

PIONEERING OUR WAY INTO THE FUTURE

The magazine for the
Annual Report 2021



STAHL

Order intake

261.3

€ million

Sales

248.1

€ million

EBITDA

16.8

€ million

Employees

1,672

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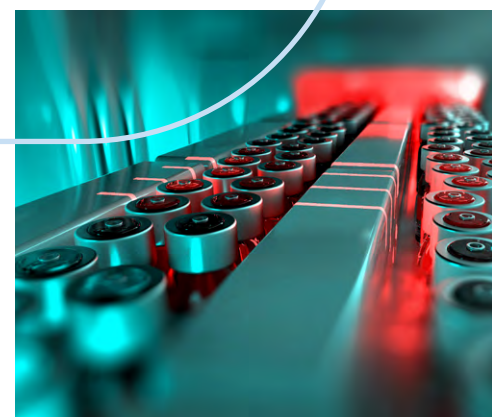




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Imprint





Dr. Mathias Hallmann
Chief Executive Officer (CEO)

“WE MAKE TECHNOLOGIES OF THE FUTURE SAFE”

Global solutions for the future are developed in the present and are rooted in a company's competences and innovative strength. In an increasingly complex corporate environment, success in the operations business in harmony with perceived corporate responsibility for the environment and society is more important today than ever before. Dr. Mathias Hallmann, CEO of R. STAHL, talks about strategies for corporate growth in the wake of global trends and the role of the company as an important partner for the establishment of safe and sustainable solutions.

Dr. Hallmann, the title of this magazine is “Pioneering our way into the future”. A powerful statement. What exactly is meant by that?

We actually interpret pioneering in two ways here. On the one hand, it is about R. STAHL and our strategic initiatives that propel the company into a successful future. On the other hand, it is also about our responsibility for the positive future of society and the ways in which R. STAHL can contribute to achieving global goals such as sustainability or decarbonization.

That sounds like a definite expansion strategy. Until now, R. STAHL has focused more on the efficiency of business processes. Has that changed?

If we take a look at where we are right now, it becomes clear how much progress has already been achieved in terms of efficiency. R. STAHL has become much more productive and has significantly more clout than it did four years ago. So now is definitely the right time to noticeably strengthen our market-oriented future initiatives. We are therefore increasingly focusing on topics that are linked to attractive growth options and take technological change into account to a large extent.



“Explosion protection ensures safety in the use of alternative energies.”

Which brings us to the second aspect of the magazine title. Where can R. STAHL be a pioneer for the future?

With our core business, we are in a position to make an important contribution to the global trend toward greater sustainability, specifically for the targeted decarbonization and the goal of climate neutrality. For these ambitious projects to succeed and be generally accepted by the public, there must also be suitable explosion protection solutions in place. The use of alternative energies means not only generating power by means of wind and sun, but also providing massive storage capacities for the quantities of energy generated. This is only possible with the help of hydrogen and its derivatives such as ammonia and methanol. Since all these media are also explosive, safe explosion protection solutions must be provided for them. These solutions can be delivered by R. STAHL – it is a field in which we have a long tradition, our DNA, if you will. Today, R. STAHL is already technologically very well positioned for an energy supply based on hydrogen. This potential must be exploited in the long term.

It is also about the broad-based technological change in the wake of digitization and Industry 4.0. Our products and services support customers from a wide range of industries as they move into the digital age. These products enable them to develop new, innovative solutions, help them implement future-oriented business models and successfully address the resulting shift in requirements.

For R. STAHL, this means attractive market opportunities, but also an increase in responsibility.

Absolutely, but we are prepared to face the challenges that arise as a result. After all, coping with the global trends just mentioned is not only important for the economy, but also for a good future for society. We therefore see our contribution to their success as an integral part of our corporate responsibility. We are a small but very important part of a larger whole. Under this aspect, R. STAHL has always pursued the goal of creating added value beyond the operational business. This enables us to tap market opportunities and at the same time to further advance general progress – as a pioneer of the future.

The pressure to act has become even more pronounced in recent months. Future-oriented models are in greater demand than ever before.

And future-oriented means both sustainable and reliable. Even during the pandemic, it was clear that a secure supply of energy, materials and components would become much more critical and that the necessary conditions would have to be put in place. Unfortunately, the events in Ukraine have confirmed this insight, especially as it relates to the energy sector.

How can R. STAHL specifically contribute to solutions here?

In the medium and long term, through our expertise in the area of alternative, non-fossil sources of energy, such as the hydrogen we just discussed, and in the short term, primarily through our expertise in the area of LNG. LNG, or liquefied natural gas, is currently becoming very important – on the one hand because of its considerably superior environmental and climate footprint compared to crude oil and coal and, on the other hand, because of the greater degree of flexibility LNG offers in terms of logistics and the long-term security of energy imports.

R. STAHL delivers solutions all along the LNG supply chain, from the infrastructure for liquefying the natural gas to transporting it by ship to LNG terminals and facilities for breaking it down into demand quantities for end users. The way the current focus on LNG is increasing will also boost the need and demand for our products and services.

Thank you, Dr. Hallmann, for taking the time to talk to us and for the insights into the future.



“Corporate responsibility also means making sure progress is achieved.”



R. STAHL has

18

operating
subsidiaries

as well as

45

international
offices

in more than

50

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 electromechanical and electronic 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 a high level of technological expertise, market-leading products and innovative new 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 aim 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 India.

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.

STRATEGY THAT POINTS TOWARD THE FUTURE

We are consistently expanding R. STAHL's leading market position in electrical explosion protection. The guiding principle and roadmap is the Group strategy EXcellence 2023. It combines our central value levers technology and efficiency with the market-driven requirements and potentials arising from the two fields of sustainability and technological change. In practice, this approach ensures the consistent development of additional market opportunities and lays the foundation for further growth.

Technology as a value lever

What sets R. STAHL apart is its unique expertise and exceptional technological competence. Within the scope of our Group strategy, we use these assets for highly market-oriented innovations. With put intensive development activities to work to create attractive new products and implement solutions that optimally meet both current and future customer requirements. Continuous development and renewal of our portfolio consolidate our technological lead and ensure particular market strength internationally.

