competences

Metals: Reduce production costs and keep your plant safe

Endress+Hauser
People for Process Automation

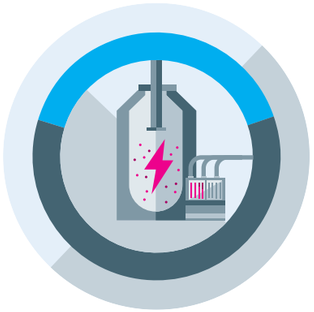
Your challenges are our mission

Our founder George Endress always used to say: “First serve, then earn!” By that he meant, that we must meet the challenges of our customers to be successful. And this mantra still leads us today. That’s why our offering of products, solutions and services is targeted towards your specific challenges. Currently, there are three topics that resonate with the metal and steel industry: process efficiency, plant safety and environmental compliance.

Process efficiency is a huge challenge for the metals industry for two reasons. One reason is that the markets have been very competitive during the last years which resulted in volatile prices and higher customer demands. Another reason is that energy is becoming more and more expensive. For the metal industry which spends up to 40% of their overall costs on energy, there is substantial potential for increased savings.

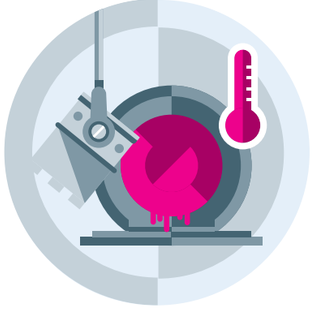
The topic of environmental protection and responsibility has become increasingly important over the last years. Although steel is one of the most recycled materials, it’s production still does impact the environment in various ways. Just think of water consumption and emissions. And with legislation becoming stricter because of the heightened environmental awareness, operators must make sure that their processes are environmentally sustainable.

High temperatures, molten metal and metal loads - steel production puts a lot of stress on both man and machine. Plus, many refining processes involve dangerous chemicals that must be handled with the utmost care. So, it is only natural that safety and availability are considered top priorities for steel plant managers. Not only to prevent potentially fatal accidents from happening but also to make sure production in an extremely competitive landscape never stops. But to achieve that kind of process control you need instrumentation that can withstand the harsh conditions within a steel plant.



Up to **40%** of the overall steel production costs are spent on energy

On the average an integrated steel plant takes in **28.6 m³** of water per ton of steel produced with an average water discharge of **25.3 m³**



Temperatures in steel production can go as high as **2,200 °C**

Extracting more from less

Reduce your production costs, keep your plant safe and boost compliance and responsibility

Volatile markets, rising energy prices and stricter environmental legislation - the ability to do more with less is now the new benchmark in the metals sector. All these trends drive an acute need for ever-better automation and tighter process control to optimize efficiency and plant availability while being environmentally compliant. Choosing the right partner for your instrumentation and automation projects has become increasingly important.

Endress+Hauser, with more than 65 years of experience in the metals industry, helps you sharpen your competitive edge. Based on this experience we have developed an extensive portfolio of measurement instruments, automation solutions and services according to the requirements of the metals industry.

Customers around the world gain a wealth of information from their processes by using our **products, solutions and services**

Relying on our **industry knowledge and skills,** we work together with our customers to find the best solution for every application

As a family-owned company since 1953, we are a reliable partner in every aspect – **for our customers, employees and shareholders**

Want to know more about or metal industry expertise?
Then visit us on www.endress.com/metal

Reduce your production costs

Process experts will guide you step-by-step to the best-fit products, services and solutions that actively reduce costs and maximize energy efficiency.

- Extensive instrumentation portfolio
- Smart sensors with wireless, digital connectivity and self-diagnostic functions
- In-depth industry knowledge

Boost environmental compliance

Our packaged measurement and control solutions ensure you meet emission regulations.

- Improved process control thanks to reliable measurement
- Instrumentation portfolio dedicated to water treatment
- Extensive environmental application knowledge

