

Hot-dip galvanizing Fieldbus applications



Fieldbus applications in hot-dip galvanizing



Corrosion protection...and more

Coating steel sheets with zinc provides them with excellent corrosion protection - in other words, protection against rust. But the kinds of applications that use voestalpine steel in the construction, household appliance, and automotive industries have requirements that go far beyond this. Not only is excellent corrosion protection a must, but materials also need to offer superb reshaping properties, be well suited to joining and welding as well as easy to paint, and have an even surface appearance.

Hot-dip-galvanized products from voestalpine meet all these criteria and boast some of the highest quality available on the market. The company manufactures strips with zinc coatings ranging in thickness from 5 to 40 μm , with approximately 0.1 μm (= 0.0001 millimeter) precision. Today, voestalpine is one of Europe's leading manufacturers in the field of surface-finished thin sheets.

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Leading innovator and technological pioneer voestalpine

The Austrian city of Linz is home to voestalpine's five hot-dip galvanizing lines, which manufacture exclusively lead-free zinc coatings out of a concern for protecting the environment. Hot-dip galvanizing lines 2, 3, 4, and 5 are multi-functional lines offering the most technologically advanced equipment available. Line 2 was the first in the world to feature in-line phosphating. Lines 3 and 5 were specifically designed for the production of automotive body shells, where particularly high levels of surface quality are demanded in the context of galvanizing high-strength and maximum-strength varieties of steel.

Another feature worth noting on all the lines is the exceptionally precise monitoring and control based on product and process data, functions which far exceed the current state of the art for this type of technology. The annealing stage of the hot-dip galvanizing process is carried out by means of special burners that reduce nitrogen emissions to the furthest possible degree. The type of hot-dip galvanizing that voestalpine performs also dispenses with the standard post-treatment practice of using chromate VI, a material that is harmful to the environment, instead favoring other, harmless materials for this stage.



Fig. 1: Hot-dip galvanizing; source: voestalpine

Four process steps on one line

Continuous hot-dip galvanizing combines four processes on a single line:

- Annealing
- Coating with zinc
- Temper passing
- Adjusting

The hard as-rolled cold rolled strip is first cleaned and heated to around 800 °C, which gives it excellent reshaping properties.

The surface is also activated to ensure good wetting by the molten zinc.

Following this, the strip is cooled to 460 °C before being passed through the bath of zinc. Zinc has a melting temperature of 420 °C. This process applies the molten zinc to both sides of the strip. Any excess zinc is blasted off by means of flat nozzles, using air or nitrogen.

Once this process is complete, the strip is either cooled to room temperature or heated up again briefly in order to create the product galvaneal (i.e., steel with a zinc-iron coating). A subsequent rolling process - temper passing - establishes the desired roughness of the galvanized steel strip surface. During this process, the surface structure stamped on the temper pass rolls is transferred to the surface of the strip.

Dazzling surfaces for the thinnest of sheets

voestalpine's hot-dip galvanizing lines manufacture galvanized steel strips featuring maximum corrosion resistance, excellent processing properties, and a superior-quality surface appearance. The range of base materials offered by the company covers virtually all types of cold-rolled steel strip.

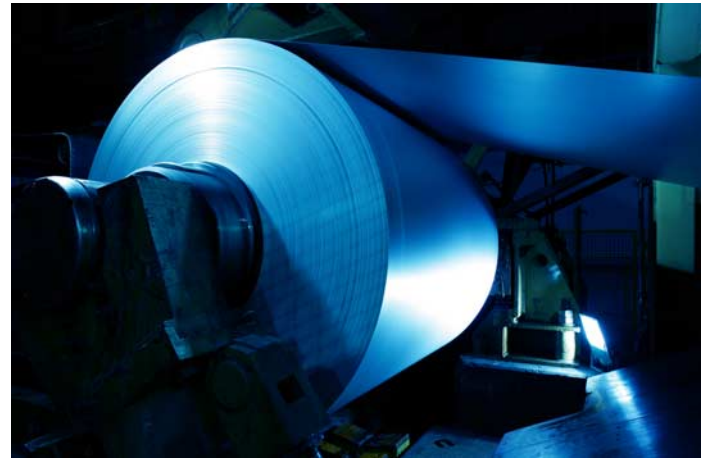


Fig. 2: Coil; source: voestalpine

Some examples of where hot-dip galvanized steel strips can be used are interior and exterior bodywork components in the automotive industry, washing machines and stoves in the household appliance industry, and the construction industry. In each of these areas, voestalpine supplies its products to practically all of Europe's best-known manufacturers.

Hot-dip galvanizing line 5, the latest addition to the range of galvanizing lines, has also been set up at voestalpine's Linz site. This line was supplied by Andritz Sundvik / Andritz Selas.