Efficiency as a value lever

With the aim of further advancing our performance standards and offering customers additional added value, we rely on efficient structures and processes. We have already made significant progress with our R. STAHL 2020 program. The EXcellence 2023 strategy concept builds on the successes achieved in the program and brings us even closer to an exemplary level of excellence. The focus is on digitalization, market-driven portfolio management, lean management and sales.

The 4 dimensions
of our EXcellence 2023
growth strategy



Growth

We provide information on our strategic initiatives in the areas of sustainability and technological change

→ from page 16

TECHNOLOGY

- Market-driven innovations
- Portfolio renewal
- Digital services

TECHNOLOGICAL CHANGE

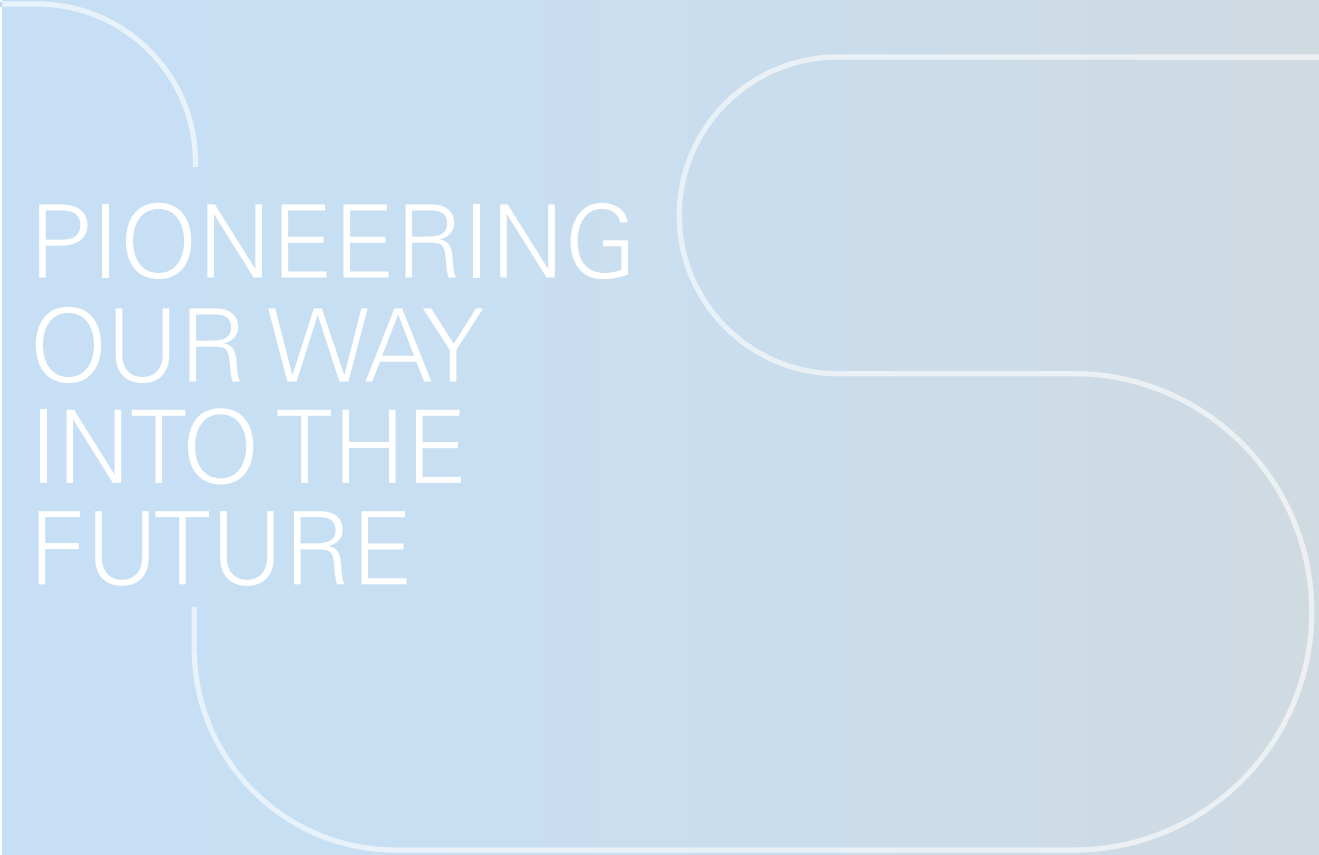
- Automation
- Individualization/mass customization
- Modular plant concepts
- Flexibilization of the value chain

EFFICIENCY

- Data-driven group management
- Portfolio management
- Lean work processes
- Sales excellence
- IT excellence

SUSTAINABILITY/ESG

- Sustainable corporation
- Applications for climate-friendly energies
- Social responsibility
- Governance



PIONEERING
OUR WAY
INTO THE
FUTURE



PIONEERING OUR WAY INTO THE FUTURE

Sustain-
ability



1

R. STAHL – SAFETY FOR A BETTER WORLD

Responsibility has always been at the very core of our business model. With solutions for electrical explosion protection, R. STAHL ensures safety for people throughout the world and helps protect their living space from damage caused by explosions. Growing awareness of sustainable corporate management strengthens the importance of our operating business. Sustainability is becoming a prerequisite for economic success. A development we support in all fields - for our customers, for society and for us.

“The world is changing. New goals and premises are in place, both in the context of society as a whole and in the industrial environment. The resulting changes are currently underway and are creating global trends that have one thing in common: a growing need for explosion protection solutions. For R. STAHL, this opens up promising market potential and the chance to demonstrate the company’s value to society and the common good more than ever before.”





Decar-
bonization

2

NO ENERGY TRANSITION WITHOUT R. STAHL

Achieving a CO₂-free energy supply is an undertaking that requires a united effort. To reach the ambitious goals, it is not only new forms of energy that are needed, but also the tools to control them. Explosion protection solutions from R. STAHL play an important role in this regard and are becoming increasingly indispensable. Especially when it comes to the implementation of new, future-oriented hydrogen applications.

