READY FOR THE FUTURE

The magazine for the Annual Report

2022

STAHL

Order intake

313.5

€ million

Sales

274.3

€ million

EBITDA

20.6

€ million

Employees

1,676

Key figures R. STAHL Group 2022

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There can be no progress without change. The world we live in is in a constant state of flux and a transformation is needed, one that will set an entirely new path forward in the economic environment. Dr. Mathias Hallmann, CEO of R. STAHL, talks about market trends, growth opportunities and the increasing need for forward-looking solutions in explosion protection.

Dr. Hallmann, you say that R. STAHL is well positioned for the future. Where do you get this confidence?

Dr. Mathias Hallmann: We are in the midst of a social and, because the two are inextricably linked, an economic transformation. Advances in technology and, above all, the array of global challenges that have to be addressed are increasing the pace of existing megatrends such as decarbonization, individualization and the reconstruction of local value chains in combination with meaningful international cooperation. As these trends unfold, numerous application needs and opportunities for explosion protection solutions arise. At the same time, we have positioned R. STAHL profitably again by consistently pursuing our Group strategy. My confidence is based on the combination of these two factors.

Where exactly do R. STAHL products support the transformation you have just described?

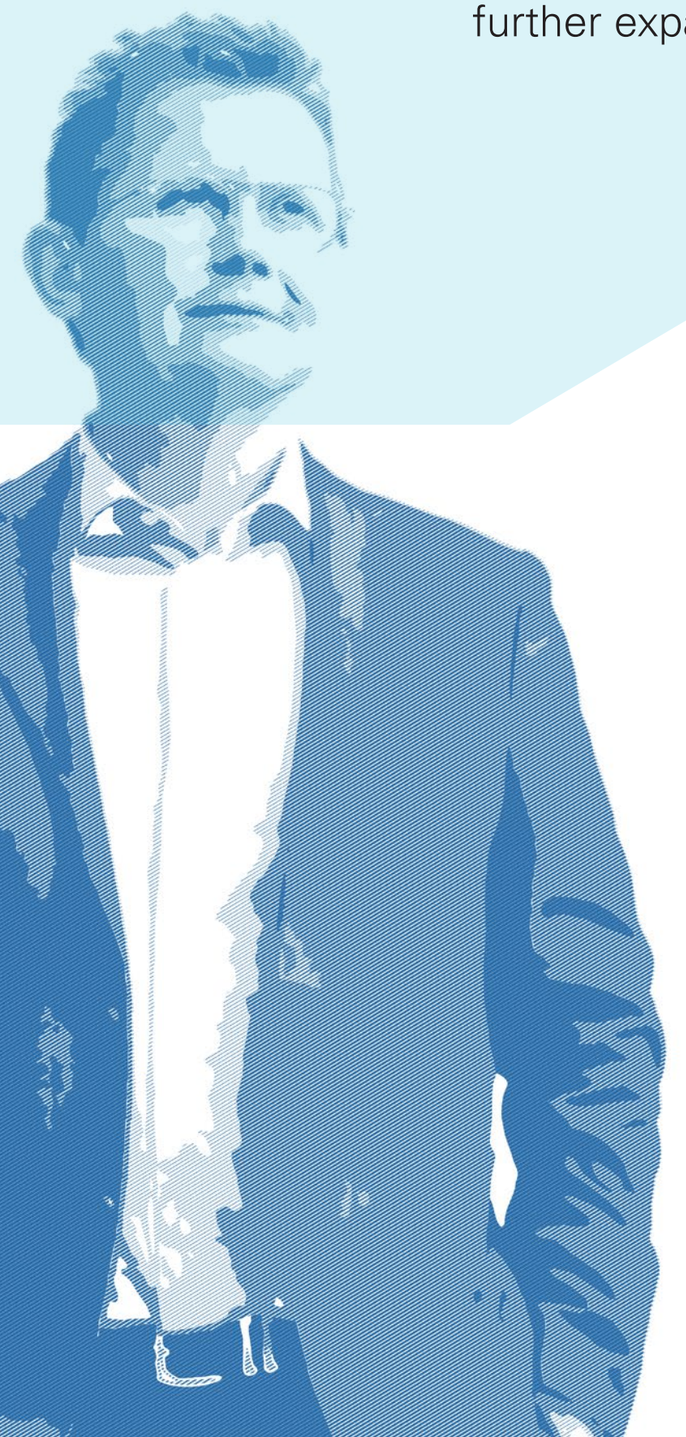
Dr. Mathias Hallmann: Every one of our customer industries is being impacted by the transformation: chemicals, pharmaceuticals, power generation, shipbuilding, even the food industry. Let's take electromobility as an example: Not only does it require enormous amounts of electrical energy, but also new types of lightweight but still sufficiently strong materials such as specialty plastics and carbon fiber materials. The e-vehicles are powered by high-performance batteries that are manufactured in the most environmentally friendly and resource-conserving way possible. All these factors mean that our customers in the energy and chemical sectors have new demands for explosion protection solutions, because many of the substances used in these processes are flammable and therefore explosive.

Population growth in developing countries is also creating a sharp rise in demand for products from the chemical industry. People need clothing, which requires textile fibers, and want to live as comfortably as possible, which requires construction chemicals such as insulation materials, varnishes and paints. The aging of the population in industrialized nations is also leading to a higher demand for pharmaceutical products. At the same time, there is a growing trend toward customized medicines, which in turn is leading to changes in production processes toward flexible manufacturing and smaller batch sizes. Meeting these challenges will only be possible with digitalization, networking and the use of appropriate automation technology.

Keyword energy transition – what does it mean for R. STAHL if crude oil is increasingly losing its significance in the energy mix?

Dr. Mathias Hallmann: Our company traces its roots back to supplying the chemical industry and, as I just mentioned, that's where we see our future, in addition to other customer segments. We are also closely involved in the energy transition, particularly in the area of LNG, or liquefied natural gas. LNG has become crucial in many ways, especially since the outbreak of the Russia-Ukraine conflict and the energy crisis that was triggered by it. R. STAHL has been serving the shipbuilding industry for many years now and almost every LNG tanker in operation today already has R. STAHL explosion protection on board. We are also a leader

"Strategically, we are well positioned. Long-term market trends provide R. STAHL with tremendous opportunities to further expand our business."



in energy distribution systems for LNG unloading and loading systems. Additional areas of application will emerge for us in the form of new types of LNG-based marine propulsion systems.

From the standpoint of climate protection, natural gas has a much lower impact on the environment than coal and crude oil, as it emits significantly lower amounts of carbon dioxide per unit of energy. This makes the use of LNG an excellent bridging technology to hydrogen. In terms of energy carriers, the future will ultimately belong to hydrogen, although we do not expect its widespread use to become a reality until the medium term. Even today, however, almost all our products are suited for use with hydrogen – and of course there is potential there for our company, because hydrogen is known to be highly explosive.

That's the market side. How have you prepared the company for future challenges?

Dr. Mathias Hallmann: We have been consistently pursuing an excellence strategy since 2018. Initially, this strategy was focused on efficient processes and structures, then technology and growth dynamics soon became part of our action plan. Market and technology-driven innovations followed. At last year's ACHEMA, the leading trade show for the process industry, we received very positive customer feedback on our range of new developments. The topic of sustainability rounded off the strategy. In addition, we have now expanded *R. STAHL EXcellence 2030* to include the value drivers digitalization and internationalization.

