Retrofitting systems with modern control and drive technology can give aging plant equipment a new lease on life. At Schott AG the complete overhaul of a plant for manufacturing glass ceramics resulted in higher productivity and energy savings.

Founded over 125 years ago as a specialty-glass production plant in Jena, Germany, Schott now has sites spread across the globe for the development and production of specialty materials, components, and systems for use in household appliances, pharmaceuticals, solar energy, electronics, optics, and imaging as well as the automotive sector. Employing elaborate melting and processing techniques, 50,000 products are manufactured using over 400 types of glass. Glass is melted in gas-fired, oil-fired, or electrically heated furnaces. Depending on the type of glass and glass batch composition, the melting temperature is between 1,000 and 1,600 degrees Celsius. After melting, depending on its ultimate use, the glass is drawn, rolled, pressed, blown, and undergoes further processing.

One of these processes is ceramization, a technique for producing glass ceramic used in applications such as Ceran® cooktop panels. A mixed glass/crystal structure is formed through the crystallization of the melted glass in a controlled time/temperature process. This process must take place within highly precise parameters in order to achieve the required physical properties such as high thermal shock resistance.

One of the furnaces used by Schott for manufacturing glass ceramic has been in service since the 1980s. The furnace was still in good condition but its control and drive technology was no longer state of the art. In order to increase efficiency and also lower energy consumption, the decision was made to modernize the existing control and drive technology used in the 80-by-10-meter production plant and carry out a retrofit program to meet new safety standards.

Modernizing the control and drive system
In collaboration with Siemens, Schott’s management developed a strategy for upgrading equipment in the ceramization plant in order to improve efficiency and equipment availability. In addition, operating personnel were to be given easy-to-use diagnostic options that make malfunctions more manageable.

Another objective was to comply with the most recent machine and occupational health and safety standards and achieve higher order-volume throughput thanks to greater machine utilization. An important consideration in the retrofit program was to complete modernization of the plant without downtime.

Schott chose a powerful Simatic S7-400 controller for the manufacturing and process automation of the ceramization furnace. The controller coordinates process flows, manages subordinated systems, has a modular design, and can be scaled up at any time. Controller configuration can be modified while the system is running. The S7-400 controller signal modules can be hot-swapped at any time (removed and inserted with the system powered), allowing plant expansion or the replacement of signal modules after a fault.

The new furnace drive system consists of a Sinamics S120 system combined with 1FK7 synchronous motors. Its modular design allows the right solution to be configured with minimal effort. Connecting the motors was also easy thanks to the prefabricated cables that facilitate fast and safe connection to the frequency converter. The PC-based WinCC software is used for the visualization and user interface of the plant’s monitoring and control system.
Rapid and simple drive configuration

One challenge involved in the project was axis positioning. Combined with the Sinamics S120 drive system, a basic positioner function module (EPos) was installed for precise positioning of the axes, eliminating the need for higher-level position control and enabling rapid signal processing. A further tool employed in the Schott project was a Drive Control Chart (DCC), which was used to program the drive system’s technological functions to match the ceramization furnace specifications. Fast and easy configuration of the drive for the Schott retrofit program was made possible by the Sizer software tool. The tool guides project members through all the graphic configuration steps – from the line supply and the motors all the way to the drive components and controllers. During commissioning, project members benefit from the Starter commissioning tool while completing parameterization, system setup, diagnostics, and service tasks. Users simply select the corresponding devices on the screen and configure them with the correct control values. The tool’s service and diagnostic functions can be accessed directly on the device or via teleservice.

Retrofitting increases plant availability

The retrofit made it possible for Schott AG to utilize its existing capital investment, because only those parts of the plant that were outdated were replaced. The efficiency of the installed ceramization furnace was considerably increased. Upgrading the peripheral equipment to Simatic S7-400 and Profinet IO devices not only made it possible to achieve greater plant availability but also introduced straightforward ways to perform diagnostic functions, making faults easier to manage. In order to avoid problems in the event of a power outage, an additional uninterruptible power supply (UPS) module was installed. The most up-to-date control and drive technology also allowed productivity reserves to be utilized.

An overview of retrofit components

- Simatic S7-400
- Sinamics S120 with basic positioner function module (EPos) and Drive Control Chart (DCC)
- Sizer and Starter engineering software
- 1FK7 synchronous motors
- Simatic WinCC
- Profinet IO devices

Info

www.schott.com