

SIEMENS



PROCESS INSTRUMENTATION

Siemens flow meters optimize production of renewable energy meters

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The customer

DONG Inbicon was established in 2007 to respond to this vital need, and in 2009 the Inbicon Biomass Refinery demonstration plant was opened in Kalundborg, Denmark. The purpose of this refinery is to showcase a patented method for producing renewable cellulosic ethanol from biomass (agricultural waste) and prove that energy exchange with an electric power plant can be beneficial to the refinery, the power plant and, most importantly, the environment.

Inbicon Biomass Refinery is integrated with the adjacent Asnæs Power Station. The power station sends waste steam to the refinery, where the steam helps to process straw and cellulosic ethanol, lignin (which replaces some of the coal burned by the power plant) and C5 molasses (which can be used as nutritional feed for livestock).

In the Inbicon process biomass is converted using only steam and enzymes. At the

Inbicon biomass refinery in Kalundborg the biomass (baled wheat straw) is cut into small pieces, conditioned using a proprietary method, and pressure-cooked to open the protective lignin structure and make the cellulose available for enzymes.

Enzymes are added to liquefy the fiber and significantly reduce its viscosity. As the fiber is liquefied, the cellulose is converted to lower carbohydrates. After the liquefaction the product is pumped into traditional fermentation tanks and yeast is added to convert the sugar to ethanol and carbon dioxide. After fermentation the fiber beer is passed to the distillation and the ethanol is purified. The ethanol is passed through a molecular sieve to physically remove the smaller water molecules from the ethanol. The solids that result from distillation are dried to a fine powder and pelletized to be used as a solid biofuel.



The challenge

In the planning stages, the objective of DONG Inbicon was to build a biomass refinery demonstration plant to test and optimize the complex technologies and processes involved in the biomass conversion process, with the ultimate goal of offering these technologies to companies interested in building larger-scale plants around the world. DONG Inbicon wanted a demonstration plant that was fully integrated, able to support automated operation 24 hours a day and seven days a week, and easy to reproduce in other locations. To manufacture such a large amount of ethanol efficiently and safely, the refinery would require a variety of highly accurate flowmeters to measure the flow throughout the biomass-to-ethanol conversion process. The chosen flowmeters would need to be reliable and durable enough to withstand corrosive media, high pressures and potentially explosive conditions. Ideally, they would also be capable of integration with a control network to optimize both process and cost efficiency. Finally, to streamline the building of the refinery, the energy company aimed to work with as few suppliers as possible.

The solution

Ultimately, DONG Inbicon selected Siemens as the sole supplier of flowmeters for the Inbicon Biomass Refinery, as well as additional products to measure level, temperature and pressure. Siemens was chosen due to its worldwide reputation for high-quality solutions for industry, as well as for its long-standing support of green energy initiatives.

Siemens provided an integrated flow solution incorporating various flowmeters at different parts of the plant, including a total of 43 electromagnetic flowmeters (primarily SITRANS F M MAG 3100 and MAG 1100 meters paired with MAG 6000 I electronics). The flowmeters from Siemens were particularly well suited to meet the unique and challenging demands of Inbicon Biomass Refinery.

The benefits

Unmatched durability

Designed specifically for the chemical and process industries, the rugged MAG 3100 family, particularly the MAG 3100 P, features a fully welded construction that fits almost any application within these industries. PFA/PTFE

liners and Hastelloy electrodes provide added resistance even in the harshest environments (including temperatures up to 150° C/300° F, pressures up to 580 psi, and strong chemicals like the ones used by the refinery to produce ethanol). MAG 3100 P has an accuracy rate of +/- 0.2% and has both ATEX and FM/CSA approvals for hazardous areas.

Enhanced reliability and comprehensive diagnostics

The unique SENSORPROM memory unit of the MAG 3100 P features the highest level of safety and reliability with factory pre-programming and an automatic storage function. This ensures fast and easy transmitter replacement without loss of data, lowered accuracy or downtime.

The user-friendly interface and sophisticated self-diagnostic functions offers comprehensive identification in easily readable text (including self-check, error messages and status logs).

Proven network

The refinery was able to take advantage of a Totally Integrated Automation solution from Siemens by integrating all instrumentation (including flowmeters) and control systems into one industrial network to enhance efficiency and decrease installation costs. Profibus was selected for its reputation as a proven network with over 30 million nodes worldwide. In addition, with Profibus, all instruments could be configured using one configuration package, SIMATIC PDM.

Although Profibus was identified as the best solution for this particular installation, the universal signal module concept of the MAG 6000 I means that it could also be connected to a number of other networks (e.g. HART, Foundation Fieldbus, MODBUS RTU, DeviceNet).

Built-in convenience

The standardized, pre-configured design of the MAG 3100 P means Siemens can offer short lead times. Additionally, because of its robust construction and the fact that it has no moving parts to wear or foul, the meter requires very little maintenance.



When service does become necessary, the refinery finds it convenient that Siemens is the singular provider of all parts. "With Siemens as our supplier, we have a responsible partner ensuring easy ordering, identification and handling of spare parts," says Steen J. Andersen, Senior Project Engineer.

Satisfied customer

The Siemens instrumentation that was installed at the Inbicon Biomass Refinery has been helping to optimize the ethanol creation process since the plant opened in 2009. "The electromagnetic flowmeters from Siemens have been running without any problems or maintenance required," says Steen J. Andersen.

Thanks to the success of the demonstration plant in Denmark, DONG Inbicon is now working to license their innovative technology to companies across the globe and create ethanol from many different types of waste materials.



The case in a glance:

Region: Denmark

Industry: Chemical

Customer: DONG Inbicon

Challenge:

Build demonstration plant with reliable instruments and suppliers

Products:

SITRANS FM MAG 3100 P,
SITRANS F M MAG 3100,
SITRANS F M MAG 1100 and
SITRANS F M MAG 6000I

Main benefits:

- Accurate flow measurements in both standard and Ex areas
- Automated integration
- Easy service and support
- Global supplier

Customer Statement:

"The electromagnetic flowmeters from Siemens have been running without any problems or maintenance required. With Siemens as our supplier, we have a responsible partner ensuring easy ordering, identification and handling of spare parts."

*Steen J. Andersen,
Senior Project Engineer
DONG Inbicon*

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