Dr. Andreas Kaufmann
Senior Vice President
Marketing & Innovation



Technological
change

3

SHIFTING TO A NEW ENERGY AGE WITH R. STAHL

Digitalization and automation are opening up new possibilities and bringing about a fundamental paradigm shift, especially in industry – including in electrical explosion protection. R. STAHL supports the transformation with digitalized products as well as smart, future-oriented services. The focus is on applications that enable the potential of technological innovations to be exploited. This positions us as a reliable partner in the change process and a powerful companion on the road to Industry 4.0.



1

PIONEERING
OUR WAY
TOWARD

SUS- TAIN- ABILITY



Sustainable economic activity is increasingly becoming a crucial success factor, both for our customers and for R. STAHL itself. The focus is on responsible corporate governance that meets all ESG requirements and takes into account environmental aspects as well as social concerns and ethical behavior in accordance with the law. Our objective is to contribute to greater sustainability – for the benefit of society as whole and for all of our company’s stakeholders.

SUSTAINABILITY AS SUCCESS FACTOR

Creating a more sustainable world is an undertaking that can only be achieved within the scope of the community and to which business has been contributing in many ways for years. In addition to their own ambitions, the requirements of the market are also increasingly having an impact, as customers are placing more and more importance on companies and business partners also impressing with their sustainability performance. Studies show that around 85% of end consumers prefer brands and companies that operate sustainably when making purchases. In B2B, the figure is even higher. Here, 91% of companies pay attention to sustainability criteria when making purchasing decisions.

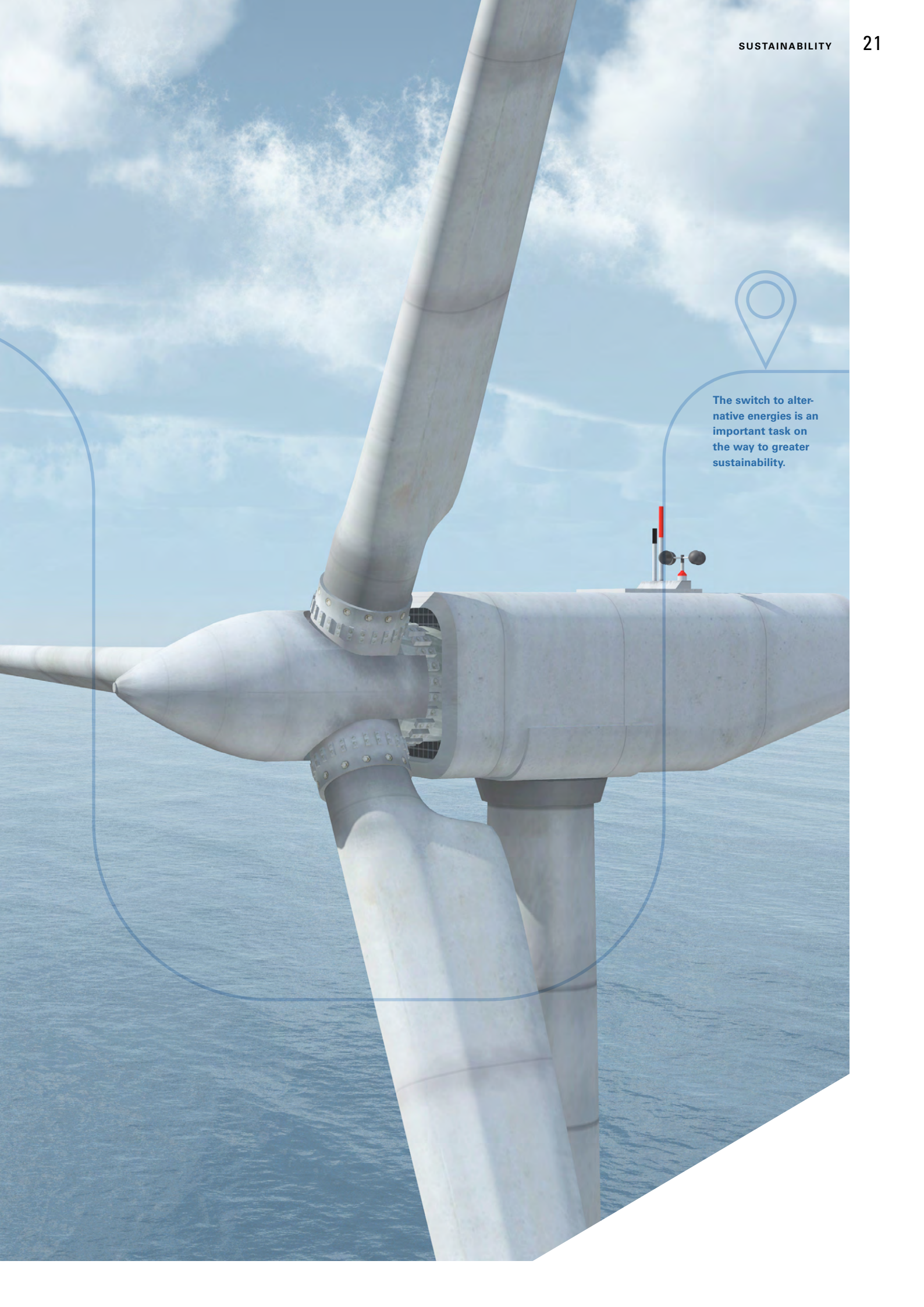
Accordingly, companies in all sectors are stepping up their sustainability efforts, focusing not only on activities in their own immediate environment but also on the environmental, social and ethical performance of their suppliers or subcontractors. For example, leading companies in the chemical industry have joined forces in the Together for Sustainability initiative. Members of the initiative link the awarding of contracts to defined sustainability standards and thus commission partner companies that meet certain sustainability criteria.

Sustainability aspects are also increasingly being incorporated into purchasing decisions for the construction and operation of explosion-protected systems. In the product area, R. STAHL takes these customer expectations into account with safety-related components and solutions that are convincing in terms of energy consumption, service life, compatibility and ecological footprint. We thus not only fulfill our own demand for sustainable business, but also contribute to our customers coming closer to their sustainability goals.