Digitization now impacts all areas of industry and life. What does this mean for R. STAHL? And what exactly do you mean by internationalization?

Dr. Mathias Hallmann: We see digitalization pushing in three different directions. On the one hand, the proportion of digital and smart functions in our products is constantly rising. At the same time, it is impossible to imagine our own processes and production lines without digitalization. We are also looking at a number of new areas of business within the framework of digital opportunities. With regard to internationalization, R. STAHL already has a very strong market position in both Germany and Europe; however, we still see significant growth potential in global markets, especially in Asia, the Middle East and Africa. We will now focus more intensively on gradually tapping into this potential.

What kind of start did R. STAHL have in 2023 and how do you expect things to develop in the future?

Dr. Mathias Hallmann: On the heels of the crisis-plagued years 2020 to 2022, we have noticed a significant easing since the middle of last year. The impact of the pandemic and supply chain issues is weakening, something that is reflected in both order intake and sales. A satisfaction analysis of German customers confirms that we have succeeded in clearly setting ourselves apart from the competition through solution orientation and reliable customer support. Reliability and product quality are more important than delivery time. Customers appreciate our sincere efforts to provide them with optimal solutions despite the supply chain issues that everyone is aware of. As a result, we started 2023 with a record order backlog that delivers considerable value. Long-term market trends as described earlier also offer tremendous opportunities to further expand our business by providing sustainable support to our customers in their transformation process.

Thank you very much, Dr. Hallmann, for taking the time to talk to us and for the interesting insights into markets and companies.

belonging to R. STAHL

18

operating subsidiaries

as well as

59

international offices

in more than

65

countries

R. STAHL – A leader in explosion protection

R. STAHL is one of the leading global suppliers of products for electrical explosion protection in the world. With a comprehensive portfolio of electro-mechanical, electronic and automation technology components as well as customer-specific system solutions, we deliver uncompromising safety – even in highly demanding applications and extremely challenging locations. Our strong market position is the result of high level of technological competence, market-leading products and innovative developments. With subsidiaries, production facilities and sales offices, R. STAHL is present in the European markets, in the Middle East and South Africa, in the Asia-Pacific region as well as in North and South America.

Strategic market development

Demand for electrical explosion protection solutions is increasing and is driven by global trends. In order to take advantage of the resulting growth options, we are pushing the expansion of our market shares. The goal is to at least maintain R. STAHL's strong market position in Europe and to sustainably expand market penetration in all other parts of the world, especially in the Middle East and Asia.

Safety for all kinds of industrial applications

Electrical explosion protection is a core aspect of safety engineering. It plays an essential role wherever flammable substances are industrially produced, transported, stored or processed. The chemical and petrochemical industries are therefore just as dependent on electrical explosion protection as the pharmaceutical industry, the energy sector, the food industry and many other industrial sectors.

With a wide range of innovative products and sophisticated system solutions, R. STAHL ensures reliable protection and a high degree of safety in potentially explosive atmospheres. We offer customers from a wide range of industries a basis for their safe handling of flammable gases, vapors, mists or dusts.

From a technological standpoint, R. STAHL is a leader in all common types of ignition protection. In cooperation with our customers throughout the world, we rely on one-stop solutions and cover all necessary individual tasks related to electrical explosion protection, from consulting and engineering to system integration and project management to certification and commissioning.

The three most important types of **ignition protection** for safety that is reliable

INTRINSIC SAFETY

The energy quantities occurring in an electrically operated device are reliably kept below the energy level required for ignition. Sparking therefore does not occur. Ignition protection via intrinsic safety is suitable for electrical components with low voltages and currents.

INCREASED SAFETY

Special design measures prevent the build-up of ignition sources inside sealed and mechanically robust housings. The outer housing surfaces are also free of ignition sources.

FLAMEPROOF ENCLOSURES

Electrical equipment is installed in special enclosures that can withstand explosion pressure and prevent explosion propagation to the outside. This type of protection is ideal where contact between electrical sparks and explosive mixtures is unavoidable. It also allows the use of non-explosion-proof components in potentially explosive environments.

R. STAHL guarantees the safe operation of electrical systems in areas exposed to explosion hazards – at any time and in almost any place.

A strategy to secure the future

We are consistently expanding R. STAHL's leading market position in electrical explosion protection. To this end, elements of the *EXcellence 2023* strategy will be updated, expanded and transferred to our modified group strategy *EXcellence 2030*. The key value levers technology and efficiency will remain, combined with the market-driven requirements and potentials of the sustainability and growth fields. The focus areas internationalization and digitalization have also been added. With its broader orientation, R. STAHL is safeguarding its technology leadership and creating an optimal foundation for further expanding its market share.

Technology and efficiency value levers

What sets R. STAHL apart is its unique expertise and exceptional technological competence. Market-driven product innovations and extensions to the product portfolio are garnered from market requirements and the corporate strategy. This results in attractive solutions that optimally meet current and future customer requirements. Efficient internal and external processes and structures are the foundation of our success. Wherever feasible, we standardize as part of our effort to simultaneously serve customers and markets as individually as possible. There is a continued focus on the successful technology and efficiency value levers, making it possible for us to continuously improve our performance level.

Value drivers digitization and internationalization

Digitalization has become indispensable as an essential function in the interaction with almost all external and internal stakeholders. Digitalization is playing an increasingly important role not only in our communication with customers, but in production and delivery processes as well. Opportunities for networking or big data also often constitute the basis for technological trends. R. STAHL is has responded with a global digitalization strategy that covers three key elements: digital business processes, digital products and digital business models. Global processes rely on a common understanding. That is why the focus is shifting to internationalization as an additional growth driver. Our goal is uniform data, processes and structures at all R. STAHL locations, taking into account local and cultural factors.

The six dimensions of our Excellence 2030 Group strategy

READY FOR THE FUTURE

Society and industry are evolving. We support forward-looking trends.

Companies are only successful if they continually adapt to new developments and challenges. Change impulses can come about in a wide variety of ways. They are sometimes the result of technological progress or demographic conditions, sometimes of geopolitical developments, general social aspirations or market changes. Today in particular, many factors are converging to demand comprehensive transformation in a number of industries.

The chemical industry, for example, is challenged by the shift away from fossil raw materials and energy sources. But this industry is also being challenged by stricter political regulations aimed at sustainable value creation processes, such as the promotion of recycling processes. At the same time, the development and application of modular plant concepts that allow flexible production processes are increasingly necessary. This is a trend that is also impacting the pharmaceutical sector. Because the world's growing population and the higher average life expectancy not only demand steadily increasing production volumes to satisfy growing demand for medicines. Pharmaceuticals are also increasingly being used in customized form, which necessitates smaller batch sizes and rapid batch changes in the production process. Automation technology is an essential precondition for meeting these requirements. Given the backdrop of global crises and disrupted supply chains throughout the world, the focus is also increasingly on manufacturing close to the sales markets. Bringing back production capacity from other places, however, requires building new capacity in Europe, a step that can only be kept within the necessary cost framework if it is comprehensively automated.

