

reliable

Corporate Responsibility Report
of Messer 2021

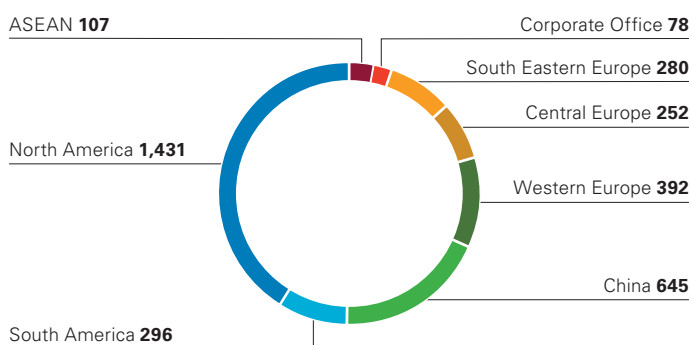
Messer Key Figures at a glance

As of 31.12.2021

		Messer Group	Messer Industries	Total*
Net sales	in million Euro	1,362	2,119	3,481
EBITDA	in million Euro	382	634	1,016
EBITDA-Margin	in percent	28	30	29
Investments	in million Euro incl. IFRIC4	224	296	520
Employees	Contractual employment in FTE**	5,206	5,819	11,025

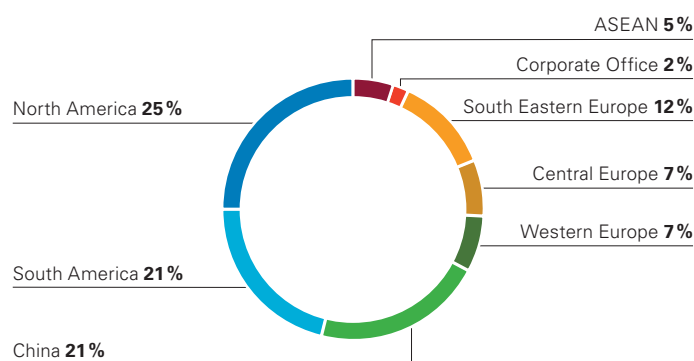
Net sales (consolidated) by region*

in million Euro



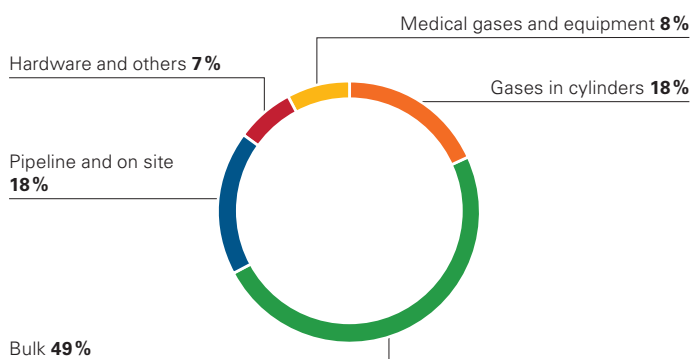
Numbers of employees by region*

in percent



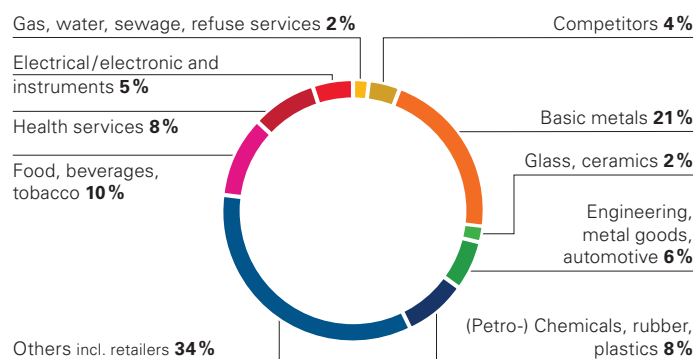
Net sales by product groups*

in percent



Net sales by industry segments*

in percent



* Total of Messer Group and Messer Industries, which includes the at equity investment Messer Industries at 100% from March 1, 2019

** Full-time equivalent

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reliable

In financial year 2020, we showed how flexibly and successfully we can react to changes – specifically due to the Covid-19 pandemic. What surprised us in 2020 became the new normal in 2021. We had to prove that Messer remains a reliable partner for the long term.

And that is precisely what we did, in a number of ways: In 2021, Messer once again managed to ensure the reliable supply of our gases – and not only the urgently needed medical gases. Sustainable investments, including in new air separation units, secured our independence and thus reaffirmed the trust that our partner firms and banks place in us. In our interactions with our customers, we showed that physical distance need not be an obstacle to close and successful collaboration. We seized the opportunities that digitalization offers us to further optimize our work and logistics processes. And the world could also rely on Messer to help confront one of the greatest challenges of our time, climate change: we worked ceaselessly not only to minimize our own CO₂ footprint but also to reduce the emissions generated by our customers' production facilities.

And everyone who works with us can also rely on this: as the international Group that we have become, Messer will continue to live the values of a family-run business.



In 2015, under the aegis of the United Nations, the international community adopted Agenda 2030. It lays out 17 global goals together with the call to implement measures to achieve those goals. In essence, they seek to permanently preserve the natural basis of human existence and to enable people everywhere to live in dignity. Messer aligns its business activities with the 17 UN Sustainability Goals, which also form, in turn, the substantive framework of this Sustainability Report.



Strategic Integration of Corporate Responsibility

Messer aligns itself with global economic, environmental and social climate and transition.

In so doing, Messer acts sustainably and responsibly in both the business and social environment.

We allow ourselves to be measured against our own objectives, innovations and traditions, but also against overarching ambitions.

Above all, climate change is fundamentally changing the global conditions of coexistence and business. The associated effects are having a direct impact on people and companies. Societal goals are undergoing realignment, free-market economic conditions are being modified accordingly – including regulatory changes. This presents us with risks and opportunities: in the

context of the energy transition, for example, Messer is helping its customers make important and necessary progress toward climate neutrality.

As companies, we respect and promote diversity in the composition of our international teams; this enables us to apply different strengths and ideas when developing and implementing new solutions.

Thinking and acting with the long term in mind, taking our social responsibility toward our employees and society seriously, measuring ourselves on our sustainable success – in this regard, these are both key features and fundamental strengths of our family business.

Sustainability commitments of the Management Board

As the world's largest family-run company specializing in industrial, medical and specialty gases, our actions are defined in relation to ESG (Environment, Social, Governance) and all employees live this in practice. Our mission statement plays a

key role, summarizing our vision, our mission and our values and addressing the demands of our customers while focusing on our shared responsibility for the environment, people and progress.

Environmental protection

Messer's gases and know-how are helping to reach the UN's declared goal of achieving climate neutrality by 2050. To that end, we are minimizing our own CO₂ footprint and helping our customers reduce CO₂ emissions in their applications. Enabling this takes many forms, including through the effect of our gas applications, an efficient gas supply, and the use of hydrogen

(H₂). We see green hydrogen as a lever to decarbonize industry and mobility. In that context, as a company we are focusing on three key elements: The economical on site production of green hydrogen, H₂ refueling solutions for public transportation and logistics, and operator models for fuel cell-powered buses.

Social entrepreneurship and diversity

The Messer team stands for courage, ambition, self-confidence, solidarity, success and respect. We are actively involved in solidarity campaigns for people who suffer hardship in their countries through no fault of their own.

We have included Diversity Management in our sustainability process through a Key Performance Indicator (KPI). We conduct training courses, for example, to counteract unconscious biases, thereby promoting a mutually respectful culture that is free of prejudice.

We benefit from the potentials of our internationally and multi-culturally staffed teams and develop them further. We want to raise the share of women in the first and second levels of management by 30 percent by 2030. From our mixed-gender management teams, we expect collaboration at the strategic level marked by well-balanced and profitable decisions.

Governance

Messer has grown to become an international group that continues to live the values of a family-run company. We reflect the regulatory requirements of ESG reporting in our corporate guidelines. We use our potential relative to resources, employees, know-how and customer satisfaction for strategies and measures for sustainable growth and a secured

financing of our investments. We examine ways to integrate our team even better in the development of new ideas. We encourage all employees to demonstrate their personal ESG commitment in harmony with the clear mission of our Group.



Stefan Messer



Bernd Eulitz



Ernst Bode



Helmut Kaschenz



Jens Luehring



Gareth Parkin

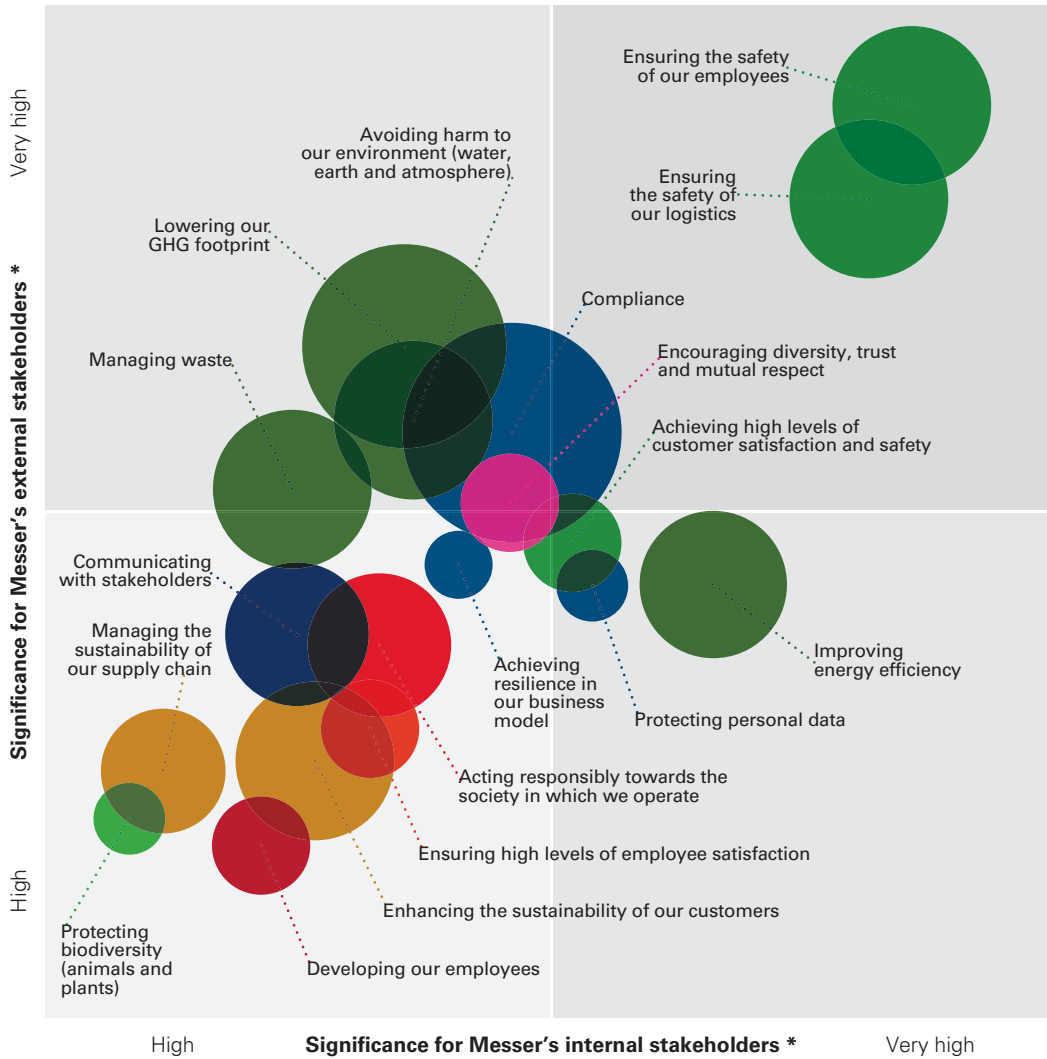
Development of our materiality matrix

Messer’s daily and long-term activities determine the key elements of our strategic sustainability process. It is also aligned with the 17 Sustainable Development Goals of the United Nations.

In evaluating these topics, we involve representatives of as many stakeholders as possible. Moreover, we follow the requirements of relevant ESG standards and reporting frameworks, such as CDP, EcoVadis, GRI and SASB. On that basis, we developed a list of 14 thematic categories and 80 individual topics whose relevance for Messer were evaluated by 47 managers and 373 employees in the context of an anonymous online survey. Selected individuals from our customers, suppliers, authorities and financial companies, as well as representatives

from politics and NGOs, journalists and followers of our social media channels, also participated anonymously in our online survey.

This year, the topics of safety, environmental protection, customer satisfaction and social responsibility were identified as areas of greatest importance. Our decisions can affect all essential topics and also have a potential impact on stakeholder groups outside the organization as well as on the 17 UN Sustainable Development Goals. Accordingly, all major projects are relevant – both in-house and external to the organization. The following color-coded summary matrix clearly shows how our core topics correspond to the UN Sustainable Development Goals.



*internal stakeholders: internal stakeholder groups such as general managers and employees
 external stakeholders: external stakeholder groups such as customers, suppliers, journalists and social media followers

Internal and external stakeholders agree that we can make our greatest contributions to sustainability in the following areas:

- Safety: We aim to ensure the safety of our employees as well as that of our logistics and vehicles. We place a very high priority on the protection of data.
- Environment: We act according to our compliance and continue to work toward reducing our CO₂ footprint. We do not pollute the water, soil or air. Through the highest possible energy efficiency, we conserve natural resources.
- Satisfaction of our customers: We meet our customers' needs regarding quality, performance and environmental compatibility as well as plant and equipment safety and the security of supply.
- Diversity and equal opportunity: Our actions are based on diversity, trust and mutual respect and we leverage them to create business advantages. We focus on this in the context of continuous improvement processes.

Responsibility of the company

Customer and employee orientation, responsible action, corporate responsibility, open communication, trust and respect: all of these are embedded in our Company Values. To make those values and our development measurable and comparable with regard to sustainable action, we have been using Key Performance Indicators (KPIs) for sustainability since 2014.

Using measurable goals, we document our improvements and developments in the different business units. As already in financial year 2020, the present Sustainability Report 2021

publishes harmonized sustainability-related Key Performance Indicators that reflect both corporate groups: Messer Group (effective July 30, 2021 the companies of Messer SE & Co. KGaA) and Messer Industries.

This report is based on the UN Sustainable Development Goals and follows the G4 guidelines of the Global Reporting Initiative (GRI). We also report on third-party agents, such as EcoVadis, the Carbon Disclosure Project (CDP) and the "Responsible Care" initiative of the chemical industry.

	Unit	2020 Combined KPI	2021 Combined KPI
1. Safety of our employees			
Number of Lost Time Injuries (Messer employees)	number	44	48
Lost Time Injury Frequency Rate (Messer employees lost time injuries)	per million working hours	2.0	2.18
Lost Time Injury Severity Rate (Messer employees lost days)	per million working hours	56.3	69.15
Number of Recordable Working Injuries (Messer employees)	number	83	81
Recordable Working Injury Frequency Rate (recordable injuries)	per million working hours	3.7	3.67
Fatalities (Messer employees)	number of persons	0	1
2. Safety of our logistics			
Cylinder fleet: Number of preventable incidents	number	64	74
Cylinder fleet: Frequency Rate (number of preventable incidents)	per million driven kilometers	3.05	2.13
Bulk fleet: Number of preventable incidents	number	194	161
Bulk fleet: Frequency Rate (number of preventable incidents)	per million driven kilometers	0.89	0.80
Development of the distance traveled per ton (payload) of liquid industrial gas or cylinder gases delivered (Index 2019 = 100)	index	101.9	99.42
3. Customer safety and satisfaction			
Number of participants in customer satisfaction surveys across the Group	number	3,927	4,150
4. Diversity, mutual trust and respect			
Proportion of women overall	%	28.4 %	28.1 %
Proportion of women in first and second management levels	%	24.1 %	25.1 %
5. Energy efficiency in production			
Energy coefficient (Index 2018 = 100)	index	99.9	101.1
6. Open communication and cooperation with stakeholders			
Number of items of customer feedback regarding the content of the digital customer magazine Gases for Life	number	2,056	1,170
Total number of attendees at employee assemblies (townhall meetings) and international network meetings towards strategic integration and know-how transfer	participants	15,559	20,509

7. Protection of the environment

CO ₂ footprint of plants and logistics - Scope 1 & 2 (location-based)	Mio. t CO ₂ e	4.78	5.46
Specific CO ₂ footprint of plants and logistics - Scope 1 & 2 (location-based) vs. Sales	t CO ₂ e / '000 Euro	1.53	1.55
CO ₂ footprint of plants and logistics - Scope 1 & 2 (market-based)	Mio. t CO ₂ e	-	5.72
Specific CO ₂ footprint of plants and logistics - Scope 1 & 2 (market-based) vs. Sales	t CO ₂ e / '000 Euro	-	1.62
Number of production / filling companies certified to ISO 14001 / RCMS*	number	59	61
Water consumption	Mio. m ³	16.6	17.5

8. Employee satisfaction

Average length of service	years	10.2	9.7
Staff turnover rate	employee turnover rate	13.2 %	10.1 %

9. Employee development

Average expenditures on training programs per employee	Euro	-	114.5
Training hours per employee per year (excluding cost-free webinars from 2020 and onwards)	hours per employee	-	15.0
Proportion of apprentices and trainees in total workforce	%	1.3 %	1.3 %

10. Compliance

Number of inquiries to the „Ask us help desk“	number	6	16
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11. Community engagement

Volunteerism	number of site volunteering	153	95
Community engagement events	number of events	237	970

12. Supplier sustainability

Vendor assessment	rating from survey feedback (1-100)	-	82.9
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Organizational and personnel Changes

New “Integrity Line” for employees

Messer’s “Integrity Line” offers a new communication platform that makes it easier for employees to report not only improvement suggestions but also perceived irregularities. Observations and suspicions regarding possible compliance violations can be directed to designated contact persons by phone or online – in compliance with the law and in the local language. It is also possible to remain anonymous. To protect not only the

reporting individuals but also the employees implicated in the alleged irregularity, the Management Board of Messer issued applicable regulations that define the reporting process and implement the requirements of the EU Whistleblower Directive. The “Integrity Line” and the regulations are part of our Compliance Code of Conduct.