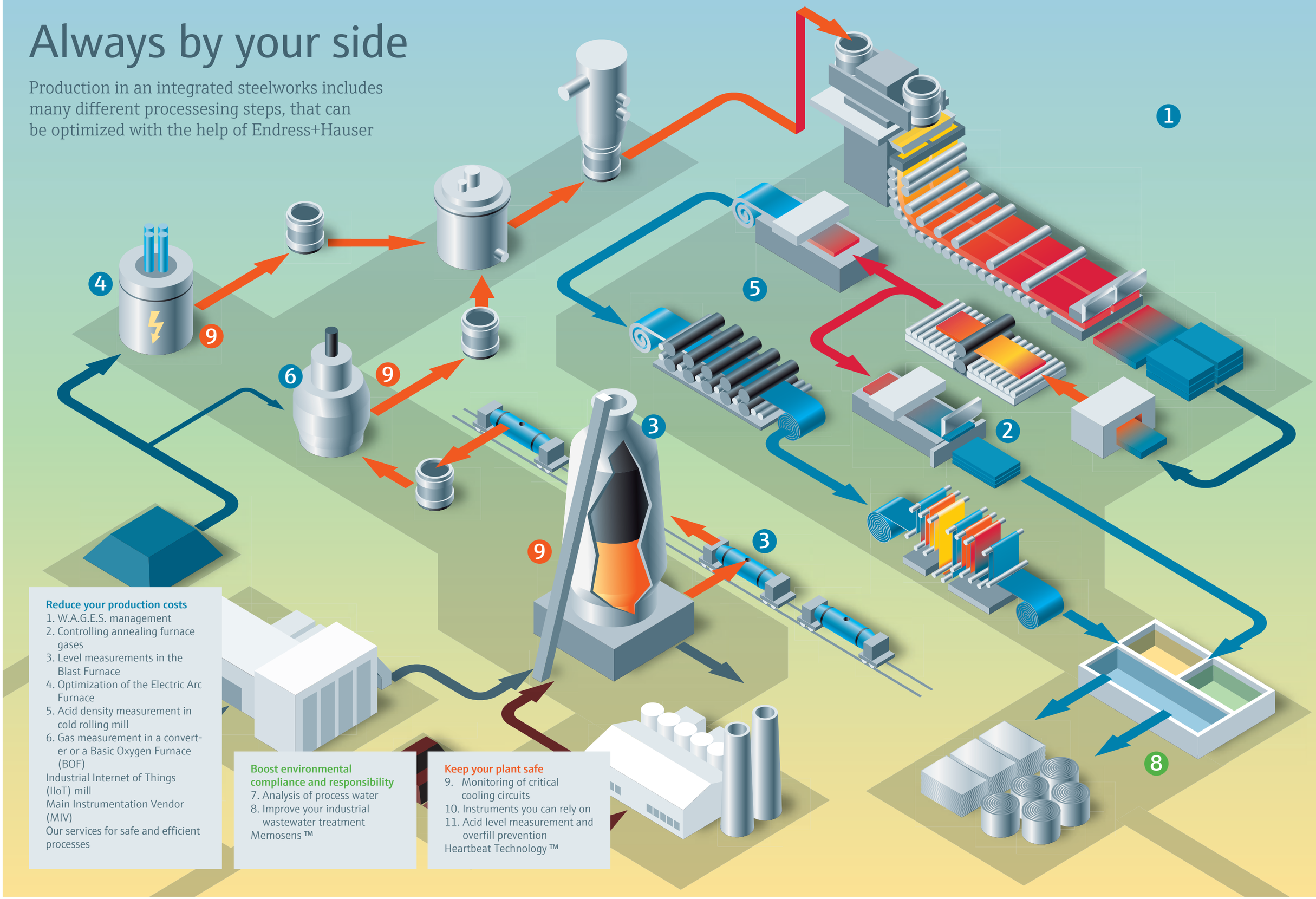
Keep your plant safe

Discover how safety and productivity go hand-in-hand, with solutions designed both to prevent accidents and enhance your competitive edge.

- Products designed according to SIL guidelines
- Self-diagnostic features for instrument verification
- Guidance through industry experts

Always by your side

Production in an integrated steelworks includes many different processesing steps, that can be optimized with the help of Endress+Hauser



Reduce your production costs
1. W.A.G.E.S. management
2. Controlling annealing furnace gases
3. Level measurements in the Blast Furnace
4. Optimization of the Electric Arc Furnace
5. Acid density measurement in cold rolling mill
6. Gas measurement in a converter or a Basic Oxygen Furnace (BOF)

Industrial Internet of Things (IIoT) mill
Main Instrumentation Vendor (MIV)
Our services for safe and efficient processes

Boost environmental compliance and responsibility
7. Analysis of process water
8. Improve your industrial wastewater treatment

Memosens ™

Keep your plant safe
9. Monitoring of critical cooling circuits
10. Instruments you can rely on
11. Acid level measurement and overfill prevention