Last but not least, virtually every industrial sector is impacted by the energy transition, first and foremost the energy industry itself. Oil and coal are not yet completely a thing of the past. But climate-friendlier liquefied natural gas (LNG) and hydrogen are rapidly gaining in importance. New technologies, safety concepts and infrastructure are needed to make the switch to these energy sources a success. In the LNG sector, a large number of loading terminals will be required in addition to large specialized tanker fleets, while hydrogen technology will see similar developments within the next few years.

As different as the individual movements and developments are – one essential common characteristic is the growing need for solutions from R. STAHL. Be it automation, energy transition or orientation towards greater sustainability – for the implementation of each of the trends mentioned, our products and systems take on important tasks to ensure safety. This qualifies R. STAHL as a reliable partner as we progress into the world of tomorrow. And as a company whose future potential is supported by powerful trends.

ENERGY

The era of coal and oil is coming to an end. In the future, hydrogen will play a key role in the supply of energy and raw materials. In the transition from a fossil to a hydrogen-based energy supply, natural gas acts as an important bridging energy source. Natural gas is not only much lower in carbon than coal and oil. When it is converted into LNG – liquefied natural gas – it can also be transported over long distances and stored easily. As a result, natural gas and LNG are now the most important of the fossil fuels. Alongside renewable energies, nuclear power also plays a role in meeting demand. Throughout the world – and now also in the EU – nuclear power is considered a climate-friendly energy source. The development of a supply of hydrogen, the energy source of the future, has begun. And it has promising prospects. Hydrogen can, for example, be used as an energy storage medium to compensate for fluctuations in the supply of renewable energies, transfer nuclear energy to mobile applications, or serve as a basic raw material for the production of synthetic fuels and a variety of chemicals.

Natural gas & LNG

Natural gas and LNG are helping to bridge the gap to hydrogen technology. We equip natural gas-based infrastructure with the necessary electrical components and systems – for example, onshore and offshore conveyor and loading facilities, LNG carriers and LNG terminals.

Hydrogen

Global hydrogen production is forecast to increase fivefold by 2050. We supply the explosion protection that is necessary for this development. Over 90% of our products are already designed for hydrogen applications and certified accordingly. We also advise and train our customers on hydrogen-specific safety technology.

Nuclear energy

There are more than 150 nuclear power plants currently in the planning or construction phase worldwide. We provide the appropriate lighting systems and installation technology such as connectors for this purpose – radiation-proof, load-proof and earthquake-proof.

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DIGITAL-IZATION

more about digitalization
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Digitalization is opening up new opportunities in virtually every area imaginable. Companies that are pressing ahead with their digital transformation gain considerable advantages over the competition. They can make processes more efficient, use technologies more effectively, accelerate innovations, initiate targeted forms of collaboration and reduce the time they spend and costs they incur. R. STAHL is taking a multilayered approach to digitalization: First of all, we provide products and systems for the end-to-end automation of all functions – right down to the Ex area. We support our customers, for example, with digitally networked lighting systems from planning to installation and programming, commissioning to control and monitoring of ongoing operation. Secondly, we are consistently digitalizing our own business processes, thereby perceptibly increasing their efficiency and, thirdly, with solutions such as the digital product passport, the digital twin and other similar solutions, we are also enabling our customers to implement such modern business models.

Digital networking

R. STAHL implements digital lighting systems with lighting control options, also for areas where there is a risk of explosion. Our solutions can be coupled with IT systems for building automation and also enable remote monitoring in addition to predictive maintenance.

Innovation driver

We are pioneers of Industry 4.0 in our field and work on solutions that promote progress. Typical examples include the development of digital nameplates, collaboration in the implementation of new network standards or remote-controlled signaling systems for autonomous ships.

Digital company

Internally, we create structures for globally uniform data, processes and structures. This gives R. STAHL additional leverage in areas such as product development and sales. At the same time, we are making every effort to ensure that our processes are automated, using our own robotics expertise in addition to robots and cobots in the production process.

SUSTAIN-ABILITY

Today, sustainability is not only a social matter of consensus, but also one of the keys to economic success. Companies throughout all industries are aggressively pursuing ambitious sustainability strategies, and R. STAHL is working to provide targeted support that helps them implement these strategies. With reliable explosion protection solutions, for example, we not only contribute to higher safety standards, but also help to prevent the kind of environmental damage that can be caused by incidents. Our LED luminaires and controllable digitalization solutions allow for an efficient use of energy; the Smart Lighting System adjusts outdoor lighting to the ambient brightness, thereby reducing energy consumption and light pollution. R. STAHL itself is committed to ESG (Environment, Social and Governance) criteria. Our products are designed to last. This approach eliminates the need for frequent replacements and prevents the consumption of resources that would be required for replacement products. We focus on lightweight construction, which reduces the use of raw materials and at the same time brings savings in transportation and installation. Environmental management systems are equally standard as initiatives with regard to a lower carbon footprint and life cycle management. As an employer, R. STAHL focuses on equal opportunities and promotes employees according to their potential.

Sustainable products

Products and systems from R. STAHL help customers achieve their sustainability goals – not only in terms of safety, but also in terms of energy efficiency, resource conservation and climate protection.

Orientation toward ESG criteria

In our orientation toward ESG criteria, we are not averse to following the path less traveled. Our own solar parks, for example, supply more green electricity than is needed for production. In other words, R. STAHL is already well on its way to becoming a climate-neutral company.

Committed to the future

We consider our responsible corporate governance a social obligation – and we also see it as an opportunity to further secure both the stability and the positive future outlook of the company beyond the scope of our operating business.

more about sustainability on pages
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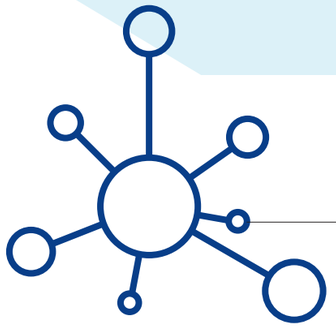
R. STAHL MAKING ITS MARK IN NEW INDUSTRY

In many countries around the world, nuclear power is viewed as an indispensable contributor to the energy transition and climate protection. As a result, the number of nuclear power plants under construction around the world is increasing year by year. One of these is Hinkley Point C, a nuclear power plant in southwest England that is expected to go into operation in 2028. R. STAHL was asked to supply, among other things, resistant linear and emergency luminaires as well as plugs and sockets. As a specialist for complex solutions, R. STAHL succeeded in convincing the French operating company of the power plant and winning an order with a value of eight million euros. In the run-up to approval, all the planned luminaires had to pass a radiation, load and earthquake test. These tests revealed that R. STAHL products more than met the exacting requirements in the nuclear environment. Not only that, but R. STAHL also implemented a customer-specific solution for the power plant that addresses a problem faced by all nuclear power plants: In areas exposed to high levels of radiation, semiconductor components in electronics generally do not perform reliably. In response, R. STAHL developed a concept for Hinkley Point C that separates the electronic operating devices from the luminaire. This approach makes it possible to install the electronics in a control cabinet that is located at a safe distance from the exposed area. This is a very good solution, especially for the emergency lighting function, for supplying extraordinarily exposed areas without having to install sensitive technology there. With this order, R. STAHL has managed to gain a foothold in an industry that is still new to the company and is likely to offer further potential on an international level in the years to come.



