

Largest ever fail-safe project in Denmark

Fail-Safe Pharma Expertise

The Danish engineering company Novo Nordisk Engineering chose Siemens to supply the largest ever Fail Safe system in Denmark. The system is installed at one of the world's largest insulin factories, owned by the pharmaceutical company Novo Nordisk, in Kalundborg.

Over a period of 36 months and with continuous planning, the Danish engineering company Novo Nordisk Engineering has built an enormous insulin factory, containing complete production lines from raw materials to finished bulk products. Insulin is used to treat diabetics. The factory was built for Novo Nordisk, Denmark's largest pharmaceutical company. Novo Nordisk has invested DKK 2.5 billion in the factory, known colloquially as IBP (Insulin Bulk Plant).

IBP is the most sophisticated factory of its kind and is four times the size of conventional insulin factories. The continuous production lines have necessitated the installation of a comprehensive, highly developed Fail Safe system in order to ensure the greatest possible protection of personnel, production and the environment while at the same time allowing the plant to be shut down in a safe and appropriate manner if, for example, a leakage of inflammable fluids should occur.

Tight schedule

Novo Nordisk Engineering (NNE) chose Siemens to supply the sophisticated Fail Safe system on the basis of a supplier survey and a firm belief that Siemens was capable of providing the necessary expertise for the task.

On the basis of NNE's requirement and function specifications, Siemens supplied the entire Fail Safe system, complete with hardware and software and including everything from system design to the construction of the necessary panels. Siemens also installed the panels and the cables connecting the many units.

The software was configured on the basis of cause-and-effect diagrams provided by NNE. In addition, these diagrams were used to prepare the plans for quality control and testing that could ultimately demonstrate the functions of the Fail Safe system. Siemens was responsible for optimising system design on the basis of the chosen concept, and for providing the necessary hardware and system configuration.

The entire project was completed under a very tight schedule in which IBP was built and equipped in stages, each corresponding to a sixth of the final factory size. This allowed independent tests and trial runs to be performed in individual sections of the factory. It was a difficult

process in which many of the tests were performed at night so as to avoid interrupting the production validation being carried out during the day.

Safe production

Large quantities of alcohol are used in the production of insulin. The Fail Safe system therefore includes a large number of sensors capable of detecting explosive gases. If excessive concentrations are recorded, the plant is partially or completely shut down. However, no more of the production line is shut down than necessary, allowing other parts to continue production. At IBP, the entire factory is supplied with raw materials from a central store. This design is more complicated



The Kalundborg site is Novo Nordisk's main manufacturing facility for insulin



All pictures: Novo Nordisk

purification are monitored and regulated from one of the control rooms while fine purification is controlled from the other. The Fail Safe system is segmented in the same way as the process control system, thus making it simple to operate.

In addition, the system has a redundant design, meaning that one of the two CPUs in the control room PLCs is constantly on standby, ready to take over should the other fail. The two PLCs also double for each other if faults occur. Furthermore, the network connecting all 19 panels has a redundant design and communicates via Profisafe on a conventional Profibus DP net. Input and output signals are handled via a modular ET 200M-FS system.

The Fail Safe system meets the requirements of SIL 3 (Safety Integration Level) in accordance with IEC/EN 61508, the new EU standard which took effect this year. The Siemens Fail Safe system thus meets the most stringent of safety requirements.

Among others, these include requirements on system design and tolerances, elevated monitoring levels and redundant wiring. The Fail Safe system therefore checks connections to all components continuously, and its redundant wiring allows the system to switch automatically to an intact network should faults occur. The system also meets the safety requirements contained in the EU machinery directive, EN 954-1. The system installed at Novo Nordisk is designed to SIL 2.

Flexible cooperation

"The Siemens engineers were extremely flexible, working both day and night when necessary. Often, the Fail Safe system had to be tested under very difficult working conditions where it was necessary to shut down other parts of the plant," says Claus Danielsen, project manager at Novo Nordisk Engineering. "It was an ambitious plan, but there has been a willingness to cooperate from both sides. Considering that this is the first system to be installed by Siemens in Denmark, the project has run smoothly. Problems have arisen along the way, but both the Danish and German divisions of Siemens have put great effort into solving them." ■

Find out more:

www.siemens.com/pcs7

E-Mail: kasper.agerbaek@siemens.com

Novo Nordisk: A focused healthcare company

- 18,000 employees, 65 percent of whom are based in Denmark
- Turnover of 25 billion Danish Crowns in 2002
- Diabetes care accounts for 70 percent of turnover
- Production facilities in seven countries
- Represented in 68 countries throughout the world

than that of decentralized distribution and necessitates a very precise control of the system. The system therefore uses PLCs and Profibus technology, based on an open standard architecture. Both Profibus and the PLCs are approved by the German testing institute TÜV.

The Fail Safe system, which collects some 800 signals from the production lines, has three main functions: shared emergency stop, substance detection, and handling of alarms from the ventilation system.

Meets the most stringent requirements

Ethernet connections have been established at two operator panels in the two IBP control rooms. Fermentation and raw