A typical example of R. STAHL's sustainable innovations is the portfolio of explosion-proof LED lights that can be controlled digitally and are thus suitable for smart load management. They allow lower power consumption and at the same time have longer service lives. Because smaller cable cross-sections are possible with these luminaires, additional material is saved in production and installation, which benefits resource conservation. Last but not least, the lightweight and compact design of our LED luminaires also reduces the number of transports with corresponding benefits in terms of fuel consumption and emission reduction.



The switch to alternative energies is an important task on the way to greater sustainability.



CORPORATE
RESPONSIBILITY
AT R. STAHL



Together for more sustainability – one goal, to which we make a contribution every day

Focused on electrical explosion protection, R. STAHL is already sustainable by virtue of its business purpose and core business. After all, our products and solutions guarantee the safety of many thousands of people worldwide every day and protect industrial plants and the environment from damage caused by explosions. With new developments and innovations, we have thus been driving the technological development of explosion protection for many decades, thus raising safety to an increasingly higher level.

Resource protection through sustainable product design

R. STAHL already takes sustainability aspects into account during product development. For example, we attach particular importance to the durability of our components and favor a product design that conserves resources and is free of substances of concern. To reduce the consumption of natural resources, R. STAHL takes a twofold approach. On the one hand, we make sure that our products consume little energy during their subsequent use. On the other hand, we ensure that the manufacturing processes of our products are also designed to conserve resources.

Social responsibility as a central corporate value

With regard to the social dimension of sustainability, as a family-owned company we traditionally stand for value-based cooperation. This applies both to the regions in which our sites are located and to cooperation within our company. Human rights and employee concerns are very important to R. STAHL. That is why we focus on respect, equal opportunities and diversity. Safe work processes and a safe working environment are an absolute priority for us. With the objective of achieving a work-re occupational accident rate, R. STAHL has implemented, among other things, a certified occupational safety management system. Initiatives such as workshops or action plans ensure that safety considerations are firmly anchored in employees' minds in their everyday working lives as well.

We strengthen the attractiveness of R. STAHL as an employer with models for the compatibility of work and personal life situation, offers for health prophylaxis as well as promotion opportunities through further training or job rotation. We provide apprenticeships for new entrants to the workforce in Germany and the Netherlands, with exemplary training rates of 8.7% in Germany and 5.0% in the group as a whole.

Governance determines our framework for action

R. STAHL is committed to acting in accordance with guidelines and to fair competition, in which we win through the quality of our products and services. Corporate compliance is accordingly an important pillar of our corporate culture. We follow the provisions of the Code of Conduct of our industry association ZVEI and have implemented two behavioral guidelines – one for all employees Group-wide and one for suppliers and intermediaries. So that we can promptly uncover and correct any compliance violations, R. STAHL has set up an Integrity Line for whistleblowers that can be accessed via our website.



With R. STAHL's internationally successful training organization, we ensure that up-to-date knowledge from the safety-critical area of explosion protection is also available to our customers' employees. Every year, around 4,000 external specialists take part in our training courses.

→ [more details on page 24](#)



SHARING KNOWLEDGE

Training organization is setting the course for even greater levels of safety

In the explosion protection working environment, technical and methodological competence are of utmost importance. It is not an option to simply be satisfied with what you have learned in the past. Rather, it is important to keep your knowledge and skills up to date at all times – a requirement that is also stipulated by law. With our internationally successful training organization, we ensure that relevant employees from the customer's organization are regularly provided with the latest knowledge from the safety-critical area of explosion protection, including information relating to new technologies and technological trends.

The seminars, courses and workshops offered in Germany, Austria and Switzerland, as well as online, cover a diverse range of topics. Technical and standardization fundamentals are taught, as is information on the installation and maintenance of electrical systems or on setting up intrinsically safe power and communication networks. As an IECEx Recognised Training Provider (ExRTP), R. STAHL also organizes and conducts training courses for the CoPC certification of qualified persons in accordance with the international IECEx system.

Roughly 4,000 external participants take advantage of our training courses every year. From the customer's perspective, R. STAHL's training organization offers a service that delivers practice-oriented support in meeting important safety-related challenges. At the same time, our program makes a significant contribution to creating even greater levels of safety in hazardous areas, above and beyond the benefits of our products. A sustainable commitment that contributes to social ESG criteria such as occupational safety, health and workplace design. It is a commitment that also focuses on greater protection for the general public and ecologically responsible corporate governance.

Further information on the seminar program is available at <https://r-stahl.com/en/global/services-and-seminars/>.

STRICT STANDARDS IN EVERY CORNER OF THE GLOBE

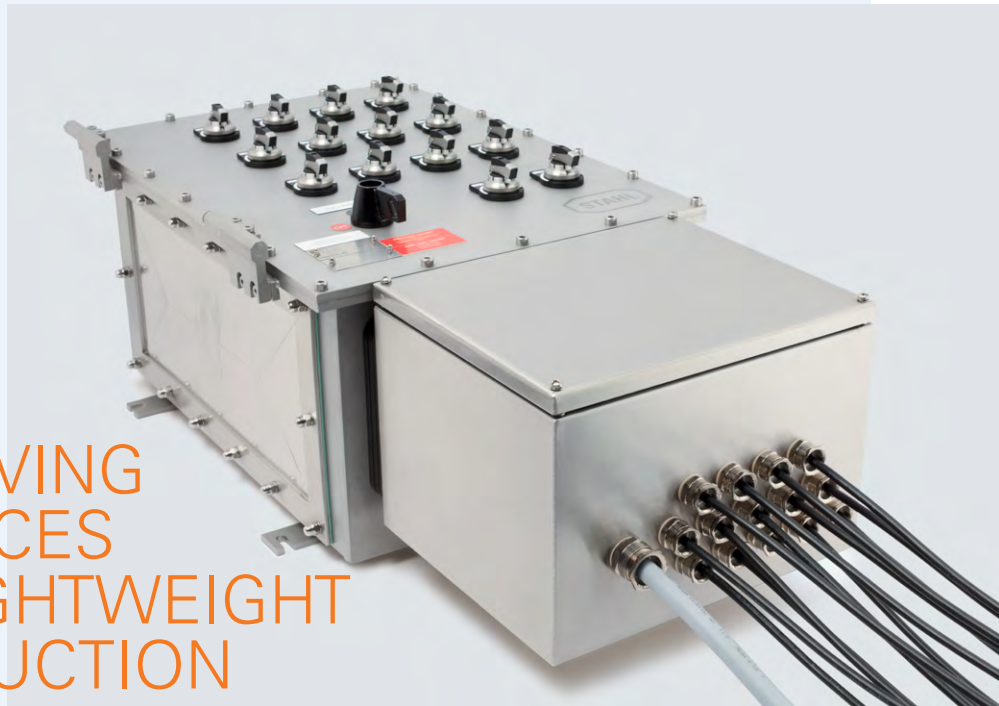
When it comes to meeting ESG criteria, our ambitious standards apply throughout the world and at all R. STAHL sites. At our Indian plant in Chennai, for example, we operate in accordance with an Environmental Management Program that ensures strict standards in the fields of environmental and occupational safety. From an environmental point of view, initiatives for energy and resource efficiency are included as well as responsible manufacturing and product design. The site, which is already certified in accordance with DIN EN 14001, also complies with European RoHS and REACH regulations in addition to the country-specific requirements in India.