Engineering Base: Efficient design for complex solutions

Complex customer-specific solutions where each team member works on his or her specific topic – across languages and time zones. To make this happen, R. STAHL has laid the foundations for an international division of labor in engineering with Group-wide consolidation on a standardized engineering platform. The underlying basis for this is a globally standardized data model for every customer project and all stages of the value chain: the so-called "Single Source of Truth". With a direct link to the central ERP system, all data is seamlessly interconnected, up-to-date and accessible to all participants. The system uses interfaces to communicate with machines as well as analysis, simulation and design tools. The result of the digital cooperation is lower development costs, shorter development times, more scope for individual customer solutions and collaborative development within the Group that uses and specifically combines the most diverse range of individual strengths.

Improved climate balance with lightweight construction and LEDs

6.7

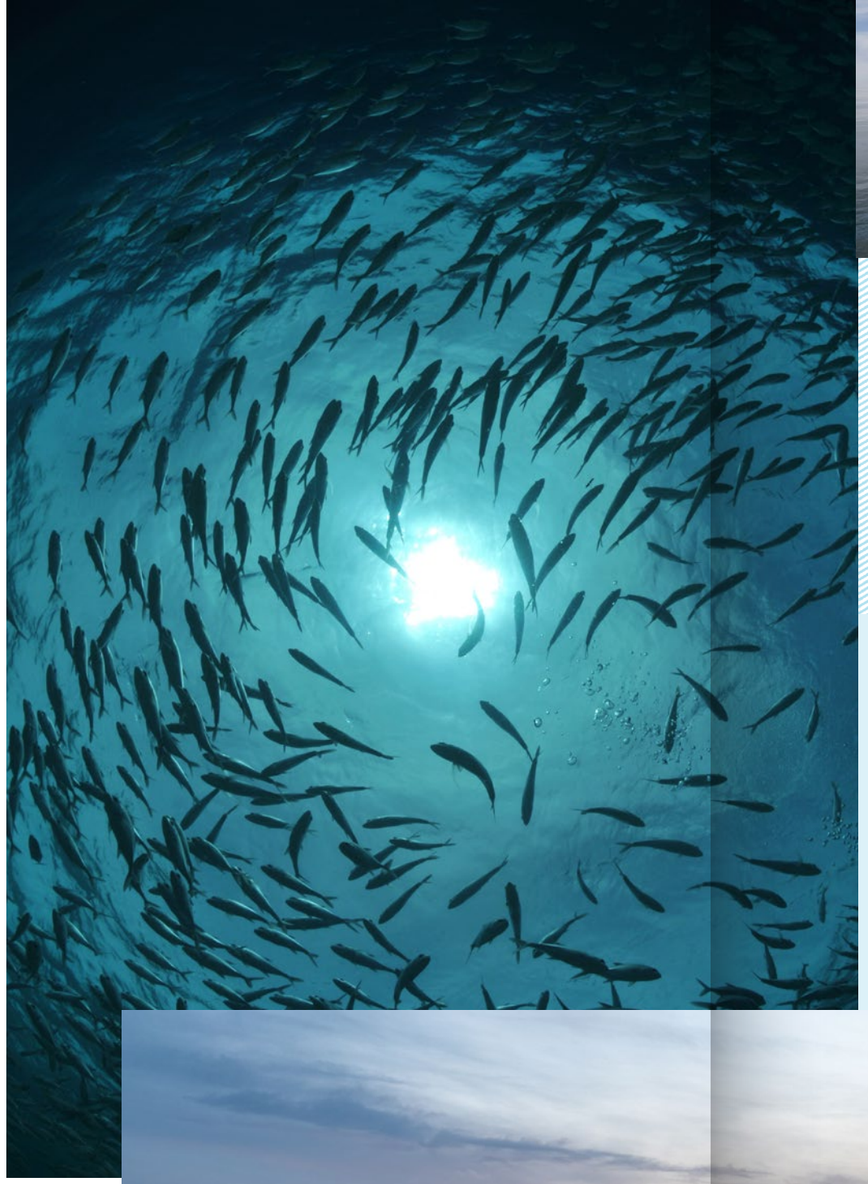
Lightweight construction enables R. STAHL to save 6.7 t of CO_2 in the production of the pioneering EXpressure® enclosures – with full functionality and safety.

An ever-increasing number of companies are having their carbon footprint certified – currently on a voluntary basis. R. STAHL, too, has long been committed to climate protection and helps keep the product and process-specific volume of carbon dioxide to an absolute minimum with products such as the 6036 tubular luminaire with LED or the EXpressure® enclosure series. The EXpressure® technology, for example, which is unique worldwide, is characterized by enclosure wall thicknesses limited to just a few millimeters. This makes it possible to save 50% to 70% of material and thus up to 6.7 metric tons of CO_2 in the production of the enclosures while retaining full functionality and safety, depending on the design.

The switch from fluorescent lamps to highly efficient LED light sources also plays an important role in reducing the carbon footprint. Students at the Jena University of Applied Sciences examined the 6036 tubular luminaire with LED for its CO_2 emissions and compared it with a fluorescent lamp. The entire cycle was included, from production to operation to disposal. The result: As early as during the production of an LED luminaire, R. STAHL saves around 35% CO_2 compared to the manufacturing process of a fluorescent lamp. During operation, the CO_2 impact drops by as much as 40% to 50% thanks to the lower power consumption – and that with a service life of up to 100,000 hours. Thanks to smaller cable cross-sections and dimensions of the lighting and operating equipment, LED luminaires are also lighter and more compact than luminaires with conventional light sources, which allows additional savings in freight costs and makes the handy tubular luminaires pioneers in explosion protection.

