

Project Information



Subject: Use of Sewage Gas in a Fuel Cell

Applicant: GEW Köln AG
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Description of Project:

In the Cologne-Rodenkirchen sewage treatment plant GEW Köln AG operates Europe's first fuel cell plant for generating power and heat from sewage gas. The aim is to show that the use of sewage gas for the environmentally friendly generation of power and heat is technically feasible. Under the heading "Use of Sewage Gas in a Fuel Cell" the plant was designated a "Worldwide Project" of EXPO 2000 and declared a leading project by Landesinitiative Zukunftsenergien des Landes NRW (NRW State Initiative on Future Energies).

Sewage gas as an energy source is produced from the digestion of sewage sludge. Since the beginning of March 2000 this gas – with its methane content of 60 to 65 % - has been converted into power and heat in a fuel cell unit co-generation plant. The electrical output of the phosphoric acid fuel cell is 200 kW and the thermal output 205 kW. The plant is integrated in the sewage treatment plant's power and heat network. Power production covers around 50 % of the essential demand, the heat being used to heat the digestion tanks and the office buildings located on the plant site.

The major technical innovation of this project is the purification of the sewage gas, because the sulphur and halogen compounds and other contaminants in the gas would hinder the chemical and catalytic processes in the fuel cell. The purification unit in Cologne-Rodenkirchen consists of a two-stage basic purification unit and a downstream adsorption stage with particulate filter. In the basic unit the gas is purified by precooling and subsequent freeze-cooling. Here the sewage gas is cooled to temperatures below minus 30°C. For complete purification the halogen and sulphur compounds are retained using activated carbon.

The demonstration plant in Rodenkirchen offers the possibility of accumulating practical experience with the purification of sewage gas and operation of the fuel cell. For this purpose regular measurements are conducted of the gas constituents both before and after purification. The results to date indicate an excellent outcome. For example, the sulphur compounds have been reduced from 17 mg/m³ in the untreated gas to less than 2 mg/m³ in the clean gas. The chlorine and fluorine compounds (halogens) in the clean gas are at levels of less than 1 mg/m³. A rated electrical output of 200 kW has been achieved.