In terms of social values, the focus is not only on the interests of employees, but also on the concerns of the region. In October 2021, R. STAHL India was honored for its exemplary performance in terms of working conditions and occupational safety with the "Work Condition and Work Safety Award" from VDMA India. Around 40 medium-sized companies applied for the coveted award and submitted relevant best-practice examples.

Thomas Wittek (middle), Managing Director of R. STAHL India, accepted the prestigious award during the 10th VDMA Mechanical Engineering Summit in Bangalore.



CONSERVING RESOURCES WITH LIGHTWEIGHT CONSTRUCTION



R. STAHL combines reliable explosion protection with the conservation of natural raw materials _ EXpressure®

is a series of enclosures developed by R. STAHL based on the pressure-proof encapsulation principle. The pressure occurring inside the enclosure in the event of an explosion is dissipated directly as it develops by means of a metallic fabric and reduced by a factor of 10. This not only creates immediate safety, but also permits enclosure wall thicknesses that are limited to just a few millimeters. Control cabinets used in explosion protection can thus be made lighter and significantly larger.

This unique technology also allows material savings of 50 to 70% in the production of enclosures, depending on the design, thus reducing the need for metal or stainless steel. Due to the weight savings, it also allows larger transport volumes, which in turn reduces fossil fuel consumption. For the cooperation project "EXpressure® – Lightweight Construction in Explosion Protection", R. STAHL and the Ernst Abbe University of Applied Sciences Jena were awarded the Research Transfer Prize in gold from the Heilbronn Chamber of Industry and Commerce.



2

PIONEERING
OUR WAY
TOWARD

DECARBONIZATION



The world is making progress on the path to climate neutrality. All around the globe, countries are leaving fossil fuels behind and relying instead on alternative, climate-friendly energies. For R. STAHL, this opens up considerable opportunities, because the large-scale use of hydrogen as a major energy source of the future, which is necessary for this shift, is increasing the demand for explosion protection solutions with each passing year.

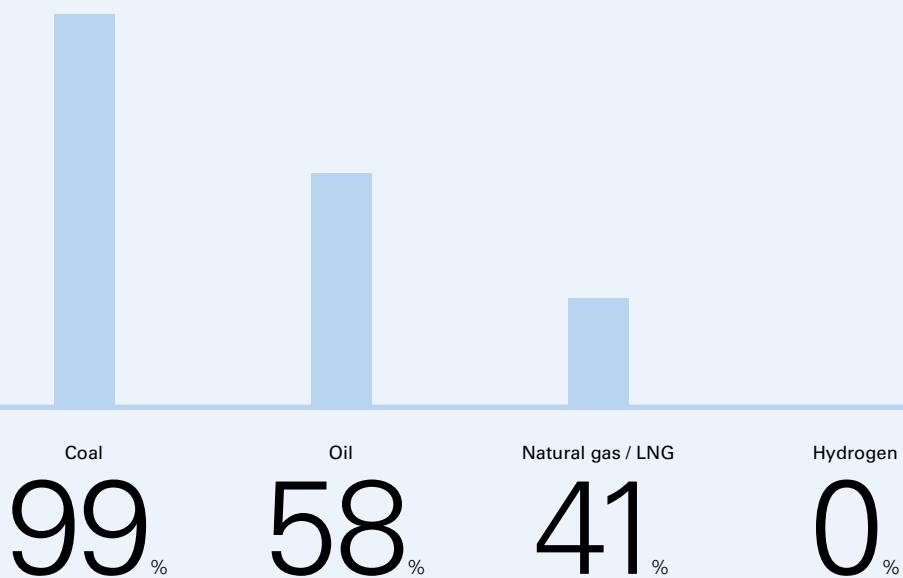


EXPLOSION
PROTECTION
PROVIDES A
FOUNDATION
FOR A SUCCESSFUL
ENERGY TRANSITION

In the fall of 2021, the 26th UN Climate Change Conference was held in Glasgow, Scotland, and ended with a historic decision. A good 200 countries around the globe committed to successively reducing the use of coal. The world climate summit thus underscored once again the direction that developments have been taking for years: The age of energy generation from fossil fuels is drawing to a close. The future belongs to renewable energies.

In Western countries in particular, the energy transition is being pursued with great speed. The USA wants to be climate-neutral by 2050 and reduce CO₂ emissions by 50% by 2030 compared with 2005. Europe also wants to be climate neutral by 2050. With the Green Deal, the EU specifies a reduction in net greenhouse gas emissions of at least 55% for 2030, compared with 1990. In Germany, the goal is to achieve national climate neutrality by 2045. For 2030, plans call for a reduction in emissions of 65% compared with 1990.