MORE ANIMAL WELFARE WITH SPECIALTY LUMINAIRES

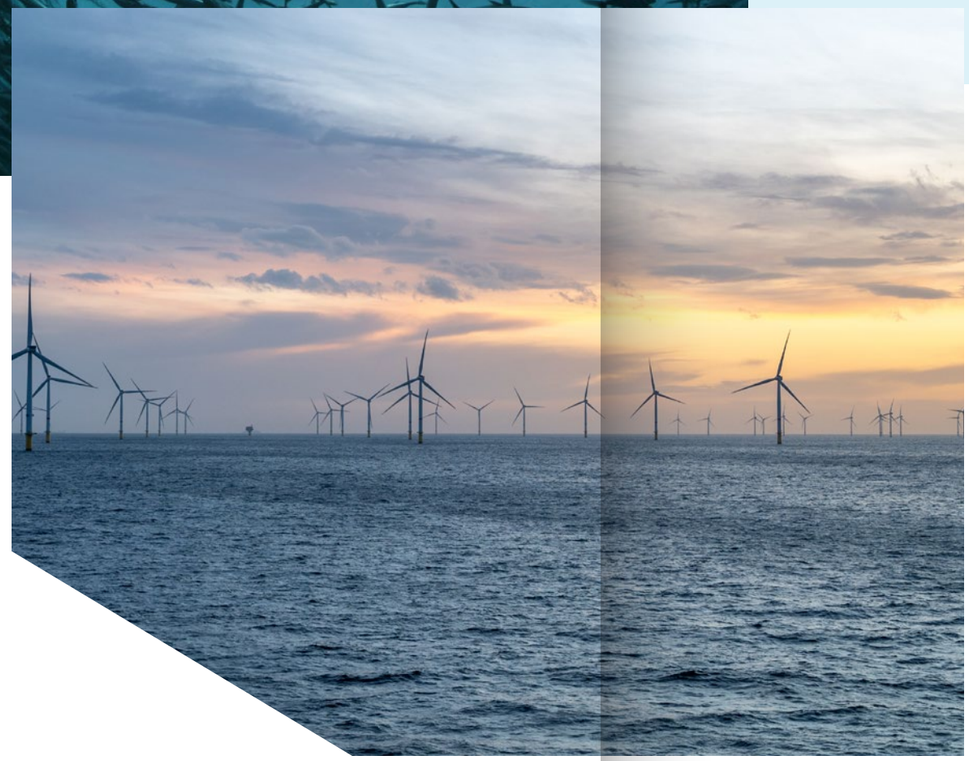
An ever-increasing amount of fish is consumed worldwide every year. In the oceans, however, many fish species are already overfished. In order to master the balancing act between rising demand and declining fish stocks in the wild, the trend is increasingly toward aquaculture, whereby the breeding of animals in fish farms poses a number of challenges. Not only a suitable habitat and appropriate feed are required, but also raising the fish without stress. Potential stress factors include motorized vessels that are used to care for the animals directly at the fish farm or in its immediate vicinity. To ensure that the sensitive fish are not unduly disturbed by this, R. STAHL, in cooperation with customers and partners, has developed ship floodlights with a special color temperature of the light. The innovative spotlights reduce the potential for disturbance of the boats and thus contribute to more animal welfare for the fish. A success that not only benefits salmon & co, but also people, because the calmer the fish farm environment, the better its later quality.



Portfolio now ready for hydrogen applications

In the medium term, hydrogen will play a prominent role as an energy source and base material for synthetic fuels and a wide range of other chemicals. Synthetic fuels and chemicals have a balanced climate balance. The carbon dioxide required for production is technically removed from the environment beforehand and then combined with hydrogen to produce the respective end materials. Products from R. STAHL have been reliably performing their duties in hydrogen-based technologies of large-scale chemistry for decades. Virtually all of the company's current products are suitable for use in hydrogen applications because of their design and have been certified accordingly.

This means that R. STAHL is already prepared for the challenges presented by the end of the fossil fuel era and the massive upheavals in the supply of energy and raw materials that this will bring. Green energy, generated from wind, waves and solar radiation, represents a particularly climate-friendly alternative to conventional energy sources. However, there is a crucial drawback that will have to be compensated for: The highly fluctuating supply, which makes a stable and reliable base-load supply more difficult. With its high storage density, hydrogen comes very close to fossil energy sources and will therefore become a central component of the energy supply. If there are energy surpluses, these can be used to produce hydrogen; in times of energy shortage, the stored hydrogen can then be used to flatten the energy supply. All this means that hydrogen is a key source of hope in the move away from fossil fuels, both in the energy and fuel supply sectors and in large-scale chemistry.



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There will be a boost in the development of offshore wind energy. The German government is targeting an expansion of 30 gigawatts by 2030.

Supplier for offshore shuttles and e-ferries

It is not possible to build or maintain offshore wind farms without the corresponding shuttle vessels. The so-called Service Operation Vessels transport people and materials to the platforms and back to shore, day after day. Even though the special ships only operate when the sea is calm, safety is always the top priority in the offshore sector. Consequently, the cruisers' lighting systems and navigation lights must be designed for demanding applications. R. STAHL has established a strong position in this particular market segment. The same is also true for the growing number of electrically-powered ferries that are becoming increasingly popular for short trips, especially in Northern Europe. Whether in the construction of new sustainable ships or their modernization and refitting: R. STAHL supplies both the general exterior lighting and the required searchlights or navigation lights. The products always have two features in common: Impressive performance in terms of energy savings and a robust design that guarantees reliable operation for years to come.

CREATING SAFETY AND TRUST

R. STAHL is advancing standards in hydrogen technology
Currently, global hydrogen production is about 100 million tons. The hydrogen is mainly produced and consumed in refineries or chemical plants. For the year 2050, experts expect a production volume of 500 million tons. In the future, a large part of this increase will no longer be produced in centralized process plants that are isolated from the public, but in a large number of medium to small, decentralized electrolysers. The applications for many hydrogen technologies, for example in transportation, building services or steel and cement production, are also becoming more decentralized, which means that hydrogen is also increasingly within the reach of non-professionals. The safety concepts that have been tried and tested for decades must therefore be further developed and supplemented in such a way that they do adequately meet the new framework conditions. R. STAHL has been working for many years on the creation and further development of effective safety standards. A large number of employees are active in a wide variety of committees. In this context, there is one commitment in particular that stands out: The function of international coordinator between the relevant ISO committee for hydrogen standardization and the international conformity assessment organization IECEx is assigned to R. STAHL. A look at the German national hydrogen strategy clearly demonstrates the importance of the committee's work. It states: "There is a particular need for scientifically accepted and regulatory measurement methods and evaluation criteria, as well as internationally accepted technical norms and standards. Furthermore, a high level of safety must also be established. Negative events and accidents can jeopardize the acceptance of hydrogen technology. It is essential to generate confidence among users!"

SMART CONNECTION TECHNOLOGY

*With its new **miniCON connector system**, R. STAHL provides a simple, safe and reliable solution for connecting electrical equipment in areas subject to explosion hazards. Typical applications are connections of sensors, actuators as well as other field devices with power sources and data networks. Made of stainless steel or robust plastic, the connectors are optimally adapted to the harsh environmental conditions of the process industry. Consistent modularization ensures economical and flexible adaptation of the product to the relevant task. The modular system, for example, provides a wide range of modules and adapters for almost any conceivable connection.*

A sophisticated coding system provides reliable protection against incorrect connections or mistaken identifications. For operators of process plants, miniCON delivers all the possibilities of a time-saving and effortless installation. Modern predictive and condition-based maintenance strategies are also supported. The replacement of devices in the plant is absolutely straightforward and can normally be carried out by a single employee. Prior disconnection of the device to be replaced is not necessary, because a sophisticated mechanism inside the plug-in connection takes care of the safe switching operations.

At work in the North Sea

Many of the major natural gas fields are located far up north, near the fringe seas of the Arctic Ocean. If the gas is liquefied in close proximity to the production areas, dual purpose ships are needed for the transport – they have to serve as LNG carriers and as icebreakers. In several projects, R. STAHL has already equipped entire fleets of these special ships. The customers are usually international shipyards and ship suppliers, for example from Japan, Singapore or Qatar, but also from Northern Europe. The components supplied by R. STAHL are mainly from three product groups: Navigation and searchlight systems, remote I/O for automation technology, and helideck lighting. Just like the LNG icebreakers, their lighting systems must also have extraordinary features. The navigation lights, for example, are equipped with controllable heaters for use in icy environments. In addition to LNG ships for the North Seas, R. STAHL also equips the floating LNG terminals of the Nordic waters. Among other things, two terminals, so-called floating storage units, are currently being equipped for a leading global shipbuilding and offshore company headquartered in South Korea.

