

On-going projects

The
VVBGC four-year-project

Abstract

During the past year, VVBGC, E.ON, AGA/Linde and a Portuguese company, SGC Energia, have held detailed discussions and negotiations on the formation of a company to facilitate a development project at the unique VVBGC gasification plant in Värnamo. The aim of the project is to demonstrate the production of renewable automotive fuels, SNG, green electricity, etc. For the required rebuilding of the plant, VVBGC has applied for part-financing from the Swedish Energy Agency, the remaining financing being provided by the other companies named above and a few additional invited companies. Work to define the basis of the technical work in the project is on-going.

In the medium- to long-term, the VVBGC gasification plant is expected to become a research and demonstration centre for biomass gasification and related processes.

In addition to the financial support provided by the partners, amounting to a total of approximately €10 million, their role in the project includes specification of the plant rebuild and the development programme, provision of supervisory management, setting up a project company and making a plan for the use of the results that will be owned by this project company.

Vattenfall has been invited to join the project and they are now participating in discussions with the other partners on the definition of the project and sharing of the responsibilities, whilst at the same time they evaluate their option to join the project.

In December of last year, the Swedish Energy Agency released about €2.5 million of funds allocated earlier for the specification and detailed engineering of the plant rebuild. This work is now on-going. One important aim of the rebuild is to make the plant sufficiently flexible that it will permit development and demonstration of a variety of processes to generate solid biomass-derived gaseous energy carriers suitable for up-grading to several types of end products, for example synthesis gas, SNG, green electricity, FT-diesel, DME and hydrogen.

It is planned that by the end of this summer the specification and detailed engineering of the plant will be sufficiently advanced that the partner companies and the Swedish Energy Agency will be in a position to take their decisions on the extent of their participation in the project.

Background and current
situation

The EU has set ambitious targets for increased

use of biomass for electricity, heating and renewable automotive fuels; these targets being complemented by additional targets set by some individual member states.

For the production of renewable automotive fuels for example, a number of new techniques have been developed and demonstrated at laboratory- and/or pilot scale. However, a common aspect of many of these is that they need to be verified and demonstrated at larger scale before commercial plants can be built.

The VVBGC gasification plant was built in the 1990's by Sydkraft (today, E.ON Sweden) as part of their development project on heat and power production based on pressurized gasification of solid biomass. After successfully proving the process in a number of test campaigns at the plant, the plant was mothballed in 2000. Although a number of companies completed pre-studies on the use of the plant for proving the production of various products based on the gasification of different types of solid biomass since that time, it is only recently, with increasing demands for renewable non-food automotive fuels and green electricity and the development of new techniques and optimization of old ones, that the market conditions for viable large-scale production of renewable automotive fuels has been judged to be within reach and thus interest in operating the plant once more has increased.

Over a period of many years, the Swedish Energy Agency has supported financially the plant and projects at the plant and they now agree to the plans to make the facility a part of the Swedish Research Infrastructure as a centre for research, demonstration and education on solid biomass gasification and related upstream and downstream processes. The plant is now owned indirectly by the Swedish government, through the holding company of Linnaeus University, which in turn owns VVBGC and the plant in Värnamo.

The cost of the plant rebuild now proposed and the near-term additions required is estimated to be €25 million, this is calculated to be approximately one third of the cost of a new plant of similar capacity and scope. The costs for the four-year development project are estimated to be €20 million, of which the partners will contribute about €10 million.

One year ago, E.ON, AGA/Linde and SGC Energia expressed their interest in taking part in the proposed four-year demonstration project with the aim to demonstrate generation of a synthesis gas suitable for up-grading to SNG and FT-diesel. At the end of 2009, Vattenfall was invited to join the partners and they are now investigating if participation in the project is of value in their development of a new technique which they have recently demonstrated at pilot scale. This evaluation is being carried out at the same time as Vattenfall is participating in ongoing partner discussions.

In addition to the partners and Vattenfall, there are a number of other companies that are assessing the value of their participation in the project. Some of these companies, for example CTC/IPT, Brazil, are interested in developing processes for the production of similar, but different, end products. The common factor for all interested parties is the gasification of solid biomass to generate, in an efficient process, a gaseous energy carrier, a synthesis gas, the composition of which can be varied depending on the required end product.

The major advantage to using the VVBGC gasification plant in a development project is that it is already available and

its capacity is big enough for the results generated in the project to be used as the basis for the design of commercial plants, but still small enough for the operational costs to be acceptable. The plant can also be modified at a cost drastically lower than the cost of building a new green field plant.

The rebuild plans for the plant are to make the plant very flexible in order to accommodate projects with widely different requirements, for example, for those requiring a full gas stream or a slipstream at various locations. End products of interest include for example synthesis gas, SNG, green electricity, FT-diesel, DME and hydrogen. It is thought that new components may be tested and optimised in slipstreams before being tested in the full gas stream. There is also sufficient space available at and around the site for plants for up-grading of the gas and the development of sellable products.

To permit the detailed engineering of the plant rebuild to continue, the Swedish Energy Agency released in December 2009 about €2.5 million of funds which had been allocated earlier but then frozen whilst waiting for the partners to agree to the terms of their participation in the project. This detailed engineering work is now being carried out in parallel with partner discussions, it is planned to be completed by the end of this summer after which the partner companies will make their final decision on their participation in the project, following which the Swedish Energy Agency will also take their final decision on the project and its financing.

The present VVBGC rebuild and demonstration project has sometimes been mistaken for the CHRISGAS project. CHRISGAS, which was successfully completed and ended with presentation of the results in a conference in February 2010, was financed mainly by the EU and the Swedish Energy Agency and included some twenty European partners (including VVBGC) in the development of processes for the generation of a "Clean Hydrogen-Rich Synthesis Gas" suitable for the production of automotive fuels from the gasification of solid biomass. Originally, the plan of the CHRISGAS project was to demonstrate the processes in the VVBGC plant but for various reasons this turned out not be possible within the scope of the budget and time-frame of the project. Instead, the current four-year project, based on the production of different end products, was drafted.

Since the 1970's, a number of Swedish gasification projects have been successfully conducted. For example, in the late 1970's Studsvik carried out pressurised gasification tests in their 2 MW pilot plant. Some of the results from these projects have been verified within the CHRISGAS project. Some of the partners, i.e. Sydkraft, E.ON and Vattenfall, as well as TPS, have also completed biomass gasification research and development projects.

In Sweden, the national government channels environmental funding through cities and municipalities and considerable amounts has been made available for climate-related projects. Through this arrangement, both VVBGC and the CHRISGAS project were both part of the Fossil Fuel Free Växjö project, receiving support from both the Swedish programmes and from the EU. Once the projects are started, the city or municipality has no direct influence on the management of the company or project.

The fact that VVBGC is owned by a university has caused some concern in some areas. Foreign partners have been reluctant to join the project fearing that the university would influence the project negatively. However, the Swedish Energy Agency is adamant that the project

should be managed by the industry partners, be run in an efficient manner and that the results, owned by the industry partners, should form the basis for building a number of large commercial plants in the future.

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