

BEST PRACTICE | SCHWARTZ GMBH

High-strength metals for more safety

Reliable gas supply and furnace atmosphere for the press hardening of steel, aluminium and non-ferrous metals



KEEPING THE GAS SUPPLY AND FURNACE ATMOSPHERE UNDER CONTROL COOPERATION WITH SCHWARTZ GMBH

These days, the automotive industry, wind power stations or the engineering industry often require high-strength steels that are processed using press hardening to create safety-relevant structural components. In this context, manufacturers are increasingly calling for precise logging and traceability of gas quantities and furnace atmospheres. Together with schwartz GmbH, the world market leader in heat treatment systems for the press hardening of steel, aluminium and other non-ferrous metals, Bürkert therefore developed a plug-and-play complete solution for controlling the gas supply in roller hearth furnaces.

Did you know?

Integration of the system solution in the higher-level control system is simple: The central control unit (SCU)* handles communication with all the integrated mass flow controllers. The SCU communicates via Profinet with the furnace PLC, which manages and logs the process values.



Source: schwartz GmbH



Automated mass flow control

Up to now, the standard operating procedure in the press-hardening process was to set the gas quantities manually depending on the quantity required with the help of a glass-cone flowmeter. Given the increasing requirements pertaining to the quality of heat-treated steels and the need to log gas quantities and furnace atmospheres, this method no longer conforms to current best practices. schwartz GmbH was looking for a new, future-proof solution. The system for controlling the gas supply needed to operate automatically, communicate via a suitable BUS interface with the higher-level control system, be sufficiently compact to fit in a control cabinet, have the necessary approvals, such as UL or CSA, and offer remote maintenance and diagnostic capabilities.



Roller hearth furnaces are used for the press-hardening process of high-strength steels used as safety-relevant structural components, for example in the field of automotive engineering. (Source: schwartz GmbH)

Compact control cabinet solution

The fluid control specialist Bürkert rose to the challenge and developed an automated system together with schwartz GmbH for controlling the gas supply of roller hearth furnaces. The system features a modular design and consists of one control cabinet per furnace zone. Each one contains two to three Type 8746 mass flow controllers.

The basic material for the press hardened sheet steel is a boron-alloyed tempering steel. In the austenitisation furnaces, both coated as well as uncoated steel sheets are heated above the austenitisation temperature to approximately 950 °C and held there for a defined period. The uncoated steel is treated in a furnace atmosphere with a shielding gas mixture comprising nitrogen and natural gas to prevent scaling and decarburisation of the surface.

The design of the maximum flows of the controllers for nitrogen, methane and air is determined by the dimensions of the furnace. The design with regard to the input pressures conforms to the gas supply conditions in the plant. From the higher-level process model, the furnace controller calculates the required gas quantity and passes this as a set-point

value to the two corresponding mass flow controllers. The necessary nitrogen and methane quantities are dosed by the mass flow controllers and supplied in their mixing ratio at the respective introduction point.

Precise control of the gas supply

The operating principle of the mass flow controllers guarantees exact and precise control: The thermal inline sensor in the flow controller sits directly in the gas flow and achieves very rapid response times. It functions as a hot-film anemometer in the CTA operating mode (Constant Temperature Anemometer).

Suitable flow conditioning within the mass flow controller as well as calibration using high-quality flow standards ensure that the gas quantity flowing per unit of time can be derived from the primary signal with a high degree of precision. The integrated PI controller and a direct-acting proportional valve from Bürkert as an actuator guarantee a high response sensitivity.

Plug-and-play solution from a single source

Apart from the high accuracy of the pressure and temperature-independent control, the new solution for controlling the gas supply offers a number of other advantages in practice. The standardised complete system simplifies the order and scheduling processes for the furnace manufacturer. Furthermore, the preconfigured control solution is quick and easy to connect. One M12 connection per cabinet is sufficient for the voltage supply.

Integration in the higher-level control system is also simple. With this in mind, one of the cabinets is equipped with a central control unit that handles communication with all mass flow controllers integrated in the cabinets. With the EDIP device platform (Efficient Device Integration Platform), Bürkert has created a practical solution for this. If necessary, the user can program the logic without any additional intervention into the furnace control system and can adapt it to changing processes and operating conditions. The control cabinets are connected as an autonomous subsystem to the higher-level fieldbus. In the application described, the control unit communicates via Profinet with the furnace PLC, which manages and logs the process values. Other fieldbuses and Ethernet connections are also supported.

Perfectly prepared for the future

Many other applications stand to gain from the exactly automated control of the gas supply. Within the "black box", the design can be optimised and further developed at any time without the need to intervene in the actual furnace layout. Not least for this reason, the autonomous subsystem for controlling the gas supply at the roller hearth furnaces of schwartz GmbH has proven itself to be very effective in the meantime.



Type 8746 Mass Flow Controller/Meter – for integration in CAN-based networks.

How you benefit from future-proof automation technology:



Increased process reliability: The proven and future-proof components enable reliable and, above all, reproducible processes.



Seamless monitoring: The EDIP device platform facilitates the management and logging of process data.



Time saving: The standardised complete system simplifies the order and scheduling processes for the furnace manufacturer.



Easy start-up: The preconfigured control solution is quick and easy to connect.

WE LEARN FROM YOU EVERY DAY – INCLUDING WHEN WE THINK OUTSIDE THE BOX.

When it comes to dealing with liquids and gases, Bürkert today is a sought-after partner all over the world. Why? Probably because we have been learning for and from our customers for more than 70 years now. This enables us to always think that crucial step ahead – or even sideways.

We make ideas flow.

For your added value. Let us prove it to you – we look forward to your challenge.

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