LIGHTING FOR A VERY DIFFERENT KIND OF SHIP

The Yara Birkeland, the world's first autonomously operating e-container ship, has been navigating Norwegian sea waters for some time now. On board are a searchlight and navigation lights from R. STAHL. Designed as special marine lighting solutions, both products directly address the special requirements of this extraordinary ship. The installed components are virtually maintenance-free, for example, an advantage that is of crucial importance on the unmanned vessel.

Equipped with the latest in digitalization technologies, the lighting can be easily activated, controlled and monitored from an onshore guidance system. The searchlight can be adjusted both horizontally and vertically by remote control. In combination with the adjustment options for the light beam, this enables 360° illumination of the surroundings and thus optimal position detection.

In keeping with Yara Birkeland's ecological focus, the lighting systems are made of materials with a favorable environmental balance, and the navigation lights also operate entirely with LEDs. The outstanding durability of the source materials, including seawater-resistant aluminum, guarantee the best possible level of reliability. For maximum operational safety, R. STAHL also planned for back-up systems as well as a redundant power supply that automatically takes over in the event of an emergency.

On the way to climate-friendly sea transport with autonomous ships, the Yara Birkeland is an important milestone. And proof that R. STAHL is the right partner when it comes to equipping forward-looking sea transport solutions safely, reliably and sustainably.

360°

The Yara Birkeland's searchlight is controlled remotely from shore and allows 360° illumination of the surrounding area.

HjemJobbHjem – climate-friendly travel

Many R. STAHL employees are interested in contributing to greater sustainability in their private lives as well. A commitment that the company is more than happy to support. This support is being demonstrated in Norway, for example, where R. STAHL has joined the HjemJobbHjem mobility program. The joint initiative of several municipalities in the Nord-Jæren district calls on people to leave their cars behind on their way to work. The overall objective is to reduce car traffic in urban areas and thus also reduce CO_2 emissions. As a member of HjemJobbHjem, R. STAHL offers employees in the Stavanger region low-cost access to a network of buses, trains, electric bikes and high-speed passenger ships. Information and campaigns have been put out to encourage employees to travel to work in a climate-friendly way, whether on foot, by bicycle or by public transport. The fact that HjemJobbHjem is supported by R. STAHL opens up new options for employees. And it makes for more climate protection in everyday life.

Flexible use in potentially explosive atmospheres

Modular HMI operator station ORCA ___ *In process engineering, the automation and networking of production processes is resulting in a continuous increase in a wide range of information. The increasing amounts of data must be available in process plants, including those with potentially explosive atmospheres, and used as efficiently as possible. To meet these requirements, R. STAHL is now introducing the ORCA HMI operator stations which feature a completely modular design. They are impressive proof that it is possible to implement state-of-the-art information technology in safety-related solutions without significant delays. One of the requirements for this is a thorough understanding of the entire spectrum of explosion protection technologies.*

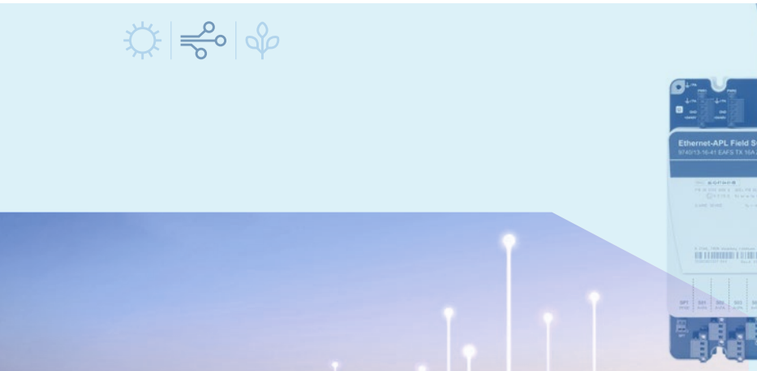
R. STAHL has resolved the contradiction between very high innovation dynamics in information and computer technology and extremely strict, inflexible specifications for explosion protection by taking a clever approach to modularizing the structure of the operating units. The components of a conventional operating system were divided into two modules for this purpose: the electronics box (E-Box) with the computer or thin client, and the display box (D-Box) with the multi-touch screen. Both boxes can be used in combination with each other and offer flexibility for maintenance or upgrades. Thanks to the new EasyConnect concept, the display and the electronics module can be separated in just a few steps – without the inconvenience of disconnecting numerous cables – and the old E-Box can be replaced with a new, more powerful version. Maintenance and any repairs are also significantly simplified due to the modularity.

The ORCA HMI system also provides flexibility during operation. The directly implemented monitor output enables a dual monitor solution that makes two data sources accessible at the same time. The process diagram (PLT) can thus be visualized on one monitor, and maintenance plans for the field devices, resource management, project control or documentation on the other. Machine data, maintenance, logistics and QM information can also be integrated. This enables process operators to be informed well in advance about changes or abnormalities in the process and to take countermeasures with appropriate safety-relevant reactions.

ETHERNET APL: NEW NETWORK STANDARD FOR THE PROCESS INDUSTRY

Comprehensive digitalization represents a key prerequisite when it comes to achieving further progress in the process industry. With this in mind, R. STAHL is working to continuously advance digitalization outside of its original core business. One of the many approaches is to ensure the most efficient process automation possible by intelligently networking people and machines, machines with other machines and machines with the plant. Permanent, seamless process monitoring and effective, efficient evaluation of diagnostic data from the field play a major role in this context. This applies in particular to potentially explosive atmospheres.

New universal automation concepts such as the NAMUR Open Architecture (NOA) or the Open Process Automation Standard (O-PAS™) require an infrastructure that is both powerful and flexible. To deliver on this promise, a network standard is called for that offers high bandwidths as well as fast transmission rates all the way into the field, and it has to be combined with ease of installation. One network standard that meets these requirements is Ethernet Advanced Physical Layer, or Ethernet APL for short. This pioneering data transmission technology has been developed in recent years by a consortium of leading automation manufacturers – and one of them is R. STAHL. Ethernet APL has been specially optimized for use in process industry plants and allows modern digitalization structures to be set up. Both continuous IP communication from the field level to the control system and even beyond is possible, as is the horizontal and vertical networking of entire plants. Ethernet APL has already attracted a great deal of interest during its presentation at the ACHEMA trade fair last year; this year, R. STAHL is launching the Field & Power Switch, one of the first products that is specifically tailored to the new network standard and enables customers to make optimum use of all its benefits.



Moving toward Industry 4.0 with the digital twin

R. STAHL has been working on a forward-looking nameplate generation that provides a wide range of information by means of digitalization since 2020. The project has now taken a giant step forward: By the end of the year, the pilot phase is scheduled to start with digital nameplates on the first 15 series equipment product groups in real operation.

The special feature is a QR code adapted to the real nameplate, which when scanned takes the user to a web-based platform. There, a broad range of documents are stored in a so-called administration shell, which brings together everything worth knowing about the respective product in the form of a digital twin. The spectrum ranges from data sheets, drawings and circuit diagrams to maintenance manuals and certificates.

Thanks to this digital solution, users will be able to access all the documents they need at any time and from any location. From a technical point of view, the administration shell is designed as an interoperable XML format, a data format that enables the exchange of structured information. It can therefore be seamlessly integrated into the respective customer systems, making the stored data machine-readable and thus usable for digital engineering, among other things.