The line is designed for three different types of coating: zinc, zinc-iron, and zinc-aluminum-magnesium.

Annual capacity: 400,000 t
 Strip thickness: 0.4 to 2.0 mm
 Strip width: 800 to 1,750 mm

Power and communication on a single cable

As with conventional 4 ... 20 mA technology and HART communication, fieldbus technology enables both power transmission and communication simultaneously on a single cable - even in potentially explosive atmospheres. What is more, it also requires considerably less wiring, meets user requirements in terms of making installation much easier and safer, and affords all the benefits of digital transmission, right down to the last field device. In addition to these clear advantages, the ready-integrated PROFIBUS diagnostics offer the ideal physical and logical vantage point for early detection by means of reading out advanced diagnostics data, as well as for effective troubleshooting. Cross-standardization across all the existing lines, plus previous knowledge of working with fieldbuses, represented additional reasons why voestalpine Stahl GmbH opted for PROFIBUS DP and PROFIBUS PA on hot-dip galvanizing line 5 at their Linz site.

Field device configuration

As with hot-dip galvanizing lines 3 and 4, the proven PROFIBUS concept was selected for line 5. The Siemens automation system S7-400 serves as a higher-level control system.

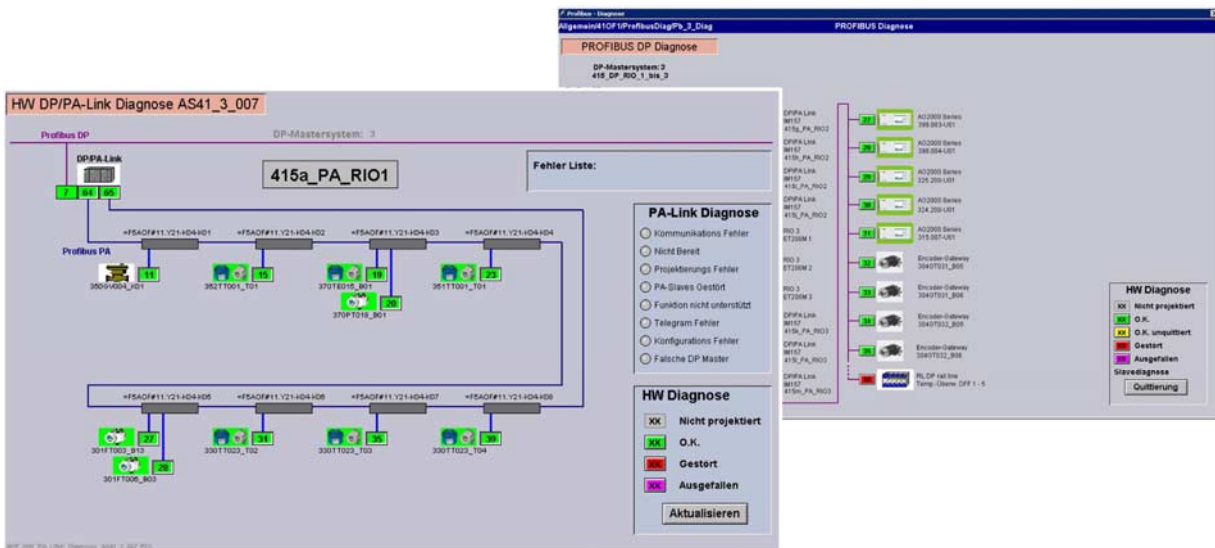
A dual processor system featuring eight RIO stations is responsible for regulating and controlling the furnace.

In addition to the digital I/Os, the PROFIBUS PA devices are connected to the RIO stations. These devices comprise 110 temperature transmitters, 108 pressure transmitters, 5 flow transmitters, as well as 7 gas analysis stations which operate via PROFIBUS DP - all supplied by ABB.

The engineering process was carried out by the PDM (Process Device Manager) integrated in the S7-400 controller, using EDD (Electronic Device Description), which is available for all the devices.

As far as the operator was concerned, key to the considerations in selecting the appropriate equipment were high-quality automation systems based on precision instrumentation, sensors, and actuators. In this respect, ABB's services covered professional dimensioning, component selection, and installation at the site. The many years of experience behind ABB's specialist personnel gave them the tools to make exactly the right choices, despite being faced with often challenging environmental and process-related conditions.

Even as early as the planning stage, one of the main areas of focus was on any maintenance work that would need to be carried out later on. Serviceability and keeping the range of types used to a minimum are key factors in this respect. Since ABB field devices and analyzers were already in use on other lines, and voestalpine had had consistently positive experiences of their serviceability and reliability, the types of devices to be used were specified.



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