Code of Conduct revised

The Group Compliance Department revised the Code of Conduct (CoC). The CoC received a new layout and the revised version applies without restriction also for Messer Industries companies in Western Europe and the Americas. Wording

and editorial changes were also incorporated. They make the content easier for users to understand through features such as supplementary footnotes and standardized terminology.

New Purchasing Policy for Electricity

In the context of our Compliance Management System (CMS), a new Purchasing Policy for Electricity was adopted in 2021. It is designed to help minimize electricity costs for each air separation unit, negotiate the best possible contract terms, and

make use of favorable market conditions when buying electricity. The policy applies to all consolidated Messer companies in Europe.

Dr. Uwe Bechtolf leaves the company

Dr. Uwe Bechtolf, Managing Director and CFO (Chief Financial Officer), left the company on December 31, 2021 at his own request. During the more than 26 years that Dr. Uwe Bechtolf worked for Messer, he made a major contribution to ensuring

our company’s sustainable and profitable growth as well as strengthening and enhancing Messer’s strategic position in Europe and Asia. We thank Dr. Uwe Bechtolf for his extraordinary commitment in the service of our company.

Helmut Kaschenz is the new CFO of Messer SE & Co. KGaA

Helmut Kaschenz has served as Chief Financial Officer of Messer SE & Co. KGaA since January 1, 2022.

Bernd Eulitz is the new Deputy CEO of Messer SE & Co. KGaA

On February 1, 2022, Bernd Eulitz assumed his position as Deputy CEO of Messer SE & Co. KGaA.

Accordingly, the Management Board now comprises Stefan Messer as CEO, Bernd Eulitz as Deputy CEO, Ernst Bode as COO and Helmut Kaschenz as CFO.

USA: New process-oriented management system

To pave new ways of working, Messer in America implemented the Messer Americas Management System (MMS). It forms the framework for fundamental guidelines, processes and procedures that enable our business to run smoothly. MMS

replaces the previous Integrated Management System (IMS) and makes it easier for employees to understand the principal components of our business. MMS is consistent with our principles and with our vision of becoming a preferred supplier.

Awards

Croatia: Croatian Sustainability Index HRIO

Messer was awarded the Croatian Sustainability Index HRIO in the "Medium-Sized Company" category. The evaluation focused on the company's attitude vis-à-vis its employees, society, its customers, its suppliers, the government and the environment. The Croatian Sustainability Index HRIO is based on

a ranking system that objectively evaluates and compares the social responsibility of companies and also audits compliance with the latest regulations of the European Union. The award is presented in three categories: Large Company, Medium-Sized Company, and Small Company.



Corporate Responsibility

Messer Compliance Management System

With the Messer Compliance Management System (Messer CMS), we emphasize our shared understanding of our fundamental values. The Messer CMS is the binding framework of action for resolving conflicts of interest and ensuring compliance with applicable laws, regulatory requirements and the policy guidelines within all business units of the Messer Group. Its purpose is to foster a relationship with our stakeholders based on fairness, solidarity and trust. It helps those in charge establish and implement our value system. Moreover, the Messer CMS is designed to prevent potential infractions in advance if

possible. The managing directors and senior management are fully committed to the Messer CMS.

Messer Americas has adopted the Code of Conduct and also applies its own Code Supplement as well as a Supplier Code of Conduct. Other guidelines include a guideline on compliance with antitrust law, a guideline on anti-corruption, a compliance guide for business partners and a data protection guideline for North America.

Compliance violations and cases of justifiable suspicion

Employees can use appropriate hotlines to report about infringements of applicable law or the Messer Code ("compliance infringements"), as well as justifiable cases of suspicion,

to managing directors and senior management at any time. The latter ensure prompt remedial action. Messer received 16 such reports in 2021, as compared with 6 in the previous year.

Data security

The Group IT Security Officer of Messer SE & Co. KGaA coordinates responsible security measures for the individual companies. He establishes the associated standards and develops the relevant expertise.

Through our IT security measures, we support the sustainability of our digitalization process and the physical security of our information, as well as the availability of the systems that our business processes require. An international team develops the

relevant IT Security services.

In the year under review, various measures were undertaken to reorient completely the IT infrastructure of Messer SE & Co. KGaA. The new IT infrastructure reflects current, globally established standards, which makes it more effective, more stable and more secure – essential preconditions for working even more efficiently.

Raising employees' awareness of IT risks

At the end of March 2021, to sharpen employees' awareness of the scope and risks of cyber attacks, we launched the first assessment initiated throughout Europe via an IT security platform. Among other things, content covered e-mail fraud, safe

use of the internet, the creation of secure passwords, and the protection of mobile devices. Based on the individual results of that first assessment, employees were referred for relevant training in a second step.

Phishing simulations as training measure

In the context of the “European Messer Phishing Campaign,” several phishing e-mails were sent out to the employees in Europe in 2021. The phishing campaign enables us to use an awareness platform to provide employees with specific training relative to the dangers of cyber crime. In this way, we minimize potential risks and strengthen the expertise of our employees.

At Messer Americas, the assessment of IT risks is part of the risk management program. Regular audits and reviews by third parties assess the security level, and the Executive Committee of Messer Americas receives regular updates on the current

state of cyber security. Regular monitoring protects end devices, servers, applications, data and cloud platforms from cybersecurity attacks and threats. Monitoring by the infrastructure and security organization enables rapid reactions to attacks, vulnerabilities or emerging threats.

To raise the employees’ awareness of IT risks, Messer Americas relies on a combination of training, communication and online tools. This improves our ability to detect potential threats such as phishing e-mails or compromised business e-mails and to prevent the problems that would otherwise result from them.

Data privacy

Messer undertakes to comply with applicable data privacy regulations. Appropriate structures are designed to guarantee a consistently high level of data privacy.

The Group Privacy Officer of Messer SE & Co. KGaA is responsible for coordinating corporate Data Privacy and provides managerial support for its implementation by the national subsidiaries. Pursuant to the EU General Data Protection Regulation (GDPR) and the German Federal Data Protection Act (BDSG), we handle the data of our employees, customers and business contacts in conformance with the law. Messer also implements legally required data protection measures relative to organization and documentation. Messer’s European national subsidiaries and Messer SE & Co. KGaA publish their data privacy statements on their websites in their respective national language to facilitate understanding.

Messer Americas complies with the applicable data protection laws, the relevant Code of Conduct of Messer SE & Co. KGaA for America and the Code Supplement of Messer Americas. In addition, Messer Americas has adopted its own data privacy guideline for North America. The Senior Counsel & Regional Compliance Officer of Messer Americas, the Head of Human Resources for North America Business Operations and members of the Legal and Compliance Team of Messer Americas are available throughout the Americas for questions concerning data privacy. Messer Americas also consults with external specialists on compliance questions.

Training programs on data privacy are included in the Code of Ethics and Conduct of Messer Americas. The “Code of Ethics and Conduct” e-learning course is mandatory for all Messer Americas employees.



Sustainable, documented supply chain

A sustainable supply chain is a prerequisite for Messer's economic success. Relationships between Messer and its key suppliers play a crucial role here.

At Messer SE & Co. KGaA, the Logistics/Sourcing and Engineering/Production departments maintain close contact with these key suppliers. These central departments take charge of, or provide assistance with, the procurement of logistics services and commodities throughout Europe. The sustainable quality management systems of both departments are certified according to ISO 9001. Periodic audits of the key suppliers are an important part of their assessment.

The Production department helps the Messer national subsidiaries operate and maintain existing production facilities. The goal is to optimize production processes. Corporate computer-aided monitoring and control improves the cost effectiveness and energy efficiency of our systems, enabling us to reduce continuously the CO₂ footprint of our plants. We consistently realize additional optimization potentials identified through regular process and energy audits.

The Engineering department is responsible, primarily in Europe, for the development, construction and modernization of units that produce technical and medical gases. In addition to plant design, project management, construction management, and start-up, this work also includes the procurement/purchasing of all required plant and equipment components. We apply the extensive experience gained during the construction and operation of existing plants to improve the efficiency of our plants continuously and to use technically high-quality, durable and energy-efficient components. Selected specialists work on advanced development for the continuous improvement of our processes – using, among other things, the latest process design programs and software tools.

In collaboration with Messer GasPack, the Logistics/Sourcing department ensures the availability and transport of all kinds of gases. This also includes the development of new logistics concepts and the rollout and operation of optimization and monitoring tools. In addition, procurement activities are conducted and coordinated throughout Europe. This applies for tank cars, stationary customer tanks, evaporators, electricity for the production plants, and gases from external sources. The leasing and periodic inspection of pressure vessels and fittings are another area of activity. The Logistics/Sourcing department also helps the national subsidiaries manage transport contracts and organize the transportation of heavy loads. Handling these specialized functions on a centralized basis not only provides economic benefits, but also serves to maintain consistently high quality standards throughout the company.

The Covid-19 pandemic sharply restricted the ability to conduct supplier audits again in 2021. Some outstanding audits have already been completed and others will be rescheduled for earliest possible completion. These audits focus primarily on the production process, the quality of the products manufactured, and sustainability. Since 2018, key suppliers have been obliged to adhere to the principles of the UN Global Compact, adding appropriate emphasis to sustainability, human rights, environmental awareness and working conditions. In the event of an unsatisfactory assessment, we work together with the supplier to develop adequate improvement measures. Critical non-compliance, however, leads to rejection of the supplier concerned.

Messer Americas also conduct regular supplier audits.

The procurement function concentrates on product category management, strategic procurement and expenditure management within the Procurement organization. This work also focuses on cost savings and occupational safety and health.

Messer Americas' Sourcing team bundles expertise in the following categories: Indirect, Plants and Production, Merchant Packaged Gas, Customer Engineering Services, Logistics and Fixed Assets. In that context, it focuses on Category Management, Contract Lifecycle Management, Supplier Relationship Management and Compliance. The Sourcing team works closely with the operative team on all current investments. Messer Americas' Sourcing team is subject to Messer Americas' procurement policy and Messer Americas' procurement guidelines.

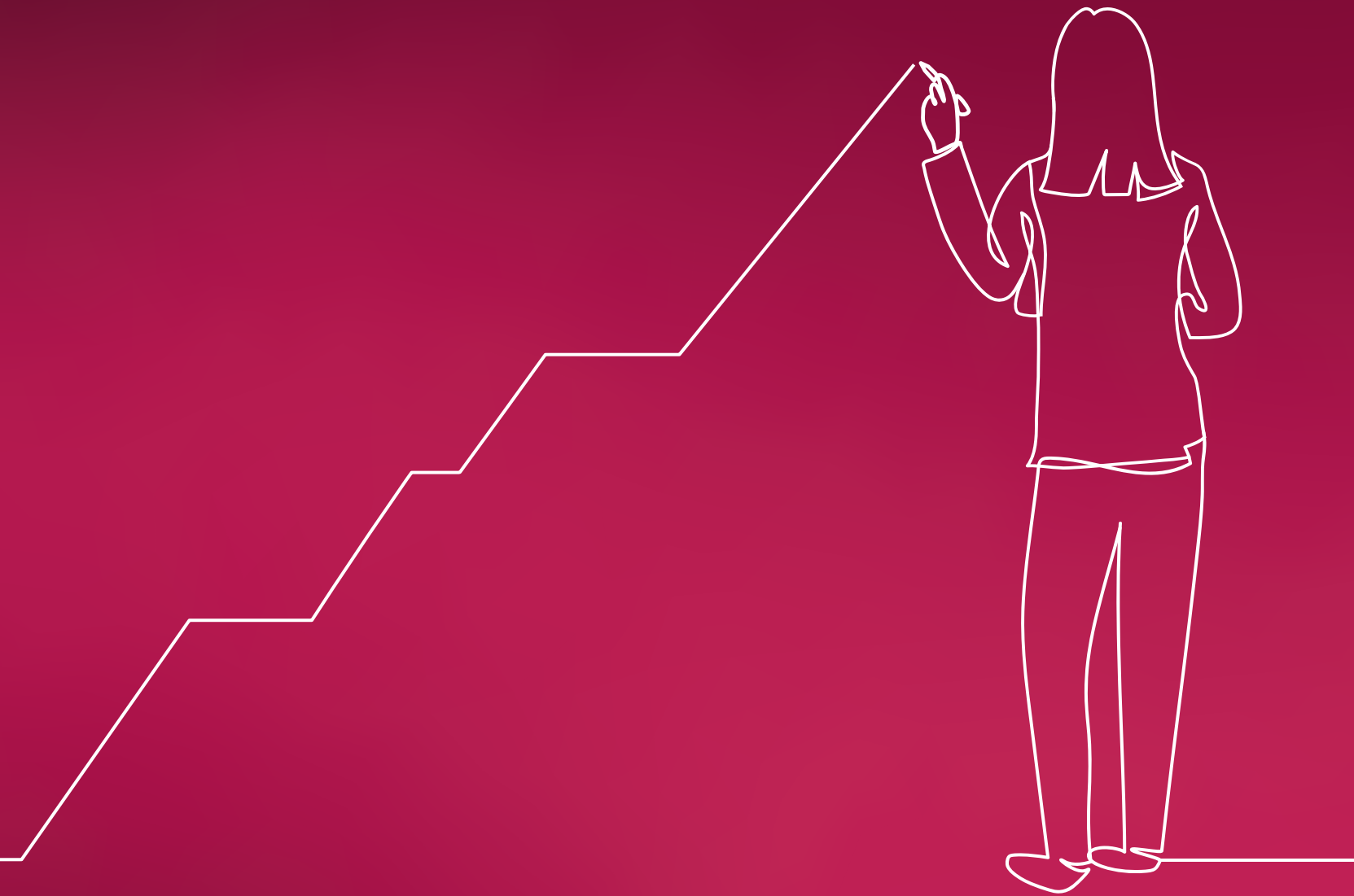
Messer Americas' Procurement group uses a supplier management system to guarantee quality and ensure compliance with standards that regulate operating performance, safety, the environment and social responsibility. Suppliers must submit a binding acknowledgment of Messer's Code of Conduct Declaration. Moreover, Messer in the USA measures compliance with our standards by demanding compliance with our Conflict Minerals Declaration and our Supplier Quality Declaration.

Messer Americas' Energy team manages the electricity demand – and with it, the Messer's largest variable cost. In that context, the dedicated energy specialists work closely with the operations team to maximize utility and efficiency. To that end, power consumption is reduced during periods of high electricity prices or power grid emergencies.

In deregulated energy markets, the Energy team has implemented a direct power procurement strategy, which enables Messer to purchase electricity directly from wholesale energy markets. In addition, the Energy team uses an energy risk management program, which has resulted in lower and less volatile electricity costs. In regulated energy markets, the Energy team works closely with utilities, government agencies and other interest groups. This ensures that Messer obtains reasonable electricity rates that are in line with operating costs.