Heartbeat Technology ™

Reduce your production costs

Process experts will guide you step-by-step to the best-fit products, services and solutions that actively reduce costs and maximize energy efficiency

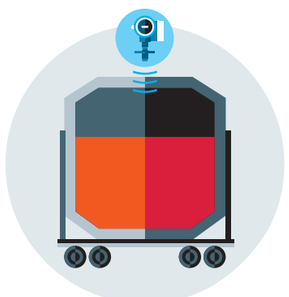
W.A.G.E.S. management

W.A.G.E.S. (Water, Air, Gas, Electricity, Steam) all play an important role in steel production. The steam, which is generated from water, is used as an energy source. So, naturally W.A.G.E.S. provide a huge potential for optimization by closely monitoring production and consumption. As Endress+Hauser not only offers a complete portfolio of different measuring technologies for parameters like **flow, pressure, level and temperature** but also **network, data acquisition and visualization applications**, we can offer integrated solutions to increase W.A.G.E.S. efficiency.
We have shown that a return of investment can be achieved within two years.

Industrial Internet of Things (IIoT)
The Industrial Internet of Things (IIoT) is one of the hottest topics in the metals industry right now and you can take the first step towards this digital future with Endress+Hauser. Thanks to the online connectivity of our products even difficult to reach measurement points can be monitored and calibrated easily. In combination with self-diagnostic functionalities like the Heartbeat Technology™ this enables instrument verification, advanced process diagnostics and condition monitoring functions. This gives managers an even greater control over their processes and helps them to make the right decisions to ensure efficiency and product quality. It also enables them to predictively plan maintenance to optimize the routines.

Controlling annealing furnace gases

When things start heating up – e. g. when plates and coils harden and temper in continuous annealing furnaces – robust measuring technologies are a must. The process needs to be monitored not only to ensure product quality, but also **to optimize energy consumption**. The first parameter for controlling the operation of the burner heads is naturally **temperature**. Another key component for an ideal combustion is the right supply of pressured air and mixed gas. That's why **pressure** must also be monitored. This way energy usage can be optimized. Ceramic sensor cells have proven to be the optimal solution in harsh conditions and high temperatures.



The availability of level measurement in a torpedo car can be increased up to nearly **100%** by using a contactless, free-space radar

Level measurements in the blast furnace

The profiles of the coke, iron ore, limestone and additives are important. To control the stacking, the **profile of the surface** is analyzed by up to five level instruments. For charging purposes it is essential that the axially symmetric bulk goods process is monitored when filling when with a rotating chute and that its positioning is controlled. Level is also a crucial parameter when the blast furnace is tapped and the molten metal is poured into a ladle or a **torpedo** car to prevent overspills.

Electric arc furnace optimization

The electric arc furnace (EAF) is the heart of electric steel-making, where electrical energy is used to melt the main feed materials, solid scrap and/or direct reduced iron (DRI). For optimizing process reliability, **flow, pressure and temperature sensors** play an important part. They perform their tasks dependably in the tough, hot environment and assist with leak detection of compressed air and the control and analysis of argon and nitrogen, natural gas, oxygen and water. Robust and reliable field instruments help to improve efficiency of the energy input into the furnace.

The production of one ton of steel from scrap metal reduces air pollution by **85%**

Main Instrumentation Vendor (MIV)
Endress+Hauser offers a broad portfolio of sensors with various measuring principles, automation solutions as well as associated services. This results in reduced complexity for our customers during the whole life-cycle. Beginning with the planning phase, working with a MIV simplifies selection and coordination as well as installation of the instruments. During operation, using instruments from only one supplier makes handling them easier and also facilitates data collection. Maintenance also gets easier, as the number of spare parts necessary is reduced.

Our services for safe and efficient processes
Our dedication towards improving your processes does not end with the delivery or commissioning of a new sensor. Our worldwide service offering supports you during the whole lifecycle of your plant. Apart from quick technical support we also offer calibration and maintenance services so that you can always rely on your measurement instrumentation. Our experts can recommend maintenance routines and with innovative tools such as our lifecycle management platform (W@M) or our Installed Base Analysis offering can improve maintenance routines and optimized spare part stockage.

Acid density measurement in cold rolling mill

Concentrated hydrochloric acid is used to to clean mill scale from steel plates in cold rolling mills. As the acid is constantly reused, it gets contaminated by iron chloride and deposits on the plates. This can result in the acid becoming over concentrated or crystallizing. By measuring the **density of the acid**, the concentration is determinated and if necessary, the addition of rinse water can be prompted. Installing the density measuring line saves time and money. In addition, there is no longer any need to transport aggressive and toxic media to the lab, which means reduced health risks for operators.