The implementation of these ambitious plans is being driven forward with a real sense of urgency. The necessary technologies are being developed further, funding programs launched and infrastructures established. Hydrogen's properties make it an almost ideal source and storage medium for the future energy mix. The main disadvantages of photovoltaics, solar thermal power and wind energy – namely low energy density and high volatility – can be offset with hydrogen. Unlike in the past, hydrogen as a source of energy will therefore be used more widely in the future and will also be used outside the industrial environment. This results in a growing need for safe technology. The resulting market opportunities for R. STAHL are already enormous. In the course of ongoing decarbonization, they will continue to grow, because the further the energy transition progresses, the higher the demand for products, systems and solutions for the safe generation, storage and use of energy.



Relative CO₂ emissions by energy source

(with equal combustion energy)

ON NEW GAS APPLICATIONS FOR HYDROGEN



Well positioned with respect to the energy sources of today and tomorrow

In view of the international energy transition as well as the market opportunities arising from it, R. STAHL focuses its sales and development activities on the sectors of liquefied petroleum gas and hydrogen. From today's perspective, versatile green hydrogen has the greatest potential to replace fossil fuels. At present, however, this climate-neutral technology is still in its infancy and will only be able to make a significant contribution to the global energy infrastructure once more advances have been made.

Market for natural gas will grow initially

Natural gas will play a key role in the transition period to widespread hydrogen use. Blue hydrogen, for example, is produced from natural gas. The CO₂ released in the process can be captured and safely stored using carbon capture technologies. This is an application that opens up major business opportunities for R. STAHL. Moreover, natural gas is the most climate-friendly fossil fuel. New gas infrastructures therefore fall under the EU Commission's taxonomy regulation and thus count as sustainable economic activities eligible for subsidies. Experts expect the use of natural gas as a bridging technology to increase at an above-average

rate in the short and medium term, leading to corresponding market growth. This is a development from which R. STAHL can benefit, because transporting natural gas from the extraction site to the consumer countries through fixed pipelines is not only rigid, but also fraught with political uncertainties. Shipping is therefore gaining in importance as an alternative. The natural gas is liquefied for this purpose, transported to its destination as liquefied natural gas (LNG) on tankers, and there depressurized back to its gaseous state or used as fuel.

Huge explosion protection potential from LNG boom

R. STAHL is already well positioned when it comes to explosion-proof equipment for plants in the LNG environment. Our market share for LNG tanker compressor stations, for example, is over 80%. We are using this advantageous starting position to further expand our market position in the upstream and downstream value-added stages of the LNG sector as well. Last year's market developments once again clearly confirmed that there is considerable potential for R. STAHL in this area. Due to the strong demand and dramatically increased gas prices in Europe, the flexible ship transport of LNG has become even more attractive, especially over long distances. At the end of 2021, for example, American LNG suppliers were increasingly heading for Europe with their fleets. In December alone, 30 tankers with a total of 4.9 million cubic meters of liquefied natural gas were en route from the USA to European destination ports.

Early positioning of R. STAHL in the hydrogen sector

In the medium and long term, R. STAHL sees attractive growth opportunities arising from the boom in hydrogen technology. We already have the explosion protection solutions required for the large-scale production and further processing of hydrogen in our portfolio and are making them available for existing hydrogen applications. In addition, R. STAHL is involved in international, national and regional project initiatives to promote this strategically important energy carrier. These include, for example, the H2 Giga funding program and the Hydrogen Technology Initiative, as well as ISO TC 197 hydrogen standardization and the IECEx W19 hydrogen certification system. In the context of Germany's National Hydrogen Strategy, we are collaborating on the Green Hydrogen Ideas Competition of the German Federal Ministry of Education and Research. The aim is to develop suitable safety concepts for the use of hydrogen in large-scale plants.

Explosion protection is always needed for energy which means R. STAHL is also always needed

Beyond hydrogen and natural gas, electrical explosion protection is also essential in connection with all other energy sources. This applies to petroleum, currently still the most important energy source and key raw material for the transportation sector as well as the chemical and pharmaceutical industries, to synthetic fuels and liquid fuels, and to methanol and biogas. Even electrification is increasing the demand for reliable explosion protection. Finally, the expansion of e-mobility will require a growing number of rechargeable batteries, the production of which requires chemical processes and thus also investments in chemical plants and their explosion protection.



In order to become more independent from Russian energy supplies, European countries are increasingly targeting alternative import options for liquefied natural gas. The flexible supply of LNG is thus becoming much more important. LNG infrastructures will be expanded across the board and supplemented by additional terminals – including in Germany, where the German government confirmed the planned construction of two LNG terminals at the beginning of March 2022.

“R. STAHL is focusing on the future – especially in the interests of our customers. Using our core business as a foundation, we are advancing the use of alternative energies and thereby contributing to a safe, dependable and affordable energy supply.”

Dr. Mathias Hallmann

EXPANDING HORIZONS

Energy transition delivers hydrogen to cities and communities

The ongoing energy transition is changing the way hydrogen is handled. Professor Dr. Thorsten Arnhold, Vice President Strategy and Technology at R. STAHL, talks about the new applications and the associated requirements for explosion protection.

Professor Arnhold, hydrogen is seen as a major source of hope for the energy transition, but also as a medium that makes high demands on technical safety. — The hazard potential of hydrogen is primarily determined by the exceptionally wide explosion range, a low minimum ignition energy and the extremely high flame speed. When it comes to the industrial use of hydrogen, the control of these hazards has been part of the company’s portfolio for decades. Proven explosion protection concepts exist and function both safely and reliably. With the planned major expansion and deepening of hydrogen use in the course of the switch from fossil fuels to other primary energies, however, new safety-related dimensions are now emerging.

New safety dimensions due to the energy transition – what does that mean in specific terms?

— Extensive hydrogen infrastructures are being created in the course of the energy transition, from electrolysis plants near wind farms to supply and refueling networks for hydrogen filling stations. All of this requires appropriate safety technology, including explosion protection, along the entire value chain including production, storage, transport and final use.

In the future, hydrogen will also play a role in everyday life, for example when refueling personal vehicles. What does this mean in terms of safety?

— Handling hydrogen will no longer take place solely in well-segregated environments operated by trained personnel, but will be decentralized to the public – right down to each individual community. The process industry is adept at dealing with hydrogen’s explosion hazards. For example, risk analyses are conducted for hydrogen plants. In some cases, the plants are also subject to the Major Accidents Ordinances and must meet their stringent requirements. With the establishment of area-wide networks, for example to supply hydrogen-powered motor vehicles, their installers and operators are now also challenged. They must design the infrastructures used in a way that reduces potential hazards through appropriate measures.