Messer Americas' Energy team cooperates with local, state and federal authorities. This is the basis for obtaining allowances that reflect the operating flexibility and energy efficiency of Messer's plants. Moreover, Messer participates in various industrial groups to help shape national and state energy policy. This primarily involves issues such as green energy, sustainability, reaction to energy demand, and the resilience of the electricity grid.





Sustainable Business

Messer's strategic orientation

In 2021, Messer Group GmbH was transformed into a limited joint-stock partnership (KGaA) and has since traded under the name of Messer SE & Co. KGaA. The KGaA legal form allows us to ensure that Messer is geared to the future as a global group with enhanced operational and organizational scope. It ensures continued control and influence on the part of the shareholder family. The new legal form will allow the family's fiscal and financial objectives to be achieved with even greater flexibility in future.

Over the next few years, the plan is to fully integrate Messer Industries GmbH, the joint venture created in 2019, into the family-owned company Messer SE & Co. KGaA. The development and implementation of a global strategy will then be

possible for the merged industrial gases group. Furthermore, this will also facilitate the leveraging of some existing minor efficiency reserves.

The economic activity of Messer SE & Co. KGaA is mainly focused on Eastern Europe and Asia. The Asia region represents the world's largest industrial gases market with the highest growth rates. Messer Industries has regional and product-specific business operations in North and South America as well as Western Europe. What unites them all is the focus on safety, customer orientation and profitable growth. We aim to achieve appropriate payment for our products through a team culture geared towards efficiency, success and motivation, a high level of employee and customer satisfaction as well as innovation.

Sustainable growth through investment

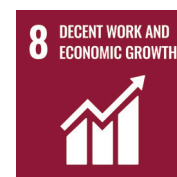
Investment projects form an important basis for sustainable growth in the industrial gases sector, which is characterized by

Belgium: CO₂ recovery at Alco Bio Fuel biorefinery

Messer, together with the Alco Bio Fuel (ABF) biorefinery and IJsfabriek Strombeek, is building a second CO₂ recovery plant in Ghent. It is due to go into operation in 2022. In combination with the first plant, which is already in operation, the recovery capacity is then expected to reach 160,000 metric tons of car-

bon dioxide a year. The biogenic carbon dioxide is a by-product in the process of producing ethanol from biomass. Instead of being released directly into the atmosphere, as is usually the case, it is captured in the two recovery plants and made available for CO₂ applications.

bon dioxide a year. The biogenic carbon dioxide is a by-product in the process of producing ethanol from biomass. Instead of being released directly into the atmosphere, as is usually the case, it is captured in the two recovery plants and made available for CO₂ applications.



Brazil: Sustainable CO₂ production in Jandaia do Sul

Messer further expanded its carbon dioxide (CO₂) capacities in the south, southeast and mid-west of Brazil: at our Jandaia do Sul site, pure, food-grade CO₂ is being produced from maize for the first time in Brazil - with production taking place throughout the entire year and without seasonal interruptions. The sustainably produced CO₂ allows us to meet the increased

demand across various industries. The decision to expand CO₂ capacities at the Jandaia do Sul site is a clear commitment on the part of Messer to further expansion in the Brazilian market. Our CO₂ production site links to the rail network to facilitate logistical access to Curitiba, São Paulo and the ports of Santos and Paranaguá as well as the entire southern region.

China: New air separation unit for biotech customer in Chongqing

At the beginning of 2021, Messer concluded a gas supply contract with Calyseo (Chongqing) Co., Ltd., a joint venture between Adisseo, a global leader in the manufacture of feed additives for animal nutrition, and Calysta, a producer of alternative proteins. According to the provisions of the contract, Messer will build a new air separation unit for Calyseo as the world's first large-scale FeedKind protein production facility, which will

produce 20,000 metric tons of protein a year. The new air separation unit is due to go into operation at the beginning of 2023. Until then, Messer will, for the most part, supply oxygen and nitrogen to Calyseo by pipeline from an existing unit. This unit also has a liquid capacity – for the market in Chongqing – which will allow Messer to further strengthen its leading position.

China: More environmentally friendly iron production

Xianggang Messer signed a new gas supply contract with its Joint Venture partner and, at the same time, largest pipeline customer, Xiangtan Iron & Steel, for the construction of a VPSA (Vacuum Pressure Swing Adsorption) unit. The new production unit will facilitate economically efficient production of oxygen to

meet the customer's increased demand for oxygen enrichment for their blast furnace. Increasing the oxygen enrichment ratio means reduced consumption of coke, which leads to greater efficiency and lower emissions in the iron production process.

China: Messer supports growth of lithium-ion battery industry for new energies

In China, Messer put an on site nitrogen generator into operation at Hunan Yuneng New Energy Battery Materials Co., Ltd. (Yuneng) in Xiangtan, Hunan province. The remote-controlled on site unit allows Messer to supply this major customer with nitrogen to support their long-term growth. Yuneng is China's leading manufacturer of lithium iron phosphate (LFP), the cathode material for lithium-ion batteries. In mid-2021, Yuneng

announced a five-fold increase of its capacities at the Xiangtan site and, at the same time, the construction of a new LFP plant in Anning, Yunnan province. At the moment, Messer is building another nitrogen generator there, which is scheduled to go into operation in the third quarter of 2022. Yuneng has been working with Messer since 2016. The new projects will further strengthen our strategic partnership.

Colombia: New nitrogen liquefier in Tocancipa

In Colombia, Messer is investing in a nitrogen liquefaction plant at the Tocancipa site, near the capital city of Bogotá, to expand its liquid capacities and meet the increasing demand for nitrogen

in the region. The liquefier will supplement the existing air separation unit at the site.

Czech Republic: New nitrogen production facility for Energoaqua

Messer put another nitrogen production unit into operation for Energoaqua in Rožnov pod Radhoštěm. Energoaqua is a service provider and supplier of electricity, heating and industrial gases for a range of companies in the adjacent industrial park. The company has been operating an on site nitrogen production unit installed by Messer for approximately ten years. Demand at the industrial park has increased greatly since then, which is why

Messer has been supplying Energoaqua with additional liquid nitrogen and other industrial gases by tanker for years. The new on site production facility allows Energoaqua to produce the nitrogen independently with high reliability of supply – with the additional benefit of eliminating the CO₂ emissions and noise pollution associated with nitrogen deliveries by road tanker.

Czech Republic: Market position in Central Europe further strengthened

Following the purchase of parts of Air Liquide Czech Republic, the acquired Air Liquide entity and Messer in the Czech Republic merged on January 1, 2021. An important component of the transaction was the takeover of a cylinder gas filling plant and an on site oxygen production facility. Added to this are 60 bulk

tanks installed on site for major customers as well as over 28,000 gas cylinders and 1,200 cylinder bundles acquired as part of the deal. In addition, Messer's distribution network in the Czech Republic has grown by a further 38 Gas Centers.

France: New CO₂ recovery plant in Lacq

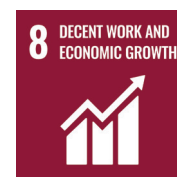
Messer is building a second CO₂ purification and liquefaction facility in Lacq with a capacity of 60,000 metric tons a year. The two storage tanks for our new CO₂ recovery plant in southwest France were delivered at the beginning of July 2021. The tanks – 29 meters in length and weighing 53 metric tons – were manufactured in Turkey and transported to Bayonne by sea. From there they were transported onwards by truck, which was done

at night in order to minimize the impact on traffic. Work on the construction of our new CO₂ recovery plant began in March 2021. The start of industrial production is planned for July 2022. The additional production capacity will allow Messer to further enhance security of supply of CO₂ for its customers in France and Spain.

Germany: New nitrogen supply system at Nowega

On October 1, 2021, Messer took over regular operation of a nitrogen production facility at Nowega in Rehden, one of the transmission system operators for natural gas in Germany. Nowega uses the nitrogen to ensure the supply of 'L-gas' quality natural gas in its network area even in periods of peak demand. Thanks to the nitrogen production facility, the previous road tanker deliveries are no longer necessary, reducing the strain on the road network and cutting noise pollution. Further

CO₂ emissions are also avoided thanks to the fact that the nitrogen does not require to be liquefied as part of the on site production process. In total, Messer and Nowega are contributing to environmental protection by reducing climate-damaging emissions by up to 16,400 metric tons a year. Moreover, the nitrogen production facility has significantly increased Nowega's security of supply of natural gas.



Hungary: Nitrogen production facility for MOL

Messer built a facility for the production of nitrogen and compressed air for the petrochemical group MOL in Tiszaújváros. MOL is building a new polyol production plant in the eastern Hungarian town. Polyols are basic raw materials with a very wide range of uses in the chemical industry. Among other things, they are required for the production of polyurethane

plastics. It is the biggest investment in MOL's history; commissioning is planned for 2022. The new nitrogen and compressed air facility is the most efficient of its kind operated by Messer in Hungary. Messer already operates an air separation unit at the same site.

Serbia: New specialty gases plant in Pančevo's industrial area

Messer commissioned a new specialty gases plant in Pančevo's industrial area, further enhancing efficiency and capacity in this segment in Europe. The plant produces a wide range of high-purity gases, standard mixtures and individual gas mixtures. With high-quality specialty gases products, we meet the exacting requirements of our customers and make our contribution towards a greener living environment. The

classic applications for high-purity gases and their mixtures include their use as test gases in research and development, in medicine and in measurement technology, for example for air purity. The new specialty gases plant directly adjoins the helium filling plant operated by Messer in Pančevo since 2011. This eliminates the need for the previous transportation routes to the former specialty gases site.

Serbia: CO₂ production plant in Rusanda

Messer is investing in a highly efficient CO₂ purification and liquefaction facility in Vojvodina. The crude CO₂ gas – with a high CO₂ concentration and high pressure – comes from a natural gas processing plant. At this facility, the sour gas is conditioned by separating the CO₂ so that it can be fed into the natural gas network. At our CO₂ plant, the relatively high methane content in the crude gas is used to generate electrical and thermal ener-

gy. This makes the production of 40,000 metric tons of high-purity liquid CO₂ per year particularly economically efficient. The plant, which is due to go into operation in the fourth quarter of 2022, will allow Messer to further strengthen its provision of a reliable and cost-effective supply of CO₂ to customers in Serbia and the region. It will also create the conditions for a significant expansion of our customer base in the region.

Serbia: Expansion of oxygen supply at Metalfer Steel Mill

Metalfer Steel Mill is one of the leading manufacturers of steel products for the Serbian construction industry and the only producer of reinforcing steel in Serbia. In view of the increased demand for industrial oxygen, Messer and Metalfer Steel Mill signed a new long-term supply contract in 2021. In future, the oxygen for Metalfer will come from a dedicated VPSA (Vacuum

Pressure Swing Adsorption) unit, which is scheduled to go into operation at the end of August 2022. The solution implemented on site will make the transportation of oxygen by road largely superfluous. This will reduce the ecological footprint and lower the company's costs.

Slovakia: First facility for the production of argon from synthesis gas at Duslo

At the Duslo, a.s. site in Šaľa, Messer put into operation an argon production facility based on residual gas from ammonia synthesis for the first time. The purge gas contains the rare gas argon as well as methane, nitrogen and hydrogen. These gases are also recovered by the facility in accordance with Duslo's quality requirements. Technically, the facility features fully

automated operation and maximum energy integration. In full operation, an annual reduction of up to around 500 metric tons of CO₂ emissions can be achieved thanks to shorter transportation routes. Moreover, this investment allows us to increase our argon capacities and further strengthen our market position in this segment.

Slovenia: New oxygen production facility at Steklarna Hrastnik

Steklarna Hrastnik develops and manufactures engineered glass products from one of the clearest types of glass in the world. This long-established company has been using oxygen in the production process for over 50 years, and since 2013 it has been harnessing the advantages of our oxy-fuel technology. In 2019, Steklarna Hrastnik and Messer signed a supply contract for oxygen from an on site unit (CryoGox), which went into op-

eration at the beginning of September 2021. Steklarna Hrastnik uses the pure oxygen generated by the on site unit in glass production in its new G furnace, with a 60 percent reduction in the carbon footprint. Steklarna Hrastnik wants to convert its processes to green technologies, and the new on site oxygen production unit is another step in this direction.

Slovenia: Automated filling in Črnuče

In April 2021, Messer commissioned a new filling plant in Črnuče, near the capital Ljubljana. It is equipped with state-of-the-art 300-bar filling technology which facilitates automatic control and monitoring of the filling process. The E-ccts customer

cylinder tracking system is available for post-delivery tracking. It allows customers to follow cylinder movements in their own company and make a contribution to the sustainable circulation of “returnable cylinders”.

Spain: Successful modernization of CMG-II air separation unit in Vilaseca

The end of November 2021 saw the successful completion – on time and on budget – of the modernization of the CMG-II air separation unit (ASU) in Vilaseca, in the southern part of Tarragona’s petrochemical industrial park. The main aim of the project was to reactivate an existing air separation unit in an environmentally and, at the same time, commercially attractive way. This was achieved by significantly improving the specific energy consumption of the unit, previously assessed as ready for decommissioning. Messer intends to operate the now completely renovated unit for at least the next ten years. This has made it possible to avoid all the environmental impacts that would have been associated with the construction of a new unit.

The project involved completely overhauling all the process machinery, improving the control system, checking all the pressure vessels, removing obsolete equipment and components and carrying out a comprehensive technology upgrade. The latter comprises using a completely new Front End with a new air compressor and a new adsorptive air purification system. All the work was completed in a record time of ten months and without a single safety or environment-related incident.

The CMG-II ASU was built in 1977. Since the Messer-IV ASU was commissioned in 2009, the CMG-II ASU has been used as a backup supply for our industrial gases pipeline network in the Tarragona Industrial Park.



Switzerland: New filling and quality control facility

Existing premises at our Lenzburg site were completely renovated and repurposed for filling and quality control of specialty gases. For specialty gases filling, the facility now houses three universal filling stations, a bundle filling station, a filling stand for reactive and toxic gases as well as a ppb filling station. In

addition, there is a separate weighing room. The quality control laboratory was also converted and re-equipped to meet current requirements. A further universal filling station is planned for expanded production in future.

USA: New air separation unit strengthens market position in the Midwest

Messer and North Star BlueScope Steel (NSBS) agreed an increase in the supply capacities of gaseous oxygen in Delta, Ohio. NSBS is a leading manufacturer of hot-rolled sheet steel for the automotive, construction, energy and manufacturing sectors. Messer is investing in the construction of a new air separation unit (ASU) to increase the oxygen supply to 700 metric tons a day. This investment underlines our commitment

in terms of expanding our on site business in the U.S. while at the same time conducting a strategic expansion of our US bulk business. Apart from supplying NSBS, Messer will use the new ASU to expand its own liquid capacities in Delta and thereby increase growth and supply reliability for customers in the expanding market of the Midwest.

USA: Construction of a new air separation unit in Texas announced

Messer announced the construction of an air separation unit (ASU) in central Texas aimed at further expanding its strong supply network for gases in the southwestern part of the country. The new ASU will produce medical and industrial gases that are indispensable for hospitals, food processing and many

sectors of industry. The new ASU will operate substantially off energy supplied from an onsite solar panel array. It is the first Messer plant to be powered by a co-located renewable energy source, helping to reduce the company's carbon footprint.

Vietnam: New nitrogen generator and pipeline connection for solar cell production facilities

In 2021, Messer further consolidated its leading role as a supplier of gases to the solar industry in Vietnam. In October 2021, Messer signed a new nitrogen generator contract with JA SOLAR, a global leader in the manufacture of high-performance photovoltaic products, for their solar cell production facility in Bac Giang. Messer also signed a contract for the piped supply of nitrogen to Trinasolar's new solar cell production plant, which is located

next to Messer's air separation unit in Thai Nguyen. With these investments, we are ensuring a reliable gas supply to both these global market leaders in the solar industry, while at the same time reducing the carbon footprint of our nitrogen and making solar cell production – so important for green energy – “even greener”.

Vietnam: New air separation units for an expansion of Hoa Phat Dung Quat

Messer and its strategic long-term partner in Vietnam, the Hoa Phat Group, signed a new pipeline contract for the supply of oxygen, nitrogen and argon for an expansion of the Dung Quat steel complex. Hoa Phat's new investment is aimed at significantly reducing Vietnam's import of flat steel products and supporting the development of the local automotive and engi-

neering industries. In addition to its three existing production facilities, Messer is investing in two new air separation units to supply Hoa Phat with sufficient gas volumes. Moreover, a new rare gas production unit is planned for the production of krypton, neon and xenon.