Gas measurement in a converter or a basic oxygen furnace (BOF)

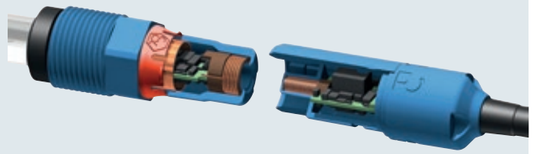
For the conversion of pig iron into steel in the BOF, argon and oxygen are needed. Measuring the flow and the mass of these gases has two benefits. On the one side, these parameters are important for the performance of the whole process and the quality of the produced steel. On the other hand, converter off gases can be used as an energy source. So, having a clear picture on how much gas is forming, can help you optimize the usage of the gases. Endress+Hauser has flowmeters which are specifically designed to measure the flow and mass of gases.

Planning tools that will make your life easier
We offer intelligent tools that support you during all project phases. Starting with "Applicator", a software that helps you to quickly find the 'best fit' instrument for your task. You can access it via our website or download it to your computer. With it you can determine the most suitable product and measuring technology for your industry. It also allows you to scale your measuring points to prepare further purchase. And our web based "W@M" portal gives you even more insights to support your engineering during the whole lifecycle. It provides you with documentation of all processes and instruments such as 2D & 3D models and hook-up drawings. The recorded engineering data will help you with commissioning and maintenance.

Boost environmental compliance and responsibility

Our measurement and control solutions ensure you meet emission regulations

Memosens
The Memosens Technology™ for liquid analysis is based on digital, intelligent sensors with an integrated data chip. The digitalization of raw data in the sensor head itself makes it possible to achieve a stable measurement regardless of external influencing factors (e.g. moisture, dirt or electromagnetic interferences) and reliable transfer of data. The data chip in the sensor head stores all relevant, sensor-specific information such as calibration data and history. Therefore, calibrating the sensor can be done under optimum conditions in the laboratory and they even can be regenerated. This simplifies calibration and results in a longer service life of the sensor.



Analysis of process water

Before process water can be safely used or reused it must be analyzed to make sure it does not harm the process or the equipment. Think for example of **cooling water**. Without checking the pH or oxygen value, algae can start to grow in the cooling pipes or the pipes might suffer from corrosion. Another example is buildup **condensate** in steam pipes. That water must be removed. But before it can be reused as feeding water for steam generation, operators have to ensure that it has the right composition. Endress+Hauser offers a whole portfolio for liquid analysis including digital sensors and transmitters. We also offer containers and space-saving panels that can be individually equipped with instruments that specifically fit our customers' demands.

Improve your industrial water treatment

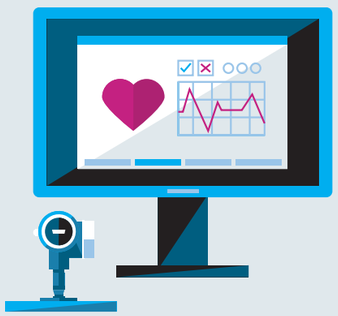
Water plays an essential role in the steelmaking process. One of its primary uses is as a cooling agent. But it is also utilized as a lubricant or in pickling and cleaning processes. Whatever the application, in most cases, the used water needs to be treated before it can be safely discharged. Endress+Hauser has decades of **experience in the water industry** and has the portfolio for the most common treatment processes. The portfolio includes liquid analyzers, flow and pressure sensors and **automation solutions**, which make your treatment reliable and efficient.

Keep your plant safe

Safety and productivity go hand-in-hand, with solutions designed to prevent accidents without losing your competitive edge

Critical cooling water circuits

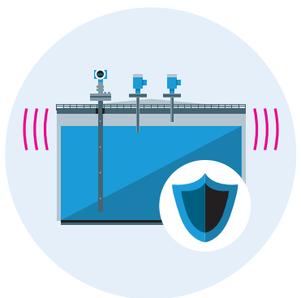
Malfunctions in water cooling circuits can be very critical to both equipment and personnel. Especially in a steel plant, where they are used to control the very high temperatures of various types of oxygen lance cooling in converters and wall and roof panels of electric arc furnaces. Regardless of the application or the cooling circuit type, our **leakage detection solution** reliably monitors the cooling circuit. It measures the inlet and outlet flow rates of the circuit by means of suitable flowmeters, either electromagnetic or ultrasonic. The inlet and outlet temperatures are acquired from sensors mounted near the flowmeters. The system displays these values and can be for density compensation set up to automatically create an alarm.