From a technological perspective, the new hydrogen applications are not yet fully developed. To what extent is R. STAHL already prepared for the future?

— R. STAHL has been actively promoting the use of hydrogen for years, both in its core business and through cooperations with partners. We are working very intensively with the Technical University of Dresden, for example, in the field of hydrogen technology safety. At the same time, we provide the services and products needed for the safe use of hydrogen. Around 90% of our products are classified in the highest explosion group IIC and can therefore already be used in hydrogen applications.





ENERGY SAVINGS WITH LED TECHNOLOGY

Many industrial plants operate around the clock, requiring thousands of light sources. With our market-leading LED luminaires, we provide energy-saving solutions that significantly reduce the power consumption of lighting. The LED lights launched by R. STAHL in 2021 will save our customers a combined total of around 3,000 tons of CO₂ per year. Currently, the share of LED technology in our sold lights is well over 80% – and rising.

GREEN ELECTRICITY GENERATED IN-HOUSE

PHOTOVOLTAIC SYSTEM WILL MAKE
R. STAHL CLIMATE-NEUTRAL BY 2023

Initiatives to increase energy efficiency in production have long been part of R. STAHL's tool kit. Producing our own climate-friendly energy is also not a new topic. In Waldenburg, we have been operating a combined heat and power plant as well as a photovoltaic system for years, and at our Indian site in Chennai, approximately 10% of our annual electricity requirements come from our own photovoltaic system.

In the future, our new photovoltaic system in Germany, which is being built on a four-hectare open area next to the Waldenburg site, will contribute even more to decarbonization. The solar park, which will consist of 11,070 modules, will produce around 6 gigawatt hours of electricity per year. Together with the green electricity generated in Chennai, R. STAHL will then generate 8.1 gigawatt hours of electricity per year from renewable energy sources. That is more than is consumed at all of the company's sites throughout the world. The planned start of operations at the Waldenburg facility in the fourth quarter of 2022 will thus enable R. STAHL to achieve climate neutrality.

We use around 40% of the electricity generated in Waldenburg to cover part of our demand. The other 60% is fed into the public grid and thus made available for general use. In a second step, a charging infrastructure with charging stations for battery-powered vehicles will also be established. In the future, we plan to couple the solar park with an electrolysis plant so that green hydrogen can also be produced.

R. STAHL is taking on the challenges of climate neutrality. The photovoltaic system in Waldenburg (seen here under construction) alone can save 2,200 tons of CO₂ per year.





3

PIONEERING
OUR WAY
TOWARD



TECHNO- LOGICAL CHANGE

For a long time, globalized production chains based on the division of labor were considered the benchmark in industry. Things have now changed, however. Since the turn of the millennium, a large number of companies have been thinking about bringing back their industrial manufacturing capacities. Successful implementation requires digitalization, automation and expanded plant capacities with appropriate explosion protection. A set of circumstances that R. STAHL can benefit from.

REGIONAL PROXIMITY ASSURES SUPPLY SECURITY



Reshoring, nearshoring, repatriation or renationalization – there are a lot of terms for bringing manufacturing steps back from a distant overseas location to one's own country or neighboring countries. The underlying motives, however, are the same across all industries: Companies expect greater flexibility, a higher delivery capability and, in some cases, lower costs, especially in terms of transportation, from bringing production back from China, India or elsewhere.

The trend toward reshoring was clearly fueled by the Corona pandemic and its consequences. At the beginning of the crisis, shortages of masks, protective clothing and disinfectants highlighted the vulnerability of globalized production. In the second year of the pandemic, disrupted supply chains and shortages of raw materials or precursors pointed to the dependence on global supplies. A dependency that not only affects industry itself, but often also has a social component in terms of the provision of public services, for example in relation to the pharmaceutical industry.

In the pharmaceutical sector, supply restrictions have a direct impact on the secure supply of medicines to the population. Even in Germany, once the world's pharmacy, numerous medicines are no longer available without restriction. At the end of 2021, the German Federal Ministry of Health listed 250 products for which supply shortages had been reported. In order to increase the security of supply of medicines, the German Pharmaceutical Industry Association is advocating increased production in Germany or Europe. The EU Commission is also moving in this direction and wants to further develop the strategic autonomy of the EU in a targeted manner as part of its pharmaceutical strategy.



For R. STAHL, re- or nearshoring tendencies result in promising market opportunities, not only, but especially, as far as the pharmaceutical industry is concerned. The pharmaceutical industry is one of our key customer groups, and in Europe we are a leading supplier of electrical explosion protection. Companies that bring back production capacities have to expand their manufacturing in European countries for this purpose and create the required facilities accordingly, which results in an additional demand for safety technology, an area in which R. STAHL can participate.

250

medical products faced
availability restrictions
in 2021



FINDING NEW OPTIONS WITH DIGITALIZATION AND AUTOMATION



Whether reshoring or Industry 4.0: We support customers with the explosion protection they need

Until now, cost aspects have often been an argument in favor of manufacturing in faraway locations. This argument, however, is increasingly losing traction, because with advancing digitalization and automation of production processes, manufacturing in Western industrialized countries is becoming more profitable. In addition, with the right plant technology, manufacturing can be both efficient and cost-effective as well as highly flexible.

Not just in the pharmaceutical industry – manufacturing by customers is more individualized

This is in line with market development in many industries, which increasingly demands small batch sizes with individualized products instead of extensive large-scale production. The pharmaceutical sector, one of R. STAHL's core industries, is a typical example, given that it increasingly differentiates between patient groups, promotes personalized therapies and launches drugs for rare diseases. To be able to do this, new, more digitalized and automated processes are needed in production, which in turn require appropriate explosion-proof technology. With its EXcellence 2023 strategy, R. STAHL addresses the full potential that digitalization and automation can provide – for the pharmaceutical industry, but also for all other industries.