Enhancing efficiency through digital improvements

Many Messer entities have strategically and technically reoriented their IT infrastructure, pursuing their digitalization strategies, with important milestones having already been reached.

Based on modern, globally established standards, the new standardized and flexibly scalable IT structure is an important

prerequisite for improved business processes and greater efficiency, as well as more flexible and agile working.

Employee awareness of cybercrime has been further strengthened, including through training sessions.

Employees made aware of IT risks

In order to heighten our employees' awareness of the risks and extent of cyber attacks, we launched our first assessment via Proofpoint's IT security platform as a Europe-wide initiative at the end of March 2021. The topics covered included email

scams, safe use of the Internet, creating secure passwords and protecting mobile devices. Based on the individual results from this initial assessment, employees were assigned additional training sessions in a second stage.

Phishing simulations as a training measure

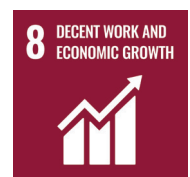
As part of the "European Messer Phishing Campaign", an e-learning program was initiated at the end of the first quarter of 2021. The topics covered by the program are email security,

password rules, safe web browsing, phishing, and malware and ransomware.

New IT infrastructure for enhanced future and data security

Messer is currently implementing one of its biggest IT projects yet in Europe: the complete reorientation and reorganization of our IT infrastructure. In the summer of 2021, we transferred our business-critical systems, such as SAP and trip planning for bulk and cylinder gases, to a new external computer center in

Frankfurt/Main. The computer center complies with the applicable international IT security standards for protection against virtual and physical threats. Moreover, it has multiple levels of protection against the loss of power, water supply or Internet connection.



New CRM for long-term customer retention

Messer has decided to introduce a new unified Customer Relation Management (CRM) system which ensures better efficiency and service quality in the area of sales while at the same time improving process organization. Once it has been rolled out, the new CRM system will support the day-to-day business

processes of almost 1,000 Messer employees in Europe in 15 languages. It will also further increase our productivity and efficiency for our customers, enabling us to retain them in the long term.

Added value enhanced through digitalization

Messer uses digital applications to optimize business and production processes as well as internal and external communication. As part of the changes to our IT infrastructure, we have decided to use globally established standards for all our national subsidiaries in order to allow us to operate our central IT systems and applications and ensure even better protection of the information they provide. We support our production, bulk and

cylinder gas management – from filling to taking back the empty cylinders from customers – with a digital cylinder tracking system. Bulk management is supported, among other things, with a tool for digital on site processing of liquid gas transport orders. We are rolling out our bulk tank telemetry system to all tank facilities in Europe to improve trip planning, protect the environment and reduce costs.

Advanced Process Control and automatic filling of our bulk fleet

Environmental protection and cost reduction are also the aims of our Advanced Process Control system, which helps reduce the consumption of electrical energy in the operation of our air separation units through digital process optimization. Furthermore, we are introducing standardized automatic filling systems at all our European sites. This will make it possible to fill

our bulk vehicles around the clock without the support of local operators. The system facilitates checking of driver and vehicle licenses. The driver is assigned a filling station, the filling pump and quality analysis are activated, and the necessary transport and delivery documents printed out.

Remote Operation & Control Centers

Over the past three years, we have succeeded in introducing largely automated control processes for our facilities. In addition, we have begun to establish central Remote Operation Centers (ROC). In each case, the purpose of this is to group a number of our facilities into clusters that are monitored simultaneously by the operators of large central on site facilities. There

will no longer be shift and weekend working at the facilities being monitored. The first cluster was established in 2021 in Southeast Europe. At the moment, the plants in Škofja Loka (Slovenia), Bor (Serbia), Zenica (Bosnia and Herzegovina) and Resita (Romania) can be monitored from Smederevo (Serbia).

Worldwide container location tracking via GPS

In 2021, Messer in Europe equipped the first helium containers suitable for sea freight with a new telemetry system. It features GPS positioning, allowing the exact location of our containers on the high seas to be determined at any time. In

addition, the fill levels and pressure of the tanks are transmitted via GSM (Global System for Mobile Communications). This can help improve supply chain efficiency and facilitate identification of technical problems.

China: Accelerating the digital transformation

In China Messer is actively using digitalization initiatives to improve internal cooperation, increase operating efficiency, support business growth and reduce costs. "Accelerating the digital transformation" is one of the core elements of Messer's latest strategy update. One of the highlights of 2021 was the implementation of the Cylinder Business Management System

(CBMS), which was introduced at three companies in the fourth quarter of 2020. The CBMS covers the entire cycle of the cylinder business process and also serves as an effective tool for managing cylinder stocks. In 2021, a further six companies successfully completed the introduction of the CBMS.

Colombia: Digital transformation of work processes

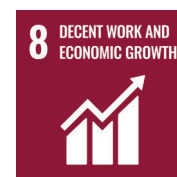
In Colombia, Messer implemented a tool that contributes to the digital transformation of work processes with our customers. The tool facilitates digital analyses, mobile applications and the integration of social media. It allows our sales team to interact

even more effectively with existing and potential customers. Another benefit of the application is that it helps to identify potential new business, implement virtual sales strategies and improve how users experience our website.

Germany / Serbia: First start-up via Remote Desktop

The start-up of a facility was carried out via online communication for the first time. Following the construction of our new oxygen and nitrogen liquefier at Smederevo, Serbia, which was challenging due to the pandemic, engineering teams in Serbia and Germany were in direct contact via live transmissions for several weeks to prepare the start-up via Remote Desktop.

The first deliveries of liquid nitrogen and oxygen from the new liquefier took place in mid-April 2021. The Smart Glasses used by Messer in Serbia and Corporate Engineering & Production have, for several months, been a helpful tool in other start-ups and maintenance work as well.



USA: Focus on digital transformation

At Messer Americas, digitalization is becoming an integral part of the business strategy and delivered through a wide portfolio of technology enabled transformation projects. The focus is on leveraging technology platforms to enhance our core gas application technologies, improve the customer experience and

empower employees. Cloud computing services, mobile tools, data and analysis platforms, robotic process automation (RPA) and artificial intelligence (AI) are among the many examples where digital technologies offer Messer considerable benefits and transformation potential.

USA: Process optimization through digitalization

The Supplier Information Management (SIM) platform allows Messer Americas to speed up and simplify the search for suppliers or service providers. Using SIM, our employees have access to an online form that requests the country-specific requirements for each supplier. After completing the entry and

submitting it, the request goes through the relevant approval processes via digital workflows and is supplemented with the requested supplier information. SIM has improved process consistency and simplified the process steps.

USA: Greater productivity through digitalized supply chain management

As part of its digitalization initiative, Messer in the Americas introduced a digital delivery process for customers and a new app for its driving personnel. Installed on digital tablets, it facilitates the entry of trip-related information and electronic proof

of delivery (e-POD). Control functions ensure that the right tank is filled, stipulated product specifications are fulfilled, and customer deliveries are completed. The app facilitates quicker trip planning as well as faster invoice processing for our customers.

Vietnam: Remote-controlled operating control system

With the increasing number of air separators and generators at different locations in Vietnam, Messer put a new remote-controlled system into operation at the beginning of 2021 via a highly secure Microsoft cloud server that would allow all production facilities to be put into safe mode if an unexpected external event occurred that could lead to a shortage of operators on site. After the difficult typhoon season at the end of 2020

and the COVID-19 pandemic with its associated lockdowns, as well as for the prevention of other unexpected situations, this system ensures that expert support can be accessed from other sites at any time. Our Messer production team underwent training in the operation of the system to get to know all the particularities of the individual production sites in Vietnam.

Vietnam: Entire maintenance process now digitalized

In 2021, Messer completed the implementation of a new Computerized Maintenance Management System at all its Vietnamese production sites and for all major customers. The entire maintenance planning process, plant monitoring and management, as well as calibration/inspection information and

maintenance reports are now digitalized processes. This led to an immediate increase in productivity, cost savings, reduced use of paper and better service quality for Messer's bulk customers.

Sustainability orientation and optimization through ratings

In order to be able to make an objective assessment of Messer's status quo in terms of sustainability and climate protection compared to other companies, and to identify concrete optimization potential, Messer decided to undergo an independent

EcoVadis "Sustainability Performance Overview"

EcoVadis is the world's largest and most reliable provider of sustainability ratings for companies. In the "Sustainability Performance Overview" published on March 25, 2021, Messer achieved the following results in the "Manufacture of chemical precursors, fertilizers and nitrogen compounds, plastics and synthetic rubber in primary forms" category: in the "Overall Rating", Messer was among the top 14 percent of companies rated. In terms of "Work and Human Rights", Messer ranked

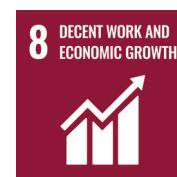
"CDP Score Report – Climate Change 2021"

The "CDP Score Report – Climate Change 2021" facilitates a classification of companies with regard to environmental and climate protection – in comparison with other companies in their industry. The report also highlights the areas that require particular attention in order to improve in terms of Climate Governance. The score categories range from "A/A-" (= Imple-

assessment: first as part of a "Sustainability Performance Overview" by EcoVadis, and second through the "CDP Score Report - Climate Change 2021".

among the top 8 percent, and with regard to "Sustainable Procurement", among the top 24 percent of companies rated. This rating by EcoVadis was valid until March 25, 2022. Following this date, there was a period of about one month in order to update the EcoVadis questionnaire. After doing this, a new rating is provided within one to two months. During this period, the existing rating is extended until the new rating is published.

menting current best practices) to "D/D-" (= Transparent about climate issues). In 2021, Messer Group GmbH scored "B-" (= Taking coordinated action on climate issues). This is slightly below the European average of "B" and also slightly below the average score for companies in the chemical sector, which is also "B".



Awards

China: “Outstanding Enterprise” from Suzhou Pingwang district

In 2021, Messer received the “Outstanding Enterprise” award from Suzhou Pingwang district.

China: “Integrity demonstration enterprise” in Sichuan province

In 2021, the Chinese province of Sichuan gave Messer an award for its demonstration of integrity in the province.

Switzerland: “Credit Rating Certificate” from Bisnode D&B Schweiz AG

In 2021, the credit agency Bisnode D&B Schweiz AG awarded a “Credit Rating Certificate” with “Risk Indicator 1” (which stands for minimum default risk) to Messer in Switzerland for the eleventh time in succession. Only two percent of all compa-

nies in Switzerland satisfy the conditions for this top rating. The certificate distinguishes Messer in Switzerland as a trustworthy, reliable, financially healthy and stable business partner.

Engagement in the economic sphere

The owner's personal commitment

Stefan Messer is a member of the general assembly as well as chairman of the foreign trade committee of the Frankfurt am Main Chamber of Commerce and Industry (IHK). Another area of commitment is his involvement as Honorary Senator of the Technical University Darmstadt and the Goethe University Frankfurt. He is a member of the board of trustees of the Faculty of Economics and of the board of trustees of the China Institute at the Goethe University Frankfurt. In addition, he is a member of the board of the German-Swiss Chamber of Commerce, a member of the advisory committee to the FrankfurtRheinMain economic initiative, a member of the ad-

visory committee of Mainova AG, a member of Commerzbank AG's regional advisory committee for the state of Hesse and a member of HDI Gerling's state advisory committee. He also sits on the board of the Friends of the German-Vietnamese University. Since January 2009, Stefan Messer has been Honorary Consul of the Republic of Slovenia for the consular district of Hesse, Rhineland-Palatinate and Saarland. He is involved in the association "Die Familienunternehmer" (The Family Entrepreneurs). Moreover, he is a member of the steering committee and board of the East Asian Association (OAV) and chairman of the inter-state committee on Thailand.

Engagement in industry associations

Messer SE & Co. KGaA is a member of the European Industrial Gases Association (EIGA). The Brussels-based EIGA represents nearly all companies throughout Europe that produce and market gases for industrial, medical and food processing applications. The association's work focuses on achieving the highest possible safety and environmental standards in the production, transport and use of gases. Messer is also a member of the International Oxygen Manufacturers Association (IOMA). Messer employees are represented in all the governing bodies of these two gases associations as well as on the German Industry Committee on Eastern Europe, in the German Eastern Europe Business Association, and in the German Asia-Pacific Business Association.

Messer SE & Co. KGaA is a member of the German Welding Society (DVS e.V.). The DVS is a not-for-profit, technical and scientific association based in Düsseldorf, and Messer employees' engagement in it sees them sitting on expert committees, supporting research projects and maintaining contacts with expert groups in technologically advanced fields.

Our subsidiaries are actively involved in various industrial associations at a local level. The list of associations of which Messer in America is a member includes the following: American Chemistry Council (ACC), Compressed Gas Association (CGA), Chemistry Council of New Jersey (CCNJ), Texas Chemical Council (TCC), California Large Energy Consumer Association (CLECA), Indiana Energy Consumers, West Virginia Large Energy User Group, West Virginia Manufacturing Association, Pennsylvania Energy Consumers Association and Ohio Energy Group.





Messer Team

Diversity and equality

Our commitment to diversity and equal opportunity are anchored in our mission statement. Our forward-looking and sustainable human relations policies ensure a level playing field for professional success, respect cultural differences, and promote

Diversity management

The goal of our diversity management program is to create a respectful work environment that is free of prejudice, regardless of the employees' gender, nationality, ethnic or social origin, religion, ideology, disability, age, sexual orientation or gender identity. Since 2019, Messer Group has been a recipient of the Total E-Quality Award for equal opportunity in personnel and organizational policy with the special citation for diversity. Valid for three years, the award is supported and recommended by the German Federal Ministry for Family Affairs, Senior Citizens, Women and Youth as well as by the German Federal Ministry of Education and Research.

Unconscious bias training

In 2021, Messer established an international training program against unconscious biases. Unconscious biases and prejudices are considered to be among the greatest barriers for diversity strategies. They can affect hiring, for example, when recruiters unconsciously give preferential treatment to people of their own gender, skin color, orientation or cultural affiliation. Messer's international management team received training in the form of a comprehensive and mandatory e-learning course. In a first stage, the training course was then expanded to the international HR network team and the workforce in Germany. It uses examples to illustrate the problems that "fast think-

interaction among each other. For Messer, diversity is essential to innovation and sustainable business success, and mutual trust and respect are the company values in which our corporate culture is deeply rooted.

In addition, we are signatories to the "Diversity Charter," an initiative that promotes diversity in companies and institutions. Our interdisciplinary team and contact persons responsible for diversity management in our international subsidiaries help us deliver on our diversity commitment throughout the organization.

In 2021, the Americas nominated a Diversity and Inclusion Officer, as well as D&I Ambassadors for each of the countries in the Americas region. The D&I Officer together with the D&I Ambassadors help advance diversity and inclusion efforts through dedicated initiatives and concrete actions. To progress the Americas D&I agenda, a formal program was established focusing on three key pillars: education, engagement and process.

ing" can create – both in private life and at work. Building on that foundation, managers were then trained in techniques designed to help them take more conscious decisions, and therefore better ones.

A leading provider of unconscious bias training was selected by the team in the Americas to facilitate its training program, which is formally being rolled out to the entire organization.

The unconscious bias e-learning courses will continue its expansion in 2022.



Diversity Report

In May 2021, Messer published its second annual Diversity Report. A wide range of data are collected anonymously, including the workforce's key indicators relative to gender along with length of company service, age distribution and nationality,

and the diversity management actions are also reflected. This monitoring will help us achieve the established objectives and metrics.

Share of women and equality

As of December 31, 2021, Messer employed 10,209 people; on December 31, 2020, that figure was 10,764. The share of women was 28.1 percent, which was slightly below the 28.4 percent share of the previous year. The share of women in first and second level management positions was 25.1 percent versus 24.1 percent in 2020. The share of women in management positions at Messer in the Americas (35.8 percent) was significantly higher than in Western Europe (23.8 percent) or Central and Eastern Europe and Asia (21.4 percent collectively).

The share of women in the first and second levels of management will be raised over the long term, with the goal of establishing mixed-gender management teams with a 30-percent share of women by 2030.

Our salaries are based on function, market, performance, education, experience and number of years of service, as well as any collective wage agreements or comparable collective wage agreements and adjustments for inflation. It goes without saying that our remuneration policy makes no distinction among genders.