Heartbeat Technology
Thanks to the Heartbeat Technology™ measurement points can be easily verified without interrupting your processes. As the devices continuously diagnose themselves, test cycles can be extended. The self-diagnostic functions of our instruments increase the reliability and safety of critical measurement points, but also support your documentation by automatically generated reports. These reports also provide precise instructions for necessary maintenance procedures. Furthermore, the process and device parameters can be used to optimize your maintenance efforts and your processes as such.

Instruments you can rely on

Process control is only as good as the instruments being used. To assess a sensor, operators can rely on industry standards such as the IEC 61511. It describes Safety Integrity Levels (SIL) that are an established benchmark for the safety integrity of a system. Endress+Hauser has one of the most extensive portfolios of IEC 61508 certified instruments created according to safety by design standards. For hard- and software development, we have implemented standardized measures to avoid systematic faults and control random failures.



Our overfill prevention solution is designed for up to **128** tanks and has an automated proof-test sequence

Acid level measurement and overfill prevention

Creating high-grade metal sheets includes pickling. This process step uses different kinds of acids to remove impurities. Handling these acids poses an environmental challenge and a safety issue. Above all, the acid storage tanks must be closely monitored to prevent an overfill. Endress+Hauser offers radar level instruments which are specifically designed to withstand aggressive media and support you with the installation to produce reliable results. We also offer a complete overfill protection automation solution which will help you fulfill prevention requirements and save you time and money.

References

Modernization of blast furnace

Customer challenge:
A steel plant in France had to be modernized to increase production capacity. To meet this goal, one of the key projects was the refurbishment of one of it's blast furnaces. This included the installation of new measurement equipment and the replacement of the old analog signals with a standardized field network.

Our solution:
To ensure the quality of the overall project Endress+Hauser formed and entered a joint venture with two French companies. Together, they planned, supplied, installed and commissioned the entire instrumentation lot within set time-frames. Specialist technicians from Endress+Hauser commissioned 1,100 sensors directly on the blast furnace and supervised 700 others in the peripheral workshops, such as the gas cleaning system and slag treatment, all connected by the digital network. More than 400 sensors on the blast furnace are connected via the field network PROFIBUS.

Customer benefit:
- Only 95 days of downtime
- Higher productivity
- Predictive approach to maintenance thanks to digital sensors and field network
- The project was so successful that a second blast furnace was revamped in the same way