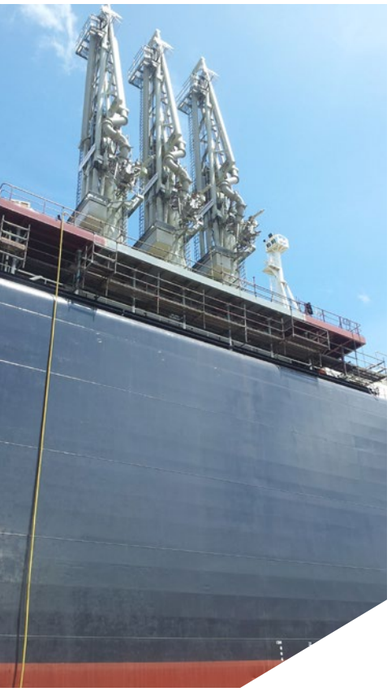
The implementation of digital nameplates is complex and affects numerous processes and systems at R. STAHL. For example, a completely new web platform must be created for the customer-friendly innovation. At the same time, many different internal processes have to be adapted accordingly, including the production processes in the manufacturing facilities. An effort that is worthwhile, because for the company and its customers, the digital twin is an important tool that enables the benefits of the digital transformation to be fully exploited.

With our own expertise for custom-fit automation

R. STAHL has long relied on a gradual increase in the degree of automation in production – an approach that has been highly successful. Today, industrial robots are used on the factory floor, as are cobots – robotic solutions that can collaborate with humans. In order to press ahead with automation, R. STAHL embarked on the formation of a competence team about three years ago. This team combines general technical progress with company-specific applications in a targeted manner. An essential basis for achieving this is the increasing development of in-house expertise. R. STAHL is now in a position to integrate robot systems into its own production, including programming and commissioning. In the current year, an automation solution for trimming plastic parts was implemented at the Waldenburg location in line with this model. The activities of the responsible employees will be upgraded; freed-up capacity can be used in the future for higher-value tasks, for example in machine setup or process optimization. Another cell is being created for the plant in Weimar, where two industrial robots will work together to assemble standard terminal blocks for linear luminaires. The company's competence team is currently still primarily focused on Germany. An international expansion of its activities is already underway in organizational terms. The fact that it is worthwhile to build up the company's own robotics and automation expertise is demonstrated not only by the benefits that can be achieved in ongoing production. The special expertise is also an advantage in the development of new products. If automation aspects are taken into account earlier in the product development process, they can be implemented more effectively later in series production.

R. STAHL ON BOARD

Explosion protection solutions support LNG use in marine operations ___ Sustainability is also high on the agenda in maritime shipping. With respect to alternative propulsion systems, for example. To eliminate the use of diesel and the associated high CO_2 emissions, an increasing number of shipping companies are turning to LNG. The environmentally-friendly fuel is not only used by carriers transporting LNG, but also by container ships, tankers, bulk carriers, cruise ships and ferries.
Fuel Gas Supply Systems (FGSS) are a necessary prerequisite for ship operation with LNG. These are complex gas supply systems that are individually designed and provided depending on the type of ship. In addition to LNG vaporizers, pumps, compressors and much more, FGSS include numerous electrical components comprising a PLC-based automation system. The electrical system necessitates a demanding set of safety standards. In the end, the safety of the ship, its crew and passengers must be ensured at all times. Explosion protection solutions from R. STAHL play an important role in this context. This applies in particular to the IS1+ remote I/O system, the most widely used system of this type in the world. There are plenty of good reasons for R. STAHL's strong market position in the marine industry. The IS1+ remote I/O system, for example, is compatible with virtually every FGSS automation system and its integrated diagnostic unit ensures a high degree of availability. Added to this are a wide operating temperature range, excellent immunity to interference, including with regard to vibrations, and the wide range of ship approvals. Thanks to its lightweight design, the system also reduces weight and space requirements, two advantages that are particularly important in ship assembly. From the point of view of shipping companies and fleet operators, the IS1+ remote I/O system from R. STAHL is thus an ideal solution for further advancing ship operation with LNG – as a future-proof solution with clear value added in terms of sustainability.



90,000

More than 90,000 ships are currently operating on the world's oceans. If they run on LNG, which is currently the most environmentally-friendly marine fuel available, a remote I/O system from R. STAHL is often on board.

R. STAHL supplies Germany's first LNG jetty

The first German LNG terminal was opened in Wilhelmshaven in December 2022. Given the energy crisis and the need to quickly develop alternatives to Russian gas, the construction of the terminal had been pushed ahead in record time. R. STAHL also participated in the tender for the equipment and was awarded the contract in October 2022. The company delivered 176 tubular luminaires manufactured at the Weimar luminaire plant to Wilhelmshaven within a week. Once there, the luminaires were installed directly. The 6036 series luminaires, which operate with LEDs, were provided with a high degree of flexibility in seven different designs. In addition to the fast availability, R. STAHL impressed the customer with the special features of the luminaires, which are maintenance-free and have protective insulation. The prospects for follow-up contracts are good, especially for the construction of the onshore LNG terminal planned in Wilhelmshaven, which is scheduled for completion in 2026.

R. STAHL well on its way to climate neutrality

Own solar parks supply more green electricity than is necessary for production
1,070 solar modules covering an area of just over five hectares. These are the dimensions of the new solar park at the Waldenburg site. The commissioning of the plant has taken R. STAHL and its sustainability agenda a significant step closer to climate neutrality. Positioned in an optimal east-west orientation, the solar park provides approximately 6 gigawatt hours of green electricity annually, saving 2,200 t of CO_2 emissions. Generating electricity using photovoltaics is not a new field for R. STAHL. The company has also been generating solar power at its Chennai site in India for some time now. Taken together, the two parks now enable R. STAHL to generate 8.1 gigawatt hours of electricity per year from renewable energy sources. That is roughly the amount of energy consumed at all of the company's sites worldwide. Roughly 40% of the electricity produced in Waldenburg is used to supply the company's own facilities. R. STAHL feeds the excess quantity into the public grid. In order to further advance the energy transition under our own direction, additional charging stations for battery-powered vehicles are planned in Waldenburg. The large-scale solar park can also be used for the production of green hydrogen by coupling it with an electrolysis plant at a later date. This is an option that R. STAHL will continue to pursue as part of its sustainability strategy.

DIGITALIZED LIGHTING TECHNOLOGY FOR HAZARDOUS AREAS

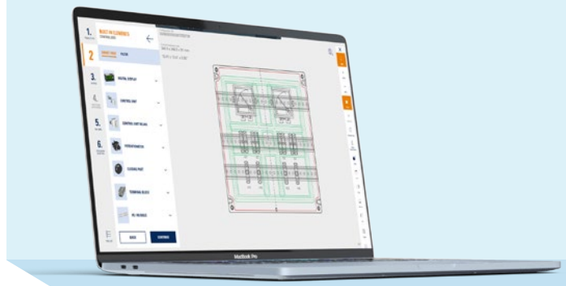
With integral lighting management, system operators can not only optimize energy requirements, they can also implement concepts for predictive maintenance. With LED lights from R. STAHL's EXLUX series, this is also possible in hazardous areas. The company has equipped special model variants of the lights designed for general and emergency lighting with a DALI/DALI-2 interface for bus-based control and monitoring. DALI stands for Digital Addressable Lighting Interface, a standard that supports data communication with all major building automation systems. In the case of networked lighting systems, this ensures a high level of reliability and thus the standard-compliant illumination of the operating premises at all times. In terms of predictive maintenance, R. STAHL's solution allows for the automatic forwarding of queries on switching states, error messages and brightness value, as well as the recording of operating hours. For emergency and safety lighting, not only the luminaire status but also the battery status is monitored. A special advantage is remote monitoring, which allows data, settings and threshold values to be managed using a web browser or smartphone app from any location. In practical use, the special lighting systems also impress with their longevity. LED luminaires, for example, achieve a service life of more than 100,000 operating hours.