Supervisory Board of Messer SE & Co. KGaA reflects gender parity

Messer appointed Sabine Scheunert to its Supervisory Board, which now comprises four women and four men. Ms. Scheunert is the Vice President of Digital & IT Sales/Marketing for Mercedes-Benz Cars at Mercedes-Benz AG. In her executive

board function at Mercedes, Ms. Scheunert is responsible for all IT-based marketing, sales and after-sales activities as well as the complete digital customer experience of the brand.

Colombia / Chile: International Women's Day activities

In March 2021, Messer's subsidiaries in Colombia and Chile organized many activities to honor the accomplishments of women and to raise awareness for equal rights. These activities were conducted in conjunction with International Women's Day, which is celebrated on March 8. Webinars featured inter-

views with female employees in management positions, and a workshop focused on the importance of gender equality. Activities were rounded out with tips on how to promote human rights and diversity in our everyday lives along with recognition of important contributions made by women leaders.

USA: Messer signs CEO Action for Diversity & Inclusion pledge

Messer America's CEO, Jens Luehring, signed the CEO Action for Diversity & Inclusion pledge. The CEO Action for Diversity & Inclusion is an organization with over 2,000 CEO signatory companies that are devoted to driving measurable action and meaningful change in the workplace. Additionally, the company

promotes celebrating diversity recognition events including, Pride Month, Martin Luther King Jr. Day, Hispanic Heritage Month, Veterans Day and Global Diversity Awareness Month to engage employees and promote inclusion.

Employee satisfaction

In 2021, the average length of service of our employees since joining Messer was 9.7 years versus 10.2 years in 2020. Total staff turnover fell slightly from 13.2 percent in 2020 to 10.1 percent in 2021.

The employee survey in Europe in 2020 identified three areas in which local organizations should place greater focus: Digitalization, communication and employee development. To improve internal communication, Messer launched an international app in 2021: the “Beekeeper” app facilitates worldwide exchange between organizations and their teams: there are different streams for information, messages and files. Moreover, Beekeeper makes it possible to conduct anonymous and non-anonymous surveys, send out newsletters, and disseminate information campaigns. The Corporate Communications

Brazil: Great Place to Work

For the fourth year in a row, Messer Brazil earned recognition from Great Place to Work! This award was based on the evaluation of Messer Brazil’s overall work environment, including

area was redesigned at the same time. Now it focuses more on content and in-house communications and is no longer organized according to communication channels. A “digital newsroom” reinforces cooperation with the communications officers in all companies.

Since the end of 2019, Messer Americas has been conducting surveys annually, in order to determine the needs and requirements of the workforce and to establish appropriate employee development programs. Their survey results from 2021 demonstrated indicators of employee engagement in the areas of company pride, safety and culture. The survey also provided employees an opportunity to express why diversity and inclusion (D&I) are important and what makes them most proud to work at Messer.

respect for all in the workplace, pride, impartiality and business safety practices.

Education, advanced training and know-how transfer

Messer is committed to the education and training of talented young professionals, who represent an important investment in the competitiveness and capability of our company. Some of that training takes place at various locations, supplemented by multi-week assignments abroad. As in the previous year, the training quota at Messer in 2021 was 1.3 percent.

Open dialog and in-house transmission of expertise are important to us. That’s why we promote the establishment and maintenance of cross-regional and intercultural networks. In 2021, most network meetings were held virtually. We use this to win over even more networking participants and to network our workforce on the professional level to an even greater extent. In all, employees participated 20,509 times – in most cases virtually – in site conferences or network meetings designed for strategic integration or know-how transfer. By contrast, that figure was 15,559 in 2020.



Continuing education and support

The worldwide Covid-19 pandemic has changed how people think about continuing education. At Messer, we used the extensive offering of virtual webinars to provide continuing and advanced education for employees in 2021. Participation in paid seminars averaged 15 hours per person in the year under

Webinars for sales teams

Messer is characterized by the fact that we adapt our gas solutions individually to our customers' business models. To do so, our sales teams must have extensive expertise across the broad spectrum of gas applications. And that is why the online

France: Part-time university studies

In 2021, Messer in France signed employment agreements with 13 part-time university students. This part-time training and continuing education arrangement is offered in all work areas – in Production, Human Resources and Accounting, as

USA: Extended knowledge of digitalization

Messer Americas is continuously developing technologies for new ways of working. The latest example is a digital continu-

USA: Cultivating future managers

Messer Americas recruited new collegiate graduates from ten universities in the USA. Within the framework of its two-year Graduate Development Program, these new hires become familiar with the different areas of the company. This includes two assignments within their respective specialty area and a

review. On average, a total of 114.5 euros per person were spent on advanced training. In tracking the cost and hours of continuing education, Messer Americas took into account only training courses involving Compliance.

tool "EduDip" was used for continuing education once again in 2021, along with the new webinar series, to keep up to date even under "pandemic conditions."

well as in Sales and Marketing. Messer in France has a long tradition of supporting part-time university study. It enables us to attract new talent, pass along our expertise, and benefit from fresh ideas.

ing education series covering emerging technologies such as "Robotic Process Automation" (RPA) and Artificial Intelligence (AI).

third assignment to another business unit. As part of our D&I initiatives, we have increased the percentage of women recruited and ensured the ten universities selected are representative of different ethnicities.

Selected network meetings of specialized groups

Messer reinforced digital networking activities in connection with the in-house Global Finance Conference. Along with existing channels, this communications concept relied on two new digital formats: The “Quarterly Touchbase,” in which reporting topics were discussed, and the “Finance Forum” for a topic-based exchange on innovations and best practices in the finance area.

For all regions, Corporate Application Technology held virtual meetings in the Food, Welding and Cutting, and High-Temperature Processes segments, as well as the annual Applications Manager Meeting.

The Global Workshop Specialty Gases was also held in four separate events, with participants from Europe, China, ASEAN as well as – for the first time – North and South America. It focused on exchanging information among the regions along with developing synergies and cooperation.

France: Digital “Tour de France”

In the context of an in-house “Tour de France,” the entire management team of Messer in France travels to the subsidiary’s seven main sites once a year. These in-person meetings provide an opportunity to discuss key developments of the past year and to present strategic business objectives along with

In September 2021, Messer held the Global Sales Meeting as a hybrid conference: While a large share of the European team traveled to Bad Soden to participate in person, the remaining employees of the international sales network and invited guests accessed the event virtually. Topics covered sales digitalization measures, business growth in the “clean hydrogen” segment, and the launch of a new system for Customer Relationship Management (CRM).

In 2021, Corporate Logistics organized three virtual meetings of the management teams in charge of logistics in the national subsidiaries. These meetings focused on current developments and mutual exchange, with the goal of further raising the productivity of logistics processes. Through the continuous optimization of supply chain management, Corporate Logistics is making a key contribution to greater efficiency and profitability.

any new projects that have been added. Due to the Covid-19 pandemic, the “Tour de France” was held in digital form in 2021: short videos and texts informed the teams about important topics and gases applications.





Safety and Health

Safety

Safety is a core value at Messer. That applies to our employees at our plants, technical and administrative workplaces, those who manage our logistics and operate our vehicles as well as customers who utilize our gases.

The high importance of this topic is also reflected in our materiality matrix. Occupational safety and health are firmly anchored, in our company as well as in our industry overall. Our mission statement, company values and internal policies emphasize the importance of safety across all our business units. Our demonstrated commitment to safety empowers our employees in continuous improvement.

Safety of our employees

In order to ensure the safety of our employees, our network of safety officers study and document all safety-related incidents at Messer. Information and training materials help further improve the safe handling of our products and applications and encourage safe behavior by employees at the various workplaces.

The number of reported industrial accidents with loss of working hours increased at Messer from 44 in 2020 to 48 in 2021. The rate of loss of employee working time per million hours

The programs launched in 2020 to protect our employees from the Covid-19 pandemic were continued in 2021. The organizational and communication structure established by the general management of each subsidiary together with the safety, health, environmental and quality (SHEQ or HSEQ) leaders enabled us to react appropriately to all types of emergencies and crises. The convened pandemic teams provided information, at times in consultation with public health authorities, and helped to implement not only their instructions but also further internal measures to protect the employees. The functional coordination and in-house vaccine offerings as well as the workforce's exemplary discipline and very high willingness to be vaccinated were reflected in low infection rates among Messer employees.

worked (accident frequency rate) increased from 2.0 in 2020 to 2.18 in the year under review. The number of working days lost per million hours worked (industrial accident severity rate) rose from 56.3 in 2020 to 69.15 in 2021. A total of 81 reportable industrial accidents were recorded in 2021, which was two fewer than in the previous year. The accident frequency rate of reportable industrial accidents per million hours worked decreased from 3.7 to 3.67. Unfortunately, we suffered one death among Messer's workforce last year due to a traffic accident.

Poland: Acetylene production plant fire

On February 17, 2021, a fire broke out at Messer's acetylene production plant in Chorzów. The employees reacted in exemplary fashion and activated the safety systems very rapidly. They also informed the fire department immediately and started to extinguish the fire. After the fire was put out, the

plant was secured and shut down until the cause of the fire was investigated. The acetylene plant had no air pollutants, so no hazardous materials were released by the fire. There was no risk to people outside the plant.



Safety Week 2021

As in the previous year, this year's Safety Day once again took the form of a Safety Week: from September 13 to 17, 2021. Each national subsidiary was free to choose the optimal timing

for its own Safety Day during that week. Pandemic-related precautions also had to be taken. The interconnecting motto of Safety Week 2021 was "Managing risks."

Examples of Safety Week implementation:

At Messer's German locations in Bad Soden, Krefeld and Bad Hönningen, Messer Safety Day took the form of a virtual meeting: A presentation explained the significance and sense of risk analyses. Practical examples showed how complex professional risk management can be.

At our production sites in Castrop-Rauxel, Salzgitter, Siegen and Speyer, the employees gathered for in-person meetings in small groups.

At Messer in France, a total of 17 in-person workshops were held in small groups at nine locations. Two virtual meetings were also organized, where one of the main messages was that risk management concerns all of us and not just our employees in the production facilities or filling plants.

Because Messer in Poland equipped its locations with defibrillators in 2021, Safety Week there started with an online training course about their operation. Presentations about risk management and a subsequent feedback session rounded out the activities.

Brazil: Cancer prevention awareness

In recent years, Messer in Brazil has launched initiatives for the early detection of breast and prostate cancer. To raise the workforce's awareness of cancer prevention, virtual meetings with doctors were held, e-mails were sent out, and information

Messer in Switzerland organized a fire protection exercise for employees. Among other things, employees learned how to use a fire blanket and to identify various types of fire extinguishers.

Messer in Spain organized all events as online meetings. There were video conferences where the significance and purpose of risk analyses and concrete measures were presented. Employees with direct access to the company's own computers attended the video conference in the conference rooms of the production plants.

The team from Messer in Thailand organized a meeting in the hall of its filling plant. The presentation emphasized personal accountability among all employees – every time and everywhere.

In Hungary, Dr. Emil Toldy-Schedel, founder of Hungary's first post-Covid center, gave a presentation. He explained the complexity of a therapy process for treating the long-term effects of a Covid-19 infection.

was provided via LinkedIn. In Brazil, breast cancer is one of the most fatal diseases in women from 35 to 54 years of age. Prostate cancer is considered to be the second most frequent form of cancer among men.

Spain: Safety training at two locations

Messer in Spain conducts annual safety drills. In November, their plants in El Morell and Vilaseca simulated hazardous conditions that can occur in connection with oxygen and hydrogen.

The exercises were supported by the fire departments of the Tarragona chemical complex, which are maintained by the member firms of the local chemical association.

USA: Cooperation with rescue personnel

Jason Caver, plant technician at Messer Americas in Birmingham, Alabama organized plant tours for local rescue personnel in small groups. The visitors were given an overview of the opera-

tions of the plant. Site tours focused on the rescue personnel's correct response during potential emergencies on the company grounds along with the minimization of associated dangers.

USA: Warning about falling objects

Messer Americas used online training courses to raise awareness for the dangers of falling objects. Employees of Messer and of outside companies participated. DROPS, as the training

program was aptly named, relied on the train-the-trainer model, whereby people who had already been trained could pass their newly gained knowledge along to the rest of their team.

Safety awards

Every year, the European Industrial Gases Association (EIGA) recognizes member companies for accident-free work at their sites. In 2021, this included four Messer locations and companies. The Bad Soden (Germany) site and the Dugi Rat (Croatia) site each received a "Silver Safety Award" for ten consecutive years without reportable work-related accidents. The Pančevo (Serbia) site and the Saint-Herblain (France) site each received a Bronze Safety Award for five consecutive years without reportable work-related accidents.

In North America, Messer was recognized by the Compressed Gas Association (CGA) for its safety performance in several categories. One Messer site received the safe facility performance "Silver Award" for 500,000 Hours or 10 Years with no lost time work accidents. Another site received the safe facility performance "Bronze Award" for 250,000 Hours or 5 Years with no lost time work accidents. Messer Americas was recognized with the Fleet Safety Excellence Award for bulk gas transportation, over 20 million miles per year. Finally, a Messer fleet engineering supervisor was recognized with the CGA's Charles H. Glasier Safety Award in recognition of his safety leadership in the industrial gas industry.

Safety of our customers

Three new video clips from Messer informed viewers how to deal with gas cylinders safely. They describe the labeling of the cylinder contents and demonstrate the most important

rules for transport and handling. The clips are a supplement to the pocket guides, which are available to download as PDFs at messengergroup.com. They cover these topics comprehensively.



Safety of our logistics and vehicles

To manage the road transport of gases as safely as possible, Messer uses – in addition to the statutory regulations – a proven transport safety concept. In Europe, by signing the European Road Safety Charter, we have also undertaken to focus specifically on the safety of our fleet.

For our logistics, we developed safety measures on the national and international level. A continuous exchange of experience among logistics and safety personnel helps to further improve the level of safety in this area.

For the most part, Messer employs external carriers to transport our gases, with the exception of Messer in North America where employee drivers transport gases. Accordingly, While Messer in America uses its own employees to transport gases, Messer in other regions primarily contracts external transport companies. In this case the legally required training of the drivers is the responsibility of those companies. We supplement their training courses with a driver training program developed by Messer Corporate Logistics. This is supported by an on-board computer system, which has been used in the vehicles since 2019. It records safety-related driving data, and thereby contributes to goal-oriented training. Based on driving data and integrated sensors, it also encourages more defensive driving

through the use of acoustic and visual cues while on the road. This makes our transports even safer while also protecting our environment through lower fuel consumption.

In 2021, there were 74 preventable accidents during the transport of our cylinder gases. In the previous year, that number was 64. That apparent degradation in performance should be viewed, however, in the context of the accident frequency rate per million kilometers driven: it fell from 3.05 in 2020 to 2.13 in the year under review. So in proportion to the distance traveled, there were fewer accidents on average. The number of avoidable accidents while transporting liquefied gases was 161 in 2021 versus 194 in 2020. This positive trend is confirmed by the frequency rate per million kilometers driven: from 0.89 in the previous year, it fell to 0.8 in 2021.

Through appropriate supplier management, driver training courses and technical assistance, such as the new on-board computer system, we want to reduce the absolute number of avoidable accidents and further improve the accident frequency rate. Driver manuals with individually tailored content for operating bulk, cylinder and service vehicles keep all key information on hand at all times.

Health

Messer is active in the medical business in over 20 countries: we provide consulting services, supply medicinal gases or gases as medical devices, plan, install and maintain supply systems, and offer medical accessories and consumables in the context of a complete service package.

Our activities in the pharmaceutical area comply with all applicable regulatory requirements on the national, European and international level. This specifically includes the requirements

of (European) Good Manufacturing Practice (EU-GMP) and the specifications of the European Pharmacopeia. As medical devices, our gases comply with the Medical Device Regulation (EU 2017/745), the previously applicable Medical Device Directives, and the corresponding national laws.

Internal audits, a standardized pharmacovigilance system, and validated procedures and computer systems ensure our product and supply quality.

Resupplying oxygen during the pandemic

The coronavirus pandemic caused a dramatic increase in the demand for medical oxygen, especially during the second and third waves. Messer undertook a series of actions to address it. In filling plants for cylinder gases, which normally manage with

a day shift, additional shifts were organized. At peak times, some plants worked around the clock. The same was true of logistics. One unit that had been shut down was restarted.

Dry ice protects mRNA vaccines

At -70°C, the mRNA vaccine against the Covid-19 virus remains stable for a long time. To maintain that temperature while transporting the vaccine, dry ice is often used: it has a temperature of -78.5°C. Since the approval of the first mRNA vaccine, the Messer subsidiary ASCO has experienced a huge increase

in demand for dry ice and the associated equipment. Many logistics companies have built up the relevant infrastructure, often relying on expertise and products from ASCO and Messer as well as partner companies.