R. STAHL combines the digitalized products with the corresponding services.

On the product side, we are continuously expanding and adding products with digital features based on our market-leading automation solutions and for use in networked environments. Furthermore, in addition to our traditional business, we are increasingly addressing complementary digital services. The focus here is on providing digital services that are directly connected with our electrical and electronic components.

Typical fields of application for R. STAHL services are in system control and monitoring. Intelligent sensors and data transmission in real time, for example, can be used to remotely control systems, but also to perform predictive maintenance. Sensors detect signs of wear or aging and report the findings to our remote I/O systems. Impending failures are thus detected at an early stage and thus can be prevented. For plant operators, this is a major contribution to increased plant availability. In addition, operators benefit from cost effects, because the continuous monitoring means that the service life of the components can be fully utilized and any necessary replacement measures can be combined in a targeted manner with upcoming maintenance work.





Digitalization, automation and the use of robots are opening up new opportunities for efficient production.

Exploiting potential – for our customers and for ourselves

Beyond products and services, R. STAHL continues to drive its own digitalization forward across the entire value chain – from data collection, transfer and processing to data management and data-driven control. We are digitalizing and networking processes in manufacturing and administration, harmonizing the Group-wide IT landscape and relying more and more on automated, globally standardized key performance indicator systems. All this not only strengthens R. STAHL's market position, but also provides added value for our customers, for example in terms of demand-driven products, high availability and shorter delivery times.

PREDICTIVE MAINTENANCE

Avoiding sources of ignition before they arise

Especially when rotating equipment in technical plants such as rollers, compressors or engines is involved, hot surfaces can develop that could potentially form a source of ignition. In such cases, we can integrate sensors into our safety technology that continuously collect data on the condition of the machine and report the recorded information to our remote systems. This means that any deviations are detected directly, allowing potential hazards to be eliminated before they actually arise.

With this in mind, we advise customers on the planning of their automation solutions and develop customized concepts with which the technical possibilities can be optimally exploited in relation to the application. Part of this is also the creation of the corresponding software.

Explosion-proof digital technology is required to implement predictive maintenance in potentially explosive environments. The sensor technology used must also be designed so that it does not itself represent a source of ignition. Together with Heilbronn University, we launched a project last year that taps into the benefits of predictive maintenance for explosion-protected machinery. The first result was a patent application for a novel sensor principle for monitoring the condition of shaft bearings.

Beyond the provision of products, R. STAHL is also increasingly involved in new, digital services, including predictive maintenance, for example. We are taking a two-pronged approach here in practice: We provide customers with application advice while also equipping our products accordingly, using intelligent sensor technology and data transmission in real time.

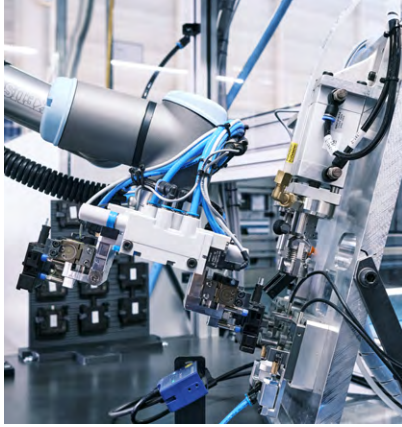


Smart Assembly research project

Manual assembly processes are time-consuming and costly, but they are also tedious tasks for the employees involved. Not only that, but they require extensive training phases, especially when there is a large number of variants. In order to improve this situation, the Ernst Abbe University of Applied Sciences in Jena is exploring new approaches, focusing in particular on assistance systems using augmented reality. R. STAHL supports the experiments that have to be conducted by providing one of our tubular luminaires, which is mounted at three workstations with different technological equipment as part of the experimental setup. The project, which is funded by the Carl Zeiss Foundation, is scheduled to be completed by the end of September 2022. Initial results show that the tested technologies reduce stress for assembly workers and lead to significantly reduced error rates. The research project is also interesting in connection with our cobot deployment, because smart assembly and cobot robotics are an optimal complement to each other.

Augmented reality uses the interaction of digital and analog aspects, for example by superimposing information on data glasses. In this way, employees can be supported during assembly and thus efficiency and quality increases can be achieved.

DIGITAL TWIN



COBOTS IN PRODUCTION

With the goal of producing in keeping with the times, R. STAHL is moving forward with a wide variety of automation projects, including the use of cobots. The distinguishing feature of these industrial robots is that they do not operate separately, but instead collaborate and work together with humans. The activities of our cobots currently in use include recurring tasks such as loading automatic testing machines. Since these agile robotic colleagues are designed to cooperate, they can be integrated into production processes without any significant safety-related effort. The robotic helpers are also easy to program, which is a particular advantage given our high product variance. Our cobots are not yet used for direct human-machine collaboration, but the option exists and presents additional opportunities. Finally, the use of cobots is a subject that continues to gain importance for R. STAHL in the context of intelligent production design.

New nameplate generation offers all information at a glance.

From the manufacturer through to labeling and approval-relevant data: To date, the classic nameplate has provided information and important facts about an industrial product. But the usual sticker is becoming gradually too small for the growing amount of information required. Another factor is that the worldwide use of products requires information in different languages. And last but not least, there is a wide range of additional information on products, such as maintenance manuals or certificates, that cannot be accommodated on the nameplate.

A digital solution is an alternative to the conventional nameplate. This is a task that R. STAHL has been working on since the end of 2020. In an interdisciplinary team, we designed a prototype for 16 of our company's standard products that provides all product information digitally. The minimum details of the familiar nameplate were supplemented by a QR code for this purpose. Product users who scan the code are taken to a web-based demonstrator platform where important product data is stored in an administration tray, as well as additional documents that users need in their daily work with the products.

As a digital twin, the newly developed nameplate reflects the entire information package for the product. This has significant advantages for customers. One of these is the fact that they have the information they need at their fingertips anywhere in the world. At the same time, they benefit from simplified data exchange, as the stored information is machine-readable and can be used for digital engineering. This is an important step into the future, because the digital twin is a key technology for tapping all the potential that digitization and Industry 4.0 have to offer.



R. STAHL is a member of the Industrial Digital Twin Association and actively participates in the development of digital twins.

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