Case Study: Safe And Expandable Monitoring For Exhaust Purification Plants

In the past, the safety functions on exhaust purification plants manufactured by Dürr Systems GmbH were monitored using conventional automatic gas burner control systems and safety relays. This required a lot of space; all the logic connections had to be implemented through the wiring. So in the past, any changes that were required during the planning phase and implementation involved a considerable amount of work. In response to its customer's varied process requirements, Dürr Environmental and Energy Systems uses the Pilz multifunctional safety system PNOZmmulti. This can be configured simply and quickly on the PC. It is used specifically to monitor the safety functions on the regenerative thermal oxidation plant Ecopure RTO and for the burner management system Ecopure BMS.

The Stuttgart-based mechanical engineering group holds a leading position on the world market in the areas in which it operates. Over 3000 innovative, environmentally-friendly exhaust purification systems manufactured by Dürr are in use worldwide, across a vast range of industries: in the chemical and pharmaceutical industry, paint finishing and coating industry as well as in printing presses. Key factors for the company when opting for the PNOZmulti were the modular structure of the safety relay and the user-friendly software tool, the PNOZmulti Configurator. "With this we can be flexible and individual in the way we react to the customer's varied process requirements", explains Stefan Hartelt, Project Manager at Dürr. "And we can be sure that our customers receive systems that conform to the standard one hundred per cent in accordance with EN 61508", he added.

Replacing conventional technology

On the regenerative thermal oxidation plant Ecopure RTO, PNOZmulti not only performs the classic safety functions such as E-STOP, but also monitors the combustion air pressure, gas pressure, ignition transformer and ionization. Even the main gas valve and combustion air control flap are operated and monitored safely

via digital inputs/outputs; this applies also to pre-purge, the burner sequence and the combustion chamber temperature.

The Ecopure RTO exhaust purification plant consists mainly of the regenerator columns, which are filled with ceramic packing material, the combustion chambers with burner management system and an air directing system. The burner system containing the burner management system Ecopure BMS was specifically developed to meet the requirements of Dürr Ecopure plants. The plant can be commissioned in the shortest possible timescale thanks to pre-tested control software.

For the Ecopure RTO to operate effectively, the air must be conveyed through the plant. This is done via an air directing system, which consists of the raw and clean gas ducts and the valves for exhaust air inlet and clean gas outlet. The exhaust air stream is transferred via a fan, which directs it through the valves alternately into one of the two regenerator columns, where it flows through hot packed beds and is preheated. If necessary, a burner heats up the raw gas to the final combustion temperature of approx. 820 degrees C. At this temperature, all contaminants are completely oxidized. The purified hot exhaust air then flows through the heat exchanger in the other column, transmitting its heat to the packed bed. When the packed bed reaches its optimum heat storage point, the direction of flow is switched. The preheated raw gas is oxidized in the combustion chamber and leaves the system as clean gas via the colder column.

This process is repeated and the direction of flow is regularly switched over to ensure optimum heat exchanger performance and purification of the raw gas.

Safety designed with flexibility

As all the safety functions on the Ecopure RTO are implemented via the PNOZmulti software, the external wiring can be reduced to a minimum. The use of test pulse outputs also enables the quality level of the safety circuits to be increased in comparison with the conventional solution. Manipulations are largely excluded because the completed configuration can be certified, protecting it from unwanted modifications.

Data is exchanged between PNOZmulti and the standard control system via a communication module for Profibus-DP. The switch status of all the connected sensors can easily be signaled directly to the master machine controller. So diagnostics are available quickly in the event of an error, which in turn keeps downtimes short. The required safety functions are no longer programmed in the PNOZmulti Configurator but are simply configured. No special programming knowledge is required; specified safety, interconnection and output modules can simply be configured via drag and drop. Users perform the actual wiring with a click of the mouse, by linking the modules in whichever way they require. The completed configuration is then stored on a chip card, which is inserted into the PNOZmulti base unit. This evaluates all the safety functions in conjunction with various input and output modules. As the PNOZmulti is modular, the plant can easily be expanded if necessary. Any changes can be implemented quickly and easily using the PNOZmulti Configurator. This also saves engineering costs.

“Our customers are familiar with Pilz control technology and have confidence in it. The fact that using PNOZmulti also means cost savings makes the system doubly attractive,“ says Hartelt, summarizing the reasons for choosing the PNOZmulti.

The simple handling of the PNOZmulti was a key reason why Dürr Environmental and Energy Systems decided to use the safety system. They were also convinced by the excellent collaboration on the special development of a PNOZmulti for the burner management system Ecopure BMS, which has been tailored specifically to meet the requirements of Dürr’s exhaust purification plants. Today, all the company’s Ecopure RTO plants are monitored using the Pilz PNOZmulti safety system.

For more information, visit www.pilz.com [1].

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