Freeze-drying for health

Freeze-drying can keep the active ingredients of drugs and vaccines as well as the vitality of bacteria cultures intact for extended periods. And liquid nitrogen is ideally suited to provide

the required cooling. Messer works in close collaboration with manufacturers of the equipment required for these applications.

Sustainable handling of nitrous oxide

Nitrous oxide is both a widely used anesthetic and an extremely powerful greenhouse gas. Messer works together with the Swedish medical technology firm Medclair to prevent unnecessary release. Medclair's product range includes stationary and mobile devices that capture the anesthetic exhaled from the lungs of patients. These "destruction units" use heat to

break the nitrous oxide down into its harmless components – nitrogen and oxygen. Messer and Medclair signed a partnership agreement in December of 2021: Medclair supplies the technology for N₂O neutralization; Messer supports sales in the healthcare sector and develops additional markets for the climate protection devices.

Gas mixture for fertility clinics

Along with cryogenically liquefied nitrogen, the fertility clinics of the international Vivaneo Group in some countries use a ternary mixture from Messer to grow egg cells and embryos in the incubator. In this new collaboration, Messer had two strong sales

arguments: the application-specific gas mixture itself and its immediate availability – six weeks is the typical lead time in this market. Messer also supports the fertility clinics with reliable liquid nitrogen service.



Austria: Medical oxygen cylinders for India

In early May of 2021, Messer in Austria delivered 400 steel cylinders for medical oxygen, which were ordered by the Austrian Ministry of the Interior and the Organizational Development Department of the Workers' Samaritan Foundation Austria. The cylinders were part of an aid shipment sent to India by air

freight. At that time, Indian hospitals and clinics were in an extremely critical situation due to the Covid-19 pandemic. Among other things, there was a serious lack of medical oxygen and oxygen tanks.

Colombia: Specialized in healthy sleep

During the coronavirus pandemic, Messer in Colombia developed a concept for providing online information to people who suffer from sleep apnea. The offering featured webinars led

by experts from the fields of medicine, therapy and psychology, who specialized in the treatment of sleep disorder-related diseases.

France: Exchange with medical professionals

On March 30, 2021, a medical expert panel convened for the first time at Messer in France. The purpose of the event was to prepare for the market launch of Serynox/Placynox, an equimo-

lar mixture of oxygen and nitrous oxide. Participants discussed its use and the associated benefits in the medical field, including obstetrics.

Germany: Gases for leak checking

Pharmaceutical packaging must be sealed to maintain the sterility of the contents and keep contaminants out. Seals are inspected using laser beams and sensors along with purge and calibration gases. The German machinery manufacturer Wilco has automated this process with high-tech machines and pro-

cures the necessary laboratory gases from Messer. Moreover, Wilco uses CO₂ for so-called "bombing." This involves exposing containers to a high-pressure carbon dioxide atmosphere in a closed chamber. The process detects any leaks in a matter of seconds.

Germany: NO gas mixtures for a hospital in Langen

Asklepios Klinik in Langen, Germany, expanded its ICU bed capacity. While on a ventilator, intensive care patients there receive a precisely metered quantity of nitrogen monoxide, which Messer provides in medical gas cylinders with nitrogen as a

carrier gas. Messer also supplies consumables such as tubing for metering and measurement systems along with various accessories.

Hungary: Gas cylinder trolley for hospitals

The Hungarian sales team developed a gas cylinder trolley specifically tailored to meet the needs of hospitals and clinics. It is handy, easy to move, and offers space for two medical gas cylinders. A quick-change system makes it possible to switch

the hose connection from one cylinder to the other very easily. The new trolley is used to supply medical gases for in-patient care.

Hungary: Gases for Covid-19 research

Messer in Hungary signed an agreement with the National Public Health Center (NNK) to supply special gas mixtures and CO₂.

The gases are needed for coronavirus research. CO₂ serves as the atmosphere for bacteria cultures and cell growth.

Hungary: Messer supports post-Covid center

Messer supported the establishment of Hungary's first post-Covid center at Szent Ferenc Hospital in Budapest with a donation, gases expertise and the necessary products. Messer

installed the technical equipment for the sophisticated gas supply system and satisfied the dramatically increased demand for gases used in post-Covid therapy.

Netherlands: Covid-19 rapid breath analysis

The Dutch company Breathomix specializes in breath analysis and the development of so-called "electronic noses," which can be used for the simple, rapid detection of a wide range of diseases, including pulmonary diseases. The "SpiroNose"

electronic nose analyzes the full range of volatile organic compounds in exhaled air in real time, and can thereby rule out a SARS-CoV-2 infection within one minute. The device is calibrated with one of our gas mixtures.

Slovakia: Evaporators for hospitals

To ensure an adequate supply of oxygen during the coronavirus pandemic, Messer installed higher capacity oxygen evaporators in several Slovakian hospitals. As the main provider of medical

gases in Slovakia, we also resupplied them with the necessary oxygen.

Spain: Medical gases for Covid patients

Since early 2020, Messer has been supplying medical gases to Burgos University Hospital. During the second wave of the coronavirus pandemic, Burgos was one of the hot spots in Spain. The university hospital, one of the largest hospitals in the

region, treated most of the Covid cases there, so the demand for medical oxygen rose dramatically. Messer installed a mobile auxiliary tank along with an additional evaporator and ensured the resupply of medical oxygen.

Spain: Stem cells from umbilical cord blood

Stem cells from umbilical cord blood likely hold the key to healing some serious diseases. At the Spanish cell bank VidaCord, parents can store the valuable material for future use. The cord blood is collected after birth and the nucleated cells, which also

include the hematopoietic stem cells, are separated and cryogenically stored. The cooling and storage facilities use liquid nitrogen from Messer.





Environmental and Climate Protection

Messer is committed to protecting the environment. As an energy-intensive company, we have a particular responsibility to help ensure that our energy use is sustainable.

Our core products, the air gases, are produced by air separation. Air is a mixture of gases, consisting primarily of nitrogen (78%), oxygen (21%) and the inert gas argon (0.9%). The remaining 0.1% is made up mostly of carbon dioxide and the inert gases neon, helium, krypton and xenon.

Air is typically separated into its components by means of distillation in air separation plants employing cryogenic rectification. This process is fully electrified, so our energy requirements are substantial for electricity. We monitor carefully the specific electricity consumption of the production process and the emissions intensity of the electricity we purchase. The decomposition of ambient air into its constituent parts produces no toxic or environmentally harmful emissions itself, even in the case of a shutdown or disruption to operations.

Messer supplies "Gases for Life" to customers typically by means of on site production at customers' sites, by pipeline, in bulk form as cryogenic liquids, or in high-pressure cylinders ('packaged' products). However, it is to be noted that the business mix by product, customer sector, and delivery mode varies greatly by geography.

The delivery of bulk or packaged gases entails the use of heavy-goods vehicles. We monitor carefully the fuel consumption of our vehicles and the efficiency of our logistics in order to minimize resulting emissions. We are also considering the future use of alternative fuels, when and where these will be permitted for hazardous goods.

Packaged products are gases held under high pressure in gaseous or liquid form in steel cylinders. Such cylinders are generally provided on a rental basis to our customers and recovered after use. After cleaning and inspection, gas cylinders are refilled and resupplied to customers. Gas cylinders can remain in circulation for over 30 years.



Greenhouse gas emissions

In accordance with the GHG (Greenhouse Gas) Protocol, for calculation purposes we classify greenhouse gases into three categories: direct emissions (Scope 1), indirect emissions from procured energy (Scope 2), and other indirect emissions in the upstream and downstream supply chain (Scope 3), measuring the emissions in terms of CO₂ equivalents (CO₂e).

For 2021, the following changes apply to the calculation of greenhouse gas emissions:

- Dual calculation approach for Scope 2, presenting both the location-based method as previously used and a new, market-based method.
- Extension of the scope of calculation for Scope 3, including additional categories recommended by a joint working group comprising industrial gases companies and industrial gases associations.

Scope 1:

Scope 1 includes direct emissions generated in our production facilities. In particular, this applies in connection with the production of hydrogen, carbon dioxide and nitrous oxide. Other direct emissions are generated in logistics by the combustion of fuel. In 2021, Scope 1 for Messer worldwide totaled 240,300 metric tons of CO₂e. In 2020, the comparable value was 220,600 metric tons of CO₂e. This 8.9-percent increase is attributable to Messer's strong sales growth, which was over 10 percent in 2021.

In 2021, the bulk and cylinder fleet of Messer including Western Europe consumed 35.37 million liters of diesel fuel. In 2020, that value was 29.95 million liters. Our fleet traveled a total of 114.30 million kilometers in 2021, versus 96.98 million kilometers in 2020. The increase of more than 10 percent is in line with the growth of our activities in 2021. The average rate of diesel fuel consumption once again remained nearly unchanged; in 2021 it was again 0.309 liters per kilometer traveled.

We express the trend in distance traveled per metric ton (payload) of liquefied industrial gases or cylinder gases for Messer worldwide in 2021 with an index value of 99.4; in 2020 the index value was 101.9. The slight decline in this parameter

In the financial year 2021, the total greenhouse gases emitted directly and indirectly as a result of Messer's activities in production and logistics worldwide, i.e. Scopes 1 & 2, stood at 5.46 million metric tons of CO₂e. That was 680,000 metric tons more than in the previous year, when the combined value was 4.78 million metric tons of CO₂e. This 14.2 percent increase is primarily attributable to two factors: First, our sales growth, and second, the less favorable CO₂ factor for energy in Asia due to the lower quality electricity mix caused by the electricity shortage.

The CO₂ emissions intensity of Messer's worldwide activities (Scopes 1&2), measured as the ratio CO₂e per Euro of sales, stood at 1.55 CO₂e/€ in 2021, slightly above the combined value of 1.53 CO₂e/€ measured for 2020.

resulted from, among other factors, the fact that the seamless supply of medical oxygen during the coronavirus crisis also required additional routes in 2021.

As in 2020 already, the year under review 2021 was marked by challenges arising from the coronavirus pandemic. From a logistical perspective, ensuring supply, notably of medical oxygen, to our customers was especially challenging. It was our top priority. Despite all of our efforts to work efficiently, however, we were unable to reach all of the targets that we had set for ourselves relative to the KPIs in the logistics area.

In Croatia, the Czech Republic, Serbia and China, Messer produces nitrous oxide (N₂O). This gas is used in medical applications and in the electronics and food industries. In Switzerland and China, Messer operates a total of six company-owned hydrogen plants. Three other hydrogen units located on our customers' premises in Austria and Hungary (on site units) are not included in the calculation of our own CO₂ footprint. In its gaseous state, hydrogen is used in many industries – e.g. as a food additive in hydrogenation or fat-hardening, in heat treatment processes, as an energy source, or even as an emissions-free fuel.

Scope 2:

Indirect CO₂ emissions under Scope 2 relate to the production process of the purchased electricity. For Messer Group-wide in 2021, that value, location-based, increased from 4.51 million metric tons in 2020 to 5.22 million metric tons in 2021, of which 1.47 million metric tons related to Messer in North and South America. This increase of 0.71 million metric tons in 2021 vs. the previous year's figure is primarily attributable to the strong growth of our business as well as the increase of the emissions factor in Asia: as long as the global trend toward more green electricity continues, we will also continue to purchase more emission-free electricity. As a result, our indirect CO₂ emissions under Scope 2 – which make up more than 90 percent of the total emissions generated from our own activities – will follow the downward trend, until the long-term goal of climate neutrality is reached.

With regard to the air separation units that we develop and build, we pay particular attention to their energy-efficient design and the cost-effective procurement of energy used to operate them.

For example, to optimize our electricity procurement, we use calls for tenders throughout Europe, long-term framework agreements, and continuous monitoring of futures and spot markets. A centralized team provides advice and support to our subsidiaries when they purchase electrical power. That team also uses regular comparative analyses to study electricity costs and the use of renewable energies.

The location-based emissions factor increased by about 3.3 percent versus the previous year; this was mainly due to our activities in Asia. Our absolute global CO₂e footprint increased by about 15.6 percent in 2021, because we consumed in total about 12 percent more electricity for the product volume manufactured.

In 2021, our production units consumed 11.9 TWh of electricity worldwide, which was 1.3 TWh more than in 2020. This change was due to a strong increase in electricity demand in all regions: relative to 2020, it rose by 14.8 percent in Asia, by 10.3 percent in Europe, and by 9.7 percent in North and South America.

Despite efficiency improvements and the procurement of renewable electricity, e.g. through power purchase agreements (PPA), indirect CO₂ emissions (Scope 2) continued to rise Group-wide. The reasons for this are the growth in sales through new air separation units along with the higher utilization of existing units.

In view of the decarbonization program and the goal to reduce greenhouse gas emissions, alongside the previously used "location-based" method, the "market-based" calculation of GHG emissions pursuant to the GHG Protocol is being used for the first time. For 2021, the GHG emissions were estimated to be 5.48 million metric tons.



Scope 3:

The emissions documented under Scope 3 are indirect emissions unrelated to the purchase of electricity. This applies to the major upstream and downstream activities. Examples of this include the purchase of commodities, services and capital goods, the consumption of other energy, and the electricity transmission losses not included in Scopes 1&2, as well as business travel, employees' commute to and from work, and products sold.

The Group-wide total CO₂ equivalence value for the greenhouse gas emissions under Scope 3 in 2021 was 2.95 million metric tons. This was significantly higher than the comparable figure for 2020. The latter accounted only for other energy consumption, business travel and the employees' commute to and from work, however. After a thorough review of our previously applied estimation method, we have started to revise the estimate of the main categories of Scope 3. This applies to all main categories that significantly impact the integration of upstream and downstream supply chains related to our activities.

Energy efficiency

Messer focuses on the responsible use of all resources, especially energy. The specific energy consumption of all processes is a key performance indicator. Actions are undertaken each

year across all Group companies aimed at achieving ever higher energy efficiency.

Hungary: High-performance compressor for energy efficiency

In its air separation unit at the BorsodChem site, Messer in Hungary replaced three existing compressors with a new high-performance turbo-compressor. The latter went into

operation in March 2021 and has been providing far greater energy efficiency ever since. The production capacity has been increased as well.

Brazil: Eco-friendly tandem trailer

In northeastern Brazil, Messer is using a new tandem tractor-trailer to transport liquid oxygen. The trailer was developed with the long routes in the region in mind. Thanks to its extended

tank capacity, it can satisfy demand with fewer delivery runs. That raises productivity, enables greater sustainability in logistics, and generates less CO₂ emissions.

Poland: Optimized filling and air separation

With the support of ACKLogic of Spain, an automated trailer filling system was installed at Messer's sites in Rybnik and Turek, Poland. It not only simplifies the work of the drivers but also makes the filling process safer and more reliable. A new software-based control system was also used to optimize the air

separation process in the production units in Rybnik and Turek. The automated control system makes it possible to reduce energy consumption as well as product losses from venting while maintaining a high argon recovery rate.

The specific energy consumption of our air separation units is a particularly important topic, since these dominate our demand for electricity. To that end, we are working to improve the utilization of the existing units, continuously investing, and focusing on projects that sustainably increase energy efficiency. These activities are the responsibility of the Global Energy Officer (GEO) of the Messer organization.

The efficiency improvement measures in production operations in 2021 included:

- Replacement of obsolete, inefficient equipment by modern technology
- Installation of on site units to eliminate the need for liquefied gas deliveries by truck
- Implementation of Aspen DMC advanced process control software.

We document the energy efficiency of our production operations with an energy coefficient, which indicates how much electricity a production unit consumed per metric ton of product it produced as compared with a theoretical “reference unit.” Relative to the reference year, the measured energy coefficient at Messer in the financial year 2021 worldwide stood at 101.1. In the previous year, this was 99.9. The decrease in energy efficiency is attributable to a strong demand for oxygen, especially medical oxygen, which prevented most units from being operated in their optimal operating range as intended.



Water consumption

Most of the water that we consume is used to cool the compressors in our air separation units. In 2021, our Group-wide water consumption was 17.5 million cubic meters, which represents an increase of 900,000 cubic meters over financial year 2020. This 5.4-percent increase is attributable to the increase in production in 2021.