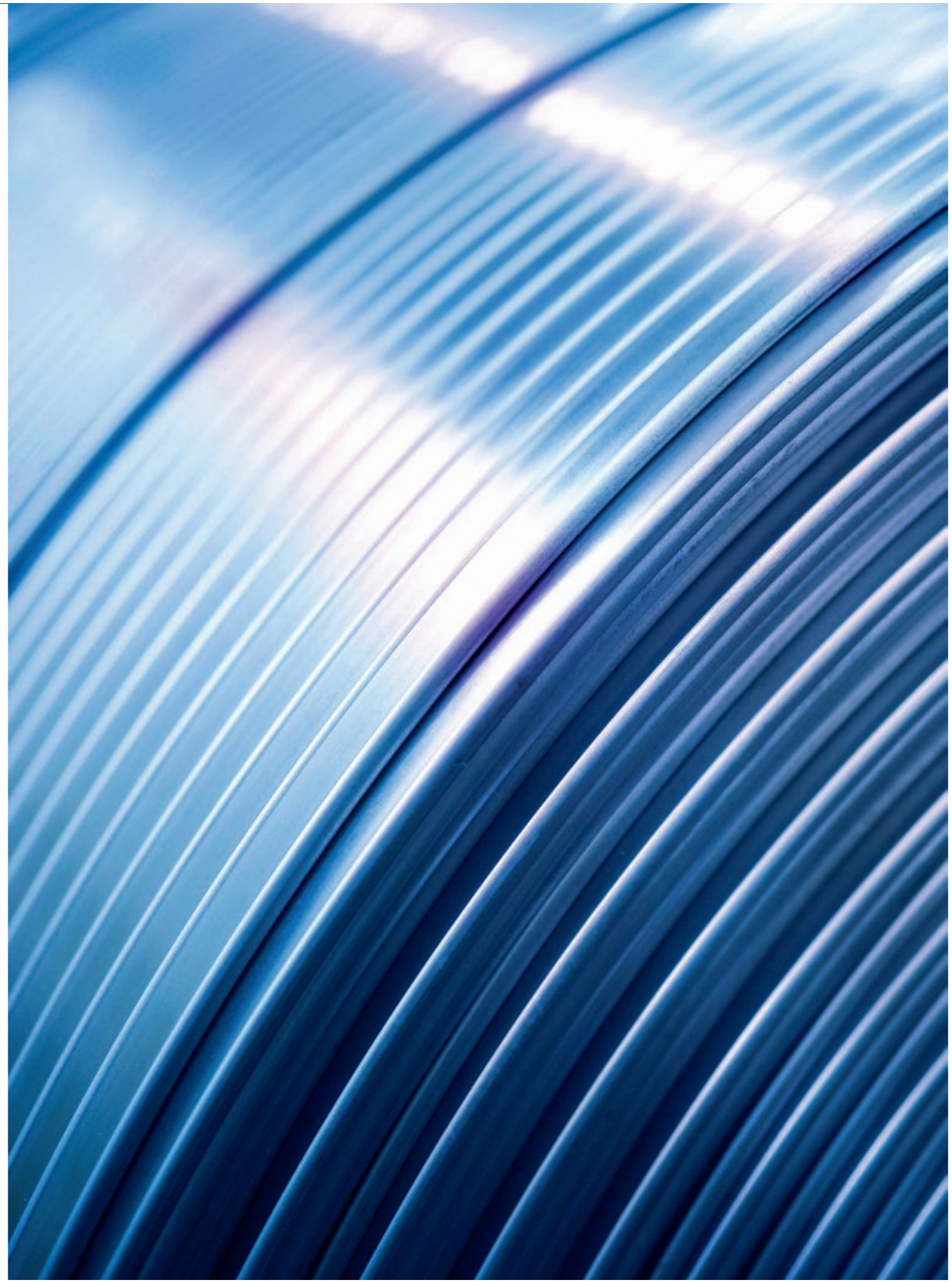
Wireless temperature monitoring for detecting damage to bearings

Customer challenge:
One of the leading heavy plate mills in Europe uses a four-high rolling stand to reshape steel slabs. This process is very demanding on the equipment because of the temperature and the rolling forces at work. For example, roll neck bearings, located on the drive side of the upper and lower back-up roll are put under a lot of stress. If they are damaged, replacement is costly and time-consuming.

Our solution:
By measuring the temperature of the lubrication circuit at the inlet and outlet, a higher degree of friction at the bearings can be detected, which can result in damaged bearings. As the ambient conditions are challenging, the thermometers must be highly resistant to heat. That's why sensors with a weld-in thermowell were used. And, as wiring is very difficult in such an environment, the sensors were equipped with an adapter which enables wireless data transmission based on the WirelessHART standard.

Customer benefit:
- Detection of any damage to the friction bearings
- Predictive maintenance intervention
- Protection of the costly friction bearings

... and how can we help to improve your processes?
Visit us at www.endress.com/metal



References

Maximum efficiency when recycling scrap material

Customer challenge:
A German engineering company is developing innovative and efficient machines and facilities for steel mills all over the world that recycle scrap metal. For the energy-intensive operation of steel mills, process reliability, resource and energy efficiency and environmental impact take top priority.

Our solution:
For optimizing process reliability, Endress+Hauser flowmeters, pressure and temperature sensors play a part. They perform tasks reliably in the tough, hot environment and assist with the search for leaks and with the control and analysis of compressed air, compressed natural gas, oxygen and water. They help to improve efficiency with the energy input into the furnace.

Customer benefit:
- Global presence
- Reliable products
- Long life cycle

Steam monitoring pays off in less than two years

Customer challenge:
A steel plant in Bosnia and Herzegovina produces hot rolled products (rebars, wire rods, mesh, lattice girders, classic construction armatures) mainly for the Balkan, EU and North African markets. Steam is one of the main energy sources used in the production. But although steam consumption is very important to the profitability of the company, consumption by different internal customers was only being calculated according to empirical standards.

Our solution:
Endress+Hauser integrated a turnkey steam monitoring solution into the company's existing energy monitoring system.
The solution includes:
- Instrumentation and energy application managers
- Data acquisition and visualization
- Mechanical installation Endress+Hauser also performed all the associated services that were required.

Customer benefit:
- Accurate, consolidated data on steam output, transport and consumption
- Controlled steam consumption via precise metering of each consumer

... and how can we help to improve your processes?
Visit us at www.endress.com/metal

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