200

In conjunction with the DALI protocol, it is possible to control connected luminaires individually, in groups or simultaneously using approximately 200 programmable commands.

Attractive apprenticeship training company

Companies that want to recruit new staff in times like these when skilled workers are in short supply have to come up with something to make them attractive. R. STAHL relies on its own training of young people and is banging on the advertising drum in many places to make young people aware of the opportunities available to them. For example, the company not only participates in job fairs, but also opens its doors for events such as the "Company Trail". At this somewhat different company run, interested parties complete a course through the warehouse and production, including exciting insights into the company. The "Career Kick", a trainee fair that took place for the first time in the Hohenlohe region in March 2023, is also a sporting event. Companies and applicants got together in a relaxed atmosphere at the foosball table in the cafeteria and took the opportunity to get to know each other. R. STAHL's broad-based recruiting initiatives are convincing: To date, we have managed to fill all the places on offer in the eleven apprenticeship profiles. The eight study profiles in cooperation with Heilbronn University as well as DHBW Mosbach are just as much in demand. R. STAHL also impresses with its commitment and creative ideas in the subsequent onboarding process, with activities ranging from trainee shared apartments and a tent camp at the start of training to study trips and trainee Christmas parties. The diverse range of activities strengthen the team spirit among the new colleagues and help them to integrate quickly into the team. Incidentally, R. STAHL received the "Great Start!" award for its dual training program, a recognition that evaluates the company's training concept and also takes feedback from trainees into account.



Product configuration

LINK BETWEEN STANDARD AND ENGINEERING

Beyond standard products, customized designs and solutions count in sales. There are also country-specific features or national specifications. In order to meet the variable requirements quickly, efficiently and economically, R. STAHL uses a product configurator as a standard tool for the entire group. Less complex orders or quotations that used to be handled in engineering can now be done with the help of the configurator.

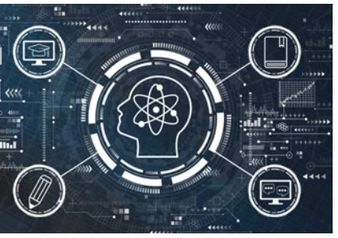
Product attributes such as size, explosion protection zones or technical details can also be reliably configured. At the same time, any information required, such as material availability or prices, is available immediately. In practical terms, this means that Sales can implement special customer requests in the configurator and in this way almost immediately design an end product that is perfectly tailored to the individual specifications.

With its extremely versatile and effective product configurator, R. STAHL has a unique selling point on the market and can map a continuous process from the inquiry through the quotation to the finished customer order. This effectively closes the gap between standard products and complex system orders with high engineering capabilities. The integration of the product configurator into the web store is planned for this year.

HYDROGEN: KNOWLEDGE CREATES SAFETY

Generally speaking, handling hydrogen is no more risky than handling other fuels. It is, however, necessary to be aware of certain properties of this chemical element that can lead to consequences if not observed and in the event of an error. Systematic investigations of accidents involving hydrogen technologies have shown that human error was the cause in more than three-quarters of the cases. In order to minimize the risk potentials that exist here, it is necessary to provide training for all employees who are working in hydrogen plants that is as broad as it is efficient. In practical terms, this means that hydrogen-specific training is given in addition to the teaching of general plant safety rules. R. STAHL is actively involved in addressing this task: Beginning in the winter semester of 2023, the company will finance an endowed professorship focusing on safety concepts for hydrogen technologies at the Ernst Abbe University of Applied Sciences in Jena. In addition, R. STAHL will provide the university lecturer responsible for the "Safety Technology" module at the new "Hydrogen Technologies" master's degree program at Dresden International University (DIU continuing education institute of the TU Dresden). Both of these courses are intended to train engineers and managers working in hydrogen plants.

The target group of engineers, foremen, technicians, experts and skilled workers is the focus of the numerous training courses that R. STAHL has been offering specifically for hydrogen applications for some time. Beyond conveying knowledge, it is important to design the safety-relevant technical systems so robustly that they retain the necessary functionality even in the event of human error. R. STAHL addresses this issue with a steadily growing range of engineering and consulting services for explosion protection.



Global learning management system for all employees

Automation related e-learning as an important focus ___ *The rapid pace of technical progress is particularly noticeable in the form of new forms of automation solutions. Terms such as digitalization, digital twin or artificial intelligence are taking up more and more space not only in our professional but also in our private lives. The challenge for R. STAHL is to familiarize the workforce with the latest technology as quickly as possible. Because only if they themselves have the skills that are necessary to deal with such new technologies will R. STAHL employees be able to make the best use of their possibilities in their own business processes. And this will also enable them to effectively support customers in their transformation processes.*

Over the course of the past few months, the Automation department has therefore developed some 40 e-learning modules covering a wide range of learning content on all aspects of R. STAHL's automation portfolio. The modules have been set up in the internal learning management system and are designed for all employees worldwide. As a talent portal, the system combines R. STAHL's complete training system - from administration and organization to the provision of learning material and the issuing of qualification certificates. The steadily growing seminar program includes both digital and face-to-face learning formats. Most of the worldwide locations are already connected to the multilingual tool. More will follow this year. For R. STAHL, this is a further step towards systematic talent management and strategically oriented global personnel management.

40

Experts in automation: R. STAHL has created around 40 e-learning modules to train its employees.

How remote I/O supports small batch production

Pharmaceutical production is in a state of flux. More personalized therapies require increasingly individualized medicines. At the same time, niche preparations for innovative treatments are also becoming more important. Both of these factors are prompting pharmaceutical manufacturers to specialize their production and increasingly rely on smaller batches. In manufacturing, this is associated with a fundamental shift. High-throughput production lines are still important, but smaller-scale plant technology that can be switched quickly and flexibly from one batch to another is becoming increasingly important. The change in approach is facilitated by a high degree of automation, and R. STAHL's remote I/O technology provides effective support in this respect. What the technology actually achieves is demonstrated by the way it is being used by a leading pharmaceutical manufacturer in Austria's Inn Valley. Remote I/O systems are being put to work there as part of the migration strategy, reliably transmitting the sometimes very critical measured variables from field devices or sensors to the control system. In principle, they thus ensure exact compliance with the formulation required for the respective batch. They also evaluate measurement signals and control the actuators, in other words those points in the production process at which electrical signals become mechanical movements. The Tyrolean pharmaceutical manufacturer has been working with automation technology from R. STAHL for years, and the systems are regularly updated via upgrades. R. STAHL is also an innovative and reliable partner in the lighting sector and in switchgear.

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