Our main manufacturing processes – air separation, CO₂ purification and liquefaction – need no water within the actual production process streams. But they do generate a great deal of heat, mainly during the compression of gases. To carry

that heat away, most units have an open cooling water circuit: the cooling water absorbs heat from the respective sources and discharges it to the atmosphere in an open cooling tower. There, part of the circulating water evaporates and another part is removed to prevent insoluble components from thickening. Fresh water must be fed back into the system to replace the water that is evaporated and/or removed. This results in the only direct water consumption of our manufacturing processes. The quantity of make-up water added is directly dependent on a unit's electricity consumption. It averages about two to three cubic meters per hour per megawatt of electrical power.

Non-toxic and hazardous waste

In 2021, the total quantity of waste for Messer including its Western European companies was 29,155 metric tons. Of that figure, 15,484 metric tons were non-toxic waste and 13,671

metric tons were hazardous waste. These figures do not include data for Messer companies in North and South America.

Energy & quality management

Our commitment to environmental protection is also reflected in our worldwide Quality Management System. In 2021, 61 consolidated companies were certified according to ISO 14001 or Responsible Care Management System (RCMS); that was two more than in the previous year. ISO 14001 is an internationally recognized standard developed by the International

Organization for Standardization (ISO). It defines requirements designed to help organizations establish, implement, maintain and continuously improve their environmental management systems. RCMS certification serves the comparable purpose and function for our American production sites.

Customer service

We act sustainably to meet our customers’ needs, which include the reduction of their own carbon footprint. We achieve this through the impact of our gas applications on their production processes, through an efficient supply of gases – via on site units, for example – and through the use of emission-free or low-carbon products such as green hydrogen.

In customers’ industrial processes, our “Gases for Life” provide for greater safety, efficiency, quality, capacity and environmental compatibility and/or reduce the associated emissions and costs. To fully realize these potentials, we work closely with our customers, supply application engineering equipment and expertise, and help design and optimize processes. In addition, we provide our customers with process development support.

Messer, including its Western European companies, signed more new bulk contracts than in the previous year: In 2021,

31.1 percent of new contracts with explicitly positive overall effect on the environment were signed; in the 2020 financial year, that figure was 29.7 percent.

The increased number of new contracts based on applications with positive effects on the environment include, among other things:

- Increase in applications and installations with oxyfuel in Europe, especially in the non-ferrous and glass segments
- Continued implementation of cryocondensation units
- Further development of oxyfuel and hydrogen-oxygen combustion technology, both in the company’s own competence center and through sponsored R&D projects

Examples of gas applications with a positive environmental impact realized in 2021 include:

Efficient superconductivity

The global demand for electricity is growing – and with it, the demand for power lines. But there is less and less space for new transmission line routes. Innovative high-temperature superconductors can alleviate the bottlenecks. Despite their name, they must be cooled with liquid nitrogen. Messer developed a cooling system that can reduce the combined energy

losses from the cooling by up to 50 percent. It works without a return line or a recirculation pump, and intermediate cooling stations are not required. This reduces investment costs significantly. This technology makes it possible to implement up to 100-kilometer-long, energy-efficient superconducting cable runs inexpensively and with very high operational reliability.



France: Eco-friendly cooling alternative

In May 2021, Messer started up a public EcoLIN station at the Rungis wholesale market near Paris. It was installed on the site of the world's largest wholesale market for fresh produce. Vehicles that use cryogenic gases to cool their refrigeration

compartments can top up their coolant supply any time of day or night – rapidly, safely and automatically. Liquid nitrogen offers an eco-friendly, low-noise cooling option that emits neither particulates nor NOx or CO₂.

Hungary: Cave research for climate model

Historic climate research forms the basis for the development of long-term climate models. The Institute for Geological and Geochemical Research in Budapest, Hungary, uses gases from Messer to analyze stalagmite and sinter samples from limestone caves throughout the world. They give us a glimpse

of a half million years of climate history. The characteristic limestone columns contain trace elements such as phosphorus, magnesium and strontium, the content of which fluctuates according to the climate conditions.

In addition, the installation of on site units that produce industrial gases eliminated the need for some bulk deliveries, thereby reducing emissions by 4,800 metric tons of CO₂e in the financial year 2021. That represents an additional 14-percent reduction relative to 2020 – despite growth that was observed in the context of increasingly dynamic activity overall.

operation of gas production facilities and refueling infrastructure will help ensure the effective operation of fleets of fuel cell electric buses and trains.

In 2021, Messer further intensified its commitment to clean hydrogen: A cooperation agreement was signed with Siemens Energy to collaborate on green hydrogen projects in the 5-to-50-megawatt range for industrial and mobility applications. Messer in Spain has already applied to the Spanish government for funding for three such green hydrogen projects in the chemical complex in Tarragona.

In Spain Messer participated in a conference in Reus on hydrogen and sustainable mobility organized by the Chair for the Promotion of Business Innovation, the URV Foundation (University of Rovira i Virgili), and Hydrogen Valley of Catalonia. Companies such as Repsol, Enagas, Messer Ibérica and Technip explained their commitment to the development of the value chain for green hydrogen. Jordi Soler, head of hydrogen business development for Messer in Spain, presented the company's activities in the sustainable mobility area and emphasized the importance of the hydrogen value chain as an energy vector.

Together with Toyota Tsusho, Messer is offering the "One-Stop Shop" to bus operators. The concept bundles all the products and services required to operate hydrogen-powered, fuel cell electric bus fleets.

In the USA, Messer Industries has substantial experience in hydrogen for vehicle refueling applications. At a car manufacturing plant in Greer, South Carolina, Messer supplies the technology and the hydrogen for one of the largest fleets of forklift trucks and other industrial handling equipment in the USA. In 2021 the facility installed by Messer was extended and the service and hydrogen supply contracts were successfully renewed.

Messer is part of the joint venture "HyDN" in the district of Düren, Germany, where a new production facility for green hydrogen is being installed. Messer's expertise in the efficient

Initiatives and awards

Germany: Messer welcomes climate course-setting

In its coalition agreement, the new federal government formed in Germany in the fall of 2021 listed many actions designed to combat the ongoing climate change. Gases such as oxygen, nitrogen and carbon dioxide contribute to environmental protection in various applications. Hydrogen produced from green energy is playing an important role in the energy transition. Against this background, Messer is positively disposed toward

many aspects of the coalition agreement and welcomes the accelerated expansion of renewable energies it sets out. This applies above all to long-term power purchase agreements (PPAs), the strengthening of European trade through certificates of origin, and the planned expansion of green energy generated from photovoltaics and wind power.

Germany: Campaign for a cleaner Rhine

Together with the initiative's other organizers Krefeld City Council, the municipal waste management service GSAK and the waste disposal company EGK, Messer solicited volunteers for the "RhineCleanUp" once again this year. This involved cleaning up a 6.5-kilometer section of the banks of the Rhine

at Krefeld. In Krefeld alone, over 300 volunteers took part in the transnational clean-up initiative on September 12. The crew also included Messer employees and their families. The aim of this environmental campaign is to prevent even more plastic waste from reaching the oceans.

Spain: Responsible Care program

Messer in Spain was recognized by the Business Federation of the Spanish Chemical Industry (Feique) as a Responsible Care company. The reason for this is that Messer is committed to social responsibility and sustainable development in the performance of its activity. In Spain, a total of 59 chemical companies have joined the voluntary Responsible Care program to date.

Responsible Care is an international voluntary initiative of the chemical industry for the continuous improvement of safety, health and environmental protection in all operations according to the principles of sustainable development and CSR. Messer companies in the Czech Republic, Germany, the Americas and Austria also support the initiative.





Customer Loyalty

Sustainable Technologies

Making our customers’ products and processes as eco-friendly as possible is one of our most important goals. We accomplish this through our gases and our applications expertise. For Messer in Europe and Asia, the aggregate share of our applications-related sales contracts with a positive overall impact on the environment was 31.7 percent in 2021 – which was 2 percent more than in the previous year.

One forward-looking example of an environmentally friendly use of our products is clean hydrogen as a sustainable energy source. Messer intensified its commitment in this area in 2021, because hydrogen is a primary lever in the decarbonization of industry and mobility, and therefore an indispensable part of the energy transition.

In 2021, we also placed special emphasis on applications that use our gases to produce, process and distribute food sustainably. The coronavirus pandemic made it clear just how important it is to optimize the shelf life of food to prevent food waste and possible supply bottlenecks. Delivering food “right to the door” also gained importance under pandemic conditions such as quarantines and lockdowns. In this context, our gases are very useful for freezing and cooling food as well as for packaging and transporting it.

The following section presents selected examples of the sustainable use of our gases and gas applications in 2021.

Our products and applications for environmental protection

Filling system for dry ice pellets

With the ASCO dry ice pellet filling unit, freshly produced dry ice pellets can be filled directly into containers or boxes and dosed by weight. This is particularly useful when cold chains must not be interrupted and goods have to be shipped under

freezing conditions. For filling the dry ice pellets, the unit provides individually storable presets that define the preliminary and main dry ice filling quantity.

Canada: ISO-certified CO₂ recovery unit

Together with HTC Extraction Systems, ASCO delivered a unit for recovering carbon dioxide (CO₂) to an Alberta-based applied research organization. It extracts six metric tons of CO₂ per day from the flue gas of a natural gas-fired power plant. It is

the world’s first CO₂ recovery plant certified according to ISO 14034 ETV. The certification was carried out by the independent consulting firm 350Solutions.



Canada: Eco-friendly cooling technology with CO₂

As a refrigerant for passenger car air conditioners, carbon dioxide (CO₂) is a climate-friendly alternative to the tetrafluoroethane that was used in the past. With its cylinder gases

segment, Messer in Canada is the country's key supplier of CO₂ in the refrigerant quality required for this application.

France: CO₂ for sustainable wastewater treatment

At its site in southwestern France, a company specialized in the production of baby food uses CO₂ and the Neutrabox injection system from Messer to neutralize alkaline wastewater. This

solution is more eco-friendly, more economical and safer than using mineral acids. It also controls pH more effectively and precisely.

Germany: EcoVap reduces ecological footprint

At FKM Sintertechnik in Biedenkopf, Messer installed new liquid nitrogen tanks and an EcoVap unit to make use of cooling energy. The gas is used for inertization in various sub-processes. The EcoVap unit takes the cold released by the liquefied gas in

a cooling plant and transfers it to the circulating coolant. This enables FKM to save energy, cut costs and reduce the size of its ecological footprint. The company also uses shielding and process gases from Messer.

Germany: Hydrogen for public bus service test

In late summer 2021, Messer supplied hydrogen for the trial operation of a fuel cell-powered public bus in the Waldshut-Tiengen district. The four-week test phase successfully investigated the practical feasibility of the vehicle. The bus

carried passengers on established routes in normal operation. One fill-up with 38 kilograms held enough fuel for up to 400 kilometers, which more than sufficed for the distance typically traveled over the course of a day, about 300 kilometers.

Germany: Toyota and Messer present the "one-stop shop"

Toyota Tsusho and Messer presented the "one-stop shop" in Höchst. This joint concept for fuel cell-powered buses offers all the associated services from a single source – including the necessary hydrogen infrastructure. Patricia Vasconcelos, Managing Director of the Portuguese bus manufacturer

CaetanoBus, used the workshop to give a live demonstration of her company's fuel cell-powered bus. The event was hosted by industrial services specialist Infracore and organized by LEA LandesEnergieAgentur Hessen.

Hungary: Hydrogen ice stops nuclear fusion

A few years from now, the ITER nuclear fusion reactor currently under construction in Cadarache, France, will begin fusing hydrogen isotopes. In order to be able to stop the reaction, if necessary, the fusion laboratory of the Energy Research Center in Budapest is developing a secure shutdown mechanism based on the introduction of -260°C hydrogen ice. It is fired at

high speed into the target area, where it lowers the temperature and therefore the energy level of the plasma. The fusion laboratory's gas supply system, which operates at a pressure of 300 bar, was installed by Messer. Messer also supplies the project with high-purity gases such as hydrogen, helium, argon, neon and nitrogen.

Hungary: Gases for flexible solar modules

The Swiss company Flisom specializes in the production of ultralight and flexible solar films. At its film production operation in Hungary, Flisom uses argon, helium and nitrogen from Messer. Flisom's production technology makes it possible to

minimize material and energy requirements for a product with both low levelized cost of electricity (LCoE) and high energy output.

Poland: Oxygen for dairy wastewater treatment plant

Mlekovita Dairy in Baranów has been treating its sewage sludge with oxygen from Messer since 2016 because the addition of oxygen increases the plant's efficiency. Otherwise, the company would have had to expand its wastewater treatment

plant. The gas also helps reduce equipment requirements and the use of chemicals. In a test series, Messer had previously determined the optimal process conditions. The dairy was able to significantly reduce the quantity of wastewater it produces.

Slovenia: On site oxygen generation benefits glass maker

Messer installed an oxygen production unit in Hrastnik for the glass manufacturer Steklarna Hrastnik. The Slovenian company has been using oxygen to melt glass for more than 50 years now. Previously, the gas has been delivered in tank cars. The new on site unit significantly reduces the cost and CO₂ emis-

sions associated with transport while raising supply reliability at the same time. The use of oxygen increases combustion efficiency in the melting furnace, thereby also lowering CO₂ emissions.

Spain: Refrigeration recycles refrigerant

To recycle refrigerators and freezers, Industrias López Soriano (ILSSA) buys liquid nitrogen from Messer. A plant in Zaragoza uses the cryogenic gas to separate out the environmentally harmful refrigerants in a two-step process. ILSSA has more than five recycling plants in the autonomous region of Aragon,

which receive waste materials and waste products from all over Spain. Using state-of-the-art technology, ILSSA extracts an extremely wide range of materials from the waste and returns them to the industrial production chain as raw materials.

Spain: Emission-free through Tarragona

The City of Tarragona wants to convert its fleet of buses to emission-free vehicles. For the test drive with a hydrogen-powered bus, Messer delivered the gas from a fuel pump installed at the company's site in Vilaseca. Along with the municipal

authorities of Tarragona, Toyota and CaetanoBus were also involved in the organization of the test run. Together with Messer, they offer a comprehensive solution for the operation of hydrogen-powered bus fleets.



Switzerland: Ozone cracks pollutants

Ozone is extremely reactive and has potentially beneficial applications, such as converting noxious drug residues into harmless substances. And that is why ozone is playing an increasingly important role in sewage treatment. The wastewater treatment plant in Reinach in northern Switzerland adds

an average of two to three grams of ozone per cubic meter of wastewater. The process is easy to handle, not labor-intensive, and considerably less expensive than alternative methods. The ozone is produced on site using oxygen from Messer.

USA: Expanded hydrogen supply for car manufacturing plant

At a car manufacturing plant in Greer, South Carolina, Messer installed a redundant hydrogen supply system with high-capacity pumps and a 90,000-liter liquefied hydrogen tank. Messer has already been developing, installing, operating and main-

taining the hydrogen supply and refueling infrastructure for the manufacturing plant since 2010. It supplies more than 700 forklifts and material handling vehicles today – one of the largest fleets of this type in the USA.

Our products and applications for food

France: Dry ice for food deliveries

When delivering frozen food to end customers in Greater Paris, the retail chain Casino Group's subsidiary O'logistique relies on SnowDrop units from Messer and MiniCryo boxes from Olivo Cold Logistics. Dry ice snow securely stored in the lid keeps

the contents of the delivery boxes reliably cooled for up to 18 hours. A Messer-patented SnowDrop machine produces fresh dry ice snow and automatically feeds it into the lids.

Germany: Proteins from sunflowers

When pressing sunflower oil, only about 40 percent of the seed weight is used for food. Until recently, the remaining components, which contain valuable fibers and proteins, were processed into animal feed or even discarded. The German

company Sunbloom has developed a process that now makes it possible to recover proteins from sunflower seeds. Messer supplies Sunbloom with high-purity test gases used in laboratory analyses.

Switzerland: Flavor protection for vegan cheese

The food manufacturer New Roots in Oberdiessbach, Switzerland, has been using plant-based materials to produce alternatives to soft cheese, cream cheese, cheese spread, crème fraîche, fondue and yogurt for the past six years. The protec-

tive gas Gourmet N70 is used to package the various cheese spreads. It extends product shelf life, thereby also preventing food waste.

USA: Cooling and freezing technology on display

On the virtual trade fair stand at the International Production & Processing Expo 2021 Marketplace (IPPE), Messer Americas showed the new Wave Impingement Freezer as well as the Bottom Injection Chilling System for mixing proteins and ingredients in the food industry. Converting to cooling and freezing

by means of liquid nitrogen can yield large efficiency gains. In connection with this, Messer offers virtual engineering and consulting services to help customers optimize processes and develop application-specific solutions.

