General Renovation Without Shutdown

Complete "Carefree" Plant Modernization Package

Most process plants are in operation over several decades. During this time, of course, parts of the plant and individual components will repeatedly have to be replaced. The necessary work can generally be performed during the scheduled downtimes for servicing and maintenance, and sometimes even while the machines are running.

The situation gets more complicated, however, when a general renovation is on the agenda, involving the comprehensive renewal of measuring technology, distribution and control system, and power supply. But even a complex modernization can be carried out without additional downtimes, as the following example demonstrates. Experience and competence are essential prerequisites, as well as good planning and preparation — in other words, what is needed is a competent partner.

The company Cordenka is the leading manufacturer worldwide of industrial rayon yarn, sold under the brand name Cordenka. The high-strength yarn is used, for example, as reinforcing material in high-performance tires, hoses and composites. As well as manufacturing approximately 32,000 metric tons of yarn a year at the Obernburg site in Germany and the Polish site in Gorzow, about 14,000 tons of fabrics per year are produced for the tire industry. Rayon consists of 100% cellulose. In a multistage process, this natural raw material is converted into a high-tenacity multifilament yarn for technical applications. First, viscose is obtained. The cellulose is brought into solution by a reaction with caustic soda (sodium hydroxide) and carbon disulfide. After filtration and degasification, the solution is ready to spin. In the spinnery, it is extruded through spinnerets into the spin bath, where it precipitates out and forms filaments. After these have been stretched, fixed and washed, they are reeled up wet before undergoing further processing.

The Cordenka plant in Obernburg that has been modernized comprehensively.

The new exhaust air extraction system: one of the two new exhaust chimneys with emission measuring points on the 43-meter-high working platform .

Spin Bath Circuit

An important role in the production of yarn is played by the spin bath. The main circuit continuously supplies the spinnery with fresh spin bath liquor; used medium is pumped off, filtered and reconditioned by adding acid and then reheating. The recovery subcircuit removes excess water from the spin bath liquor by vaporization, and excess sodium sulfate is removed by crystallization and subsequent calcination.

The automation technology behind this circuit had given reliable service for many years. However, in order to ensure absolute reliability in the future, too, comprehensive modernization measures had become necessary. Hardware and software were no longer technological state-of-the-art; replacement parts were limited, and servicing and maintenance were becoming more and more costly and time-consuming. For these reasons the plant operator decided on a comprehensive general modernization, which was carried out from 2008 onward following a two-year planning phase.

Comprehensive Modernization Measures

In the course of the project, all the measuring devices were to be replaced by PA bus-capable components and new measuring points; modern measuring stations and operator stations were to be installed, as well as a new distribution and control system. The whole low-voltage power supply also needed to be addressed, as many distributors were exposed to a heightened corrosion risk at their installation sites — a risk the company planned to avoid in the future.

The limiting conditions for this extensive project were decidedly complex: Rayon yarn is produced around the clock, and the idea behind the project was to ensure that modernization measures did not affect continuous operation any more than absolutely necessary.

For economic reasons, avoidable downtimes are just as unacceptable for the spinnery at Obernburg as they would be in most other process plants. However, Cordenka found a competent partner for this modernization project in Rösberg Engineering, which was able to provide the necessary engineering services for detail planning and coordination of the numerous trades involved in the modernization, while hardly affecting the running of the production plant at all.

Planning and Preparation Instead of Shutdown

The essential prerequisites for this ambitious objective were comprehensive experience, precise planning and good preparation of all the necessary work stages. The modernization project involved a total of nearly 3,000 measuring points, about 200 valves, numerous cable lines, the whole of the compressed-air piping system and several transformer stations for the 400-VAC supply, the metrology bus installation using fiber-optic rings for Profibus DP, Profibus PA and Ethernet. The automation specialists from Karlsruhe took on responsibility for procurement and coordination of all the trades involved, including the necessary maintenance and production staff and the task of schedule monitoring.

Highest priority was accorded to creating the infrastructure for the complete system. In order to avoid corrosion damage in the future, all power lines were laid to — mostly newly constructed — switch rooms with air-purification systems. The whole system of power cables both inside and outside the building was then built up parallel to the existing system, in order not to interrupt production. The same approach was followed with the control wiring and the signal wiring. In most cases the new control rooms including fittings, air conditioning and air-purification systems, were built up next to the existing control rooms, which were still equipped with conventional instrument panels.

Following these preparatory infrastructural measures, modernization of the production plant — i.e., the spin bath circuit — was tackled in several steps. In order to interfere as little as possible with production, the automation specialists first drew up detailed time schedules for the electrical, measurement and control installations. In each case, instrumentation was then integrated into the routine cleaning cycles for the individual plant components.

Particular care needed to be taken when replacing the inline devices. New components such as valves or flowmeters had different dimensions and different installation requirements from the existing devices. The corresponding changes in the piping were already described in the specifications for the electrical, controlling and instrumentation installations and were able to be efficiently and speedily implemented. Thus the detailed preparatory work and methodical procedure really paid off, and for the plant operator the modernization of the spin bath system turned out to be a complete "carefree" package. As in most real-life situations, a few smaller projects were also generated, and these were carried out with the same care and attention.

Energy Efficiency Measures and New Exhaust Air Extraction System

It proved possible to cut electricity consumption considerably, by integrating more than 50 frequency converters regulated by the new control system. At the same time, the introduction of these controls optimized process conditions — which minimized the cooling water requirement, among other benefits.

Another project was the installation of a new exhaust air extraction system. For this purpose a new control room was built, a new visualization system was installed, and two chimneys with emission measurement points were erected. Here, too, the Karlsruhe automation specialists supervised all the trades involved, were in charge of work on the building site — including safety instruction for external companies in accordance with the plant operator's regulations — and of course they also took care of the acceptance protocols of work by external firms (activity reports) which were then imported into SAP.

Thus the complex modernization of the Obernburg plant, which was completed early in 2014, was carried out over six years without any loss of production, and at reasonable cost to the plant operator.

Claus Wolff, project leader, Rösberg Engineering GmbH, Karlsruhe, Germany

▶ Contact:
info.ka@roesberg.com
www.roesberg.com