of the research here is the influence of the flow resistance of the waste air heat exchanger on the fresh air supply of the fuel cell. It is also to be investigated how the remaining residual heat of the waste air can be partly returned to the fresh air circuit and thus help increase the efficiency of the fuel cell system. In the experimental plant in Bielefeld the intention is in a two-stage heat extraction process to make optimum use of the heat arising and to increase the overall efficiency of the fuel cell installations. Since November 1999 the plant has been in operation and co-generates power and heat. In continuous operation it generates 150 kW electrical power with an efficiency of 47%.

The MCFC fuel cell works at an operating temperature of 650°C. the waste gases arising from "cold" combustion leave the fuel cell with a temperature of about 300°C. In the first stage of waste heat utilisation the hot waste gas is directed into a steam generator, which generates saturated steam at 3 bar. The waste gas is cooled here to 155°C. In all the fuel cell works very successfully and reliably. Plant outages occurred repeatedly in the first 6 months of operation. But they were all attributable to conventional problems with the electrical and mechanical peripheral systems.