Co-gasification at the Buggenum IGCC power plant

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The NUON Power Buggenum (formerly Demkolec) plant was the first IGCC plant and was build as a demonstration plant. It started operations in early 1994. The demonstration period lasted till ’98 after which the unit was in commercial operation.

The gasification island comprises a high pressure ASU, a dry coal fed oxygen blown Shell entrained flow gasifier, gas cooling by recycle gas to about 800°C followed by a water tube syngas cooler (SGC) for saturated steam raising, a fly ash cyclone and a barrier filter with ceramic candles at 250°C, water scrubbing, COS hydrolysis, H₂S removal by the Sulfinol M solvent, gas saturation and water cleanup. The power block is based on a Siemens V 94.2 gas turbine combined cycle with a turbine inlet temperature of 1100°C (equivalent to Siemens ISO of ~1050°C). The NOₓ emissions are controlled by both saturation of the fuel gas with hot water and by the addition of nitrogen from the ASU. Because of the characteristics of the Siemens gas turbine and Demkolec’s desire for maximum efficiency this plant was designed with full integration of the ASU and the gas turbine. In other words, the entire feed for the ASU is supplied (extracted) from the gas turbine compressor.

Initial availability of the installation was not high mainly caused by problems with the Gas Turbine. After resolving this in ’96 performance of the GT has been excellent (up to 94% availability in 2004). Availability of the complete IGCC has been up to approximately 80%.

Current Operations at Buggenum

The Netherlands, as part of the European Community is a signer of the Kyoto protocol. In partial response to this, the Netherlands has undertaken a coal covenant with coal users. This requires the Buggenum plant to make a CO₂ emission reduction of 200,000 mt/year which is equivalent to 28-50 MWe derived from biomass. Currently 30 wt% of co-gasification biomass is done, requiring appr. 200 kton/y of biomass. Other secondary fuels like pet cokes, automotive shredder fibres, rofire are tested or currently being tested.

For the future Nuon is exploring the possibilities of CO₂ sequestration.