Satisfaction of our customers

Because the satisfaction of our customers is a fundamental metric of our success, Messer continuously monitors satisfaction and solicits information concerning individual needs. We transform the results into improvements in our products,

processes and services. This in turn helps improve our customers' satisfaction and performance – and thereby also reinforces customer loyalty.

Customer satisfaction surveys

We measure the satisfaction of our customers through systematic surveys and incorporate the results into our management processes. With the Net Promoter Score (NPS), we have established an additional indicator for our customer satisfaction analyses.

overall result remains high. The Central and Eastern European companies achieved an average evaluation between 8.5 and 9.7. This result also reflects a high level. Improvement potentials were identified and implemented for the individual countries to further raise the satisfaction of our customers.

In 2021, we conducted our customer satisfaction surveys at eight Messer sites in Europe – specifically, in France and Spain, as well as in Romania, Poland, Bosnia-Herzegovina, North Macedonia, Bulgaria and Slovakia. In all, 14,550 companies were contacted. Subsequently, 1,012 questionnaires were evaluated and the results were summarized by regions. The evaluations were made on a scale of 1 for “very dissatisfied” to 10 for “very satisfied.”

The businesses in the Americas, also conducted a customer satisfaction survey in 2021. The survey focused on customer sentiments and satisfaction with Messer products, services, safety and brand recognition. The survey scores demonstrated an above-average performance in overall satisfaction. The team continues to focus on delivering a great customer experience through speed, ease, consistency, relevancy, transparency and personal touch.

The Western European companies obtained an average evaluation between 8.4 and 9.0; in the previous year the values ranged from 8.9 to 9.4. Despite that slight degradation, the

There were 4,150 people participated in our customer satisfaction surveys in 2021, which was slightly more than the 3,927 participants in the previous year.



Interaction with our customers

We have a wide range of information offerings and opportunities to collaborate with our customers. Due to the Covid-19 pandemic and the associated protection measures, digital communication channels such as online meetings and remote

services played a particularly important role in 2021. We managed to prove that Messer is also able to remain close to its customers at a distance. Selected examples of this are provided below.

Feedback about our magazine for industrial gases

Our digital magazine "Gases for Life" is a timely source of information for a wide audience: the magazine serves both professionally oriented target groups and people with a general interest in the world of industrial gases. "Gases for Life" is published three times a year in English, German, Spanish and Czech. In 2021, our magazine's layout was optimized: among

other things, it now enables readers to share individual articles via social media. In 2021, European customers and interested parties sent us a total of 1,170 positive responses about the content of our magazine. In the previous year, that figure was 2,056.

Messer Innovation Forum

The Messer Innovation Forum's webinars have established it as a platform for application engineering-related advanced training. A total of 159 webinars were conducted in 2021, reaching 870 external and 940 internal participants. As in the previous year,

topics covered the full range of application areas, including food, metallurgy, welding and cutting, industry and chemistry/environment. The platform was used by the national subsidiaries and also by ASCO.

Non-contact service via ShareView app

In view of contact restrictions during the coronavirus pandemic, the "Messer ShareView" e-service offered clear benefits. "Messer ShareView" enables our specialists to make virtual contact with customers virtually – to provide direct assistance

and advice with technical problems in production operations, for example. The app can be installed on computers, tablets or smartphones and is easy to use. It is designed for the digital transmission of live streams, chats and documents.

Canada: Remote maintenance for dry ice machine

To keep up with growing demand, a Canadian dry ice manufacturer raised its production capacity with the addition of a dry ice machine from ASCO. It can produce up to 400 kilograms of dry ice per hour in the form of slices or pellets. While setting up the

machine and during the start-up phase, the Swiss ASCO team provided support to the Canadian customer via remote maintenance.

Spain: Digital quality certificates

After batch analysis, Messer in Spain issues the appropriate quality certificate for the food-grade and specialty gases it produces and also for the Diveline and Pharmaline brand gases it produces. In the past, that certificate was printed out and affixed to the individual cylinders. With the introduction of

digital certificates, Messer is helping to improve quality control processes: the certificate is stored in the filling plant and can be called up with a QR code on the cylinder. In addition, digital safety information for pressurized gas cylinders has been introduced. All cylinder labels include the corresponding QR code.

USA: Experiencing expertise in the Technical Center

At Messer’s Technical Center in Cleveland, Ohio, guests can experience practical demonstrations of gas technologies – in person or virtually. Our team helps current and potential customers identify and implement solutions through consulta-

tion, testing, analysis, training, joint development and practical demonstrations of applied gas technologies. Messer’s specialists work closely together with the customers to help them achieve their goals.





Commitment to Education
and Social Justice

In 2021, the far-reaching consequences of the Covid-19 pandemic became clear. There was a lack of modern IT technology for school instruction, children who were especially affected by contact restrictions, remained at home and some families experienced extreme financial stress. For this reason, we maintained the full extent of our commitment to education and social justice – even intensifying it if possible – to support institutions and initiatives in the countries and regions where we operate.

In all, 95 Messer locations demonstrated that commitment in 2021 in the form of financial and material donations, social events, or to the benefit of social institutions. Our teams supported 970 campaigns for social causes – a number that is both impressive and impactful.

Messer consciously refrains from communicating its social commitment on social media or in the local press – unless it can raise awareness further, and thereby generate additional support for projects, initiatives or events. The following section lists selected examples of our commitment to education and social justice.

Commitment to training, education or science

Spain: Messer Award for technical students

In June 2021, the Messer Award was presented in Spain for the ninth time. It was given to chemical engineering and food biotechnology students at Rovira i Virgili University in Tarragona (URV). The chemical engineering students who received the

award submitted plans for an acetone production plant including sustainability study. The students studying food biotechnology designed a production facility for kefir-based ice cream.

Spain: Messer Award for MBA students

Messer presented an award to the students who completed their Master in Business Administration and Management (MBA) at Rovira i Virgili University with the best academic performance of 2021. Presented for the ninth time, the individual

award went to Xavier Carbonell Maté, Regional Mechanical Engineering Manager EU at Lear Corporation. The best project team was also recognized.

Spain: Grant for radiosurgery

Messer in Spain awarded a grant for clinical research in radiosurgery to Dr. Silvia Tuna, radiation oncology specialist. It enables her to participate in a clinical research project in the field of cerebral and extracerebral radiosurgery in the Department

of Oncology and Radiotherapy at the Vithas Consuelo Hospital in Valencia. Messer has been working together with the Vithas Foundation for 12 years. Vithas is one of the largest private hospitals in Spain.



Commitment to combat poverty and fight for social justice

Brazil: Solidarity for underserved communities

For the Messer Brazil team's year-end charitable effort, employees donated around 300 new or semi-new toys to local non-government organizations (NGO) and other institutions.

In addition, through a Solidarity Raffle, employees voluntarily donated cash to be split among four NGOs.

Canada: Addressing food insecurity

Employees at the offices, plants and branches of Messer in Canada support the Breakfast Club of Canada as its national charity. Messer colleagues participate in several internal cam-

paigns throughout the year, raising funds that enable students to gain access to nutritious foods. The team donated close to \$25,000 to the Breakfast Club of Canada in 2021.

Colombia: Laptops for remote learning

Messer in Colombia donated laptops to six healthcare workers from its own organization, whose families previously had no

computers of their own. The devices were provided to children who received online classroom instruction due to the pandemic.

Colombia: Support for patients and victims of violence

Employees from Messer Colombia participated in the "Reading to our Patients" program at REMEO healthcare facilities. The program which encourages spending time with patients by reading to them provided much needed companionship.

Employees also donated clothes to support women who are victims of violence and provided clothes and toys for their children through the Fundevida Foundation.

Croatia: Solidarity after earthquakes

Two powerful earthquakes shook central Croatia at the end of December 2020. The quakes destroyed the small towns of Sisak, Petrinja and Glina. In Zaprešić alone, more than 100 families were forced to leave their inhabitable homes. To provide

rapid support to the victims of the natural catastrophe, Messer initiated a fundraising drive. The entire workforce donated part of their December salary to help affected families make their homes habitable again.

Germany: Help after catastrophic flooding

In mid-July 2021, heavy rains triggered devastating flash flooding along several tributaries of the Rhine River. There were 184 deaths in Germany. To support aid efforts in the flooded areas, Messer provided protective clothing, buckets, tools, pumps and drying equipment, drinking water, batteries, disinfectant, insect repellent and headlamps. Beekeeper, Messer's in-house communications app, was used to organize the deployment of volunteers from the workforce. On July 21, Messer teams traveled to the heavily impacted Ahr Valley to help with the clean-up.

Among other things, they removed heating oil-contaminated sludge and water from cellars and cleared away debris. A short time later, Stefan Messer visited affected colleagues and their families in Sinzig and Ahrweiler and decided: We'll keep on helping. Messer organized an international solidarity campaign. Donations from employees and from Messer SE & Co. KGaA provided financial support for three facilities affected by the flood: An elementary school, a kindergarten, and a home for disabled persons.

Hungary: Support for three relief efforts

Messer in Hungary supported three relief efforts: One donation went to an organization that is helping a child who suffers from leukemia and whose family needs financial support. A local

animal rescue station and an institution that promotes better education for children from the poorer regions of the country were also supported.

Hungary: Support for the "Never Give Up" café

In the heart of Budapest, there's a café named "Nem Adom Fel", which means "never give up." It is run by disabled people who kept the café-and-restaurant business going during the coronavirus pandemic by also delivering their delicacies to their

customers' doorstep. Messer in Hungary supported the café with a donation. It was collected through an initiative from within the team: everyone paid a little extra for their coffee capsules and the proceeds were collected.

Spain: Donation for popular sports

Messer in Spain organized several activities to promote sports for children and adolescents and handed over donations to the Johan-Cruyff Foundation and the Costa Daurada soccer campus. The Cruyff Foundation develops sport projects for abused children and for children with disabilities. The Costa Daurada

soccer campus is an association dedicated to the promotion of soccer sports for children and adolescents from 6 to 15 years old. Messer sponsors sportswear and accessories for the summer campus.



Spain: Computers donated

Messer donated eleven computers to the Red Cross of Tarragona. They will be distributed to the regional offices of the aid organization in support of training courses. This initiative seeks to narrow the digital gap for socially disadvantaged communi-

ties. Secondhand computers were also provided to the neighborhood association of the La Floresta district. It organizes refresher courses and computer training especially for middle-aged people to help them search for employment.

Spain: New food bank donations

In Spain, the coronavirus pandemic triggered an unprecedented crisis affecting healthcare, the economy and social services. Many families depend on aid for their existence. The number of requests from the needy at the Spanish food bank “Banco de

Alimentos” has increased by 40 percent since the outbreak of the pandemic. In view of this emergency, Messer in Spain decided once again to make a donation to support the food bank in Tarragona province.

Spain: Remote-controlled vehicle for hospital hallways

The Vithas hospital chain and Messer in Spain implemented a special solution for younger patients: in Vithas Castellón Hospital, children get to ride to the operating room in a remote-

controlled electric car. This calms the fears that children and their parents have when faced with pediatric operations, and facilitates preoperative procedures.

Switzerland: Recognition for promotion of disabled sports

For many years now, Messer in Switzerland has been supporting the disabled sports association PluSport. In 2021, we

received another certificate in recognition of our support of disabled sports in Switzerland.

USA: Holiday clothing drives for people in need

For the holiday season, Messer in the Bridgewater, New Jersey, corporate office hosted clothing drives to benefit underserved communities. New winter clothing was donated to the Veterans Affairs Supportive Housing community, an organization that provides supportive services to help veteran residents re-enter

the workforce. Additionally, the MEPS collected clothing and personal effects from employees in the Stewartsville, New Jersey and Naperville, Illinois sites. The clothing collected was donated to the WINGS program, the largest domestic violence service provider in the state of Illinois.

Vietnam: Covid rapid tests donated, donations received

In July 2021, Messer donated 30,000 Covid-19 rapid antigen tests to Vietnam. Messer regularly provides support to communities in areas surrounding its Vietnamese production sites and has helped establish and upgrade several hospitals and schools there in recent years. Our worldwide workforce is also committed to supporting Vietnam: the proceeds from an in-house sol-

idarity campaign helped rebuild the apartments and homes of our Vietnamese workforce. They were damaged or destroyed by tropical storm Molave. The donations also procured a power generator for the medical facility of the municipality of Dung Quat and repaired a school.



The foundations

On April 6, 1978, Dr. Hans Messer and his family established the private charitable foundation now known as the Dr. Hans Messer Foundation. The independent foundation is a shareholder of the Messer Group and promotes education, science and research throughout Germany.

Dr. Hans Messer Foundation

The purpose of any foundation should be to support projects and ideas that are given no or insufficient consideration within the framework of basic state provision. The Dr. Hans Messer Foundation also pursues this idea by supporting and recognizing scientists who gain prominence through special or outstanding achievements, by awarding scholarships and prizes, and by supporting scientific and educational establishments.

The Dr. Hans Messer Foundation's activities encompass support and funding as well as operational aspects. It operates as a charitable foundation with legal capacity established under private law, making a varied and ongoing contribution to the promotion of science and research as well as school and vocational education. This work is becoming increasingly important in this day and age as the state is often unable to provide sufficient funding. In this way, thirst for education, innovation, scientific curiosity and pioneering spirit are rewarded.

In the social and health spheres, Ria Messer established a second charitable foundation – today's Ria Messer Foundation – in memory of her husband Dr. Hans Messer.

The activities of both charitable foundations are independent of those of the Messer Group.

The purpose of the Dr. Hans Messer Foundation is to be a driving force for education and science. According to its charter, the Dr. Hans Messer Foundation supports science and research, public and vocational education, and the provision of help to students. In all, more than 20 million euros have been spent for foundation purposes to date.

The Board of the Dr. Hans Messer Foundation determines the focus of the foundation's work with the aim of defining a specific direction. The focal areas can change, however, or apply for only a certain period of time. The foundation currently focuses on science and research grants primarily in STEM fields, i.e. science, technology, engineering and mathematics. The field of medicine also receives regular funding. The Dr. Hans Messer Foundation awards a number of different scholarships to students, undergraduates, doctoral candidates and professionals. In addition, special scholarship programs are also set up.

Foundation prizes of the Dr. Hans Messer Foundation

To provide specifically targeted support to young scientists and their research, the Dr. Hans Messer Foundation continuously awards foundation prizes. The Foundation Prize 2021, for example, was given to the Technical University of Darmstadt for the promotion of outstanding achievements in the areas of natural science and engineering as well as economics, social sciences and the humanities. At 50,000 euros, it carries the highest endowment of any award for young scientists at the Technical University of Darmstadt. The prize is intended to fund material and personnel resources for research projects.

Recipients of the award were Dr. Meike Saul (Technical University of Darmstadt, Faculty of Biology) for her research work "Exosomal microRNA-574-5p: Small molecule with a large impact on inflammations and cancers" and Prof. Dr. Vera Krewald (Technical University of Darmstadt, Faculty of Chemistry) for her research work "Light-driven nitrogen fission: At the right wavelength and with the right impetus".

A cross-disciplinary awards committee with representation from the foundation and the university board determines the prize recipients.

Ria Messer Foundation

The aim of the Ria Messer Foundation is to support the most vulnerable members of our society. In accordance with the charter, the foundation supports charitable projects and public welfare projects.

Even today, there are many people who are more vulnerable than others. People who are sick or need care, people who do not receive enough support in our society, but desperately need help. This is precisely where the Ria Messer Foundation seeks to provide assistance. In keeping with the times, it fulfills the binding social contract implicit in the will of the founder: helping other people.

The Ria Messer Foundation treats all people with respect and tolerance. Its activities encompass support and funding as well as operational aspects. It has been a charitable dependent foundation established under private law since it was founded. It is held in trust by the Dr. Hans Messer Foundation.

The purpose of the foundation is to provide support to specific individuals within the meaning of § 53 AO (German tax code) and to promote social welfare. This purpose shall be achieved by helping individuals who are dependent on the help of others as a result of their physical, mental or psychological condition (§ 53 No. 1 AO of the German tax code), who find themselves in need through no fault of their own, for example as a result of natural disasters, who are in need according to § 53 No. 2 Clause 3 AO of the German tax code, by providing one-off or ongoing financial support in order to remedy their need in the long term or by financially aiding the work of the leading independent welfare organizations or other tax-privileged bodies operating in the charitable sector or other tax-privileged organizations providing care and treatment to individuals suffering from serious illnesses through no fault of their own.



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