

# SICKinsight

MAGAZIN

: FOCUS ENERGY. EFFICIENCY. TRANSPARENCY.



## TRANSFORMATION THROUGH TRANSPARENCY

EFFICIENCY INCREASE IN THE ENTIRE ENERGY SECTOR



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# TRANSFORMATION THROUGH TRANSPARENCY





## VISION AND REALITY OF THE ENERGY REVOLUTION

>> Climate protection, energy revolution, reduction in greenhouse gases. We are living through dramatic changes. The climate change which has been predicted for many years is here and we have to face the real consequences. Rethinking is essential. Continuing as before will not prevent the negative consequences – the greenhouse effect has been proven and is already happening. And to keep with the metaphor: We should not throw stones, since we are all living in this fragile glass house together. The good news: There are solutions.

The key to the rethinking process is decarbonization. With reliable data generation, SICK is already creating the most important prerequisite for limiting emissions: Transparency. Nothing can be reduced, until it is reliably measurable and given a value. This is the basis of the CO<sub>2</sub> tax.

That is why SICK is involved whenever it is necessary to make improvements and increase efficiency in the entire energy sector with pioneering and advanced technology. Energy flows will change all over the world. Oil tankers will be replaced by LNG (Liquid Natural Gas) tankers, which will later be replaced by hydrogen tankers. In the mid-term, fossil energy suppliers will be obsolete and

replaced step-by-step by those with regenerative sources. Carbon capture, storage and use in power plants, cement plants or in waste-to-energy plants, power-to-X or sector coupling are only some of these visionary and, in some cases already implemented, approaches. Above all, the electrolysis of water to generate hydrogen promises to become an important process. Hydrogen can be easily stored and integrated into the economic cycle – this is the case as a direct source of heat energy, or as a supplement to natural gas in turbines for power generation or as a component together with CO<sub>2</sub> in synthetic fuel. An impressive technology to achieve a compensated CO<sub>2</sub> balance.

Read about it in this booklet: Whether for onshore gas flow measurement, emission measurements on ships, in blast furnaces under harsh conditions or digitally in the cloud – intelligent sensors from SICK create transparency and will accompany you and your data in the transformation to a clean future.



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BREF: WHEN THE BEST AVAILABLE TECHNOLOGY BECOMES THE REFERENCE POINT  
Expertise in dust, gas and flow measurement

Imprint

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# RETHINKING IS BECOMING INCREASINGLY IMPORTANT

## GREEN ENERGY INTO THE GAS NETWORK

A climate-friendly and promising application is emerging for the natural gas network. Operators of gas grids can keep up with the trend to feed, transport and store regeneratively produced hydrogen in existing gas networks – without additional investment in new FLOWSIC gas flow meters. Ultrasonic technology from SICK continues to provide stable measurements in gas infrastructure despite changes in gas properties. Power-to-gas plants also profit from the measurement performance.





>> The need for energy remains high and will even increase worldwide in the next few years. If the energy supply is to remain secure, a smart energy mix must cover the new requirements. The share of natural gas in this mix is estimated to grow to more than 30%. Today its share is about 22%. Renewable energy generated from wind, water, sun and biomass are a priority in the current climate discussion – despite some supply problems. Power generation fluctuates due to changing weather conditions, and the amount generated is not predictable. In addition, there is currently not enough storage space for surplus power from solar and wind power plants. The way out of this dilemma could be the conversion of climate-neutral power into gas generated free of CO<sub>2</sub>. In the power-to-gas process, green electricity is converted via electrolysis into storable gas, e.g. hydrogen. Methane or synthetic natural gas can also be stored. Producers of fuel cells profit from green hydrogen, and natural gas vehicles move in a climate-friendly manner.

#### Energy supply with hydrogen

The power-to-gas technology has potential for climate protection and is part of the energy sector just as much as CO<sub>2</sub>-free generated hydrogen. This hydrogen can certainly also be fed into and saved in existing natural gas networks. The existing gas infrastructures can be used for this purpose. The green energy added to the natural gas is thus used in an economically efficient manner and is available in sufficient quantities at all times.

Research teams in the European Union and Asia are examining how reliable the supply in the existing natural gas network is in principle without straining the gas consumers. Process steps are optimized and advanced. The admixture of 5% to max. 25% hydrogen to natural gas is currently considered possible. Also under examination are protection from leakage in existing systems, material compatibility of the pipelines and fixtures, regulation for explosion protection and finally the question of how the calorific value is determined and can be controlled.

#### Looking at gas flow meters

It is clear that the properties of natural gas change significantly when hydrogen is admixed. Many operating entities of gas networks ask whether this change has a negative effect on the measure-

ment performance of its gas flow meters. Especially in times of cost savings, additional charges are pretty much a no-go.

“Of course, when feeding in hydrogen, the measuring devices already installed in the gas grid should still be in good working order,” explains Jörg Wenzel, Head of Product Marketing Services at SICK. “That is why we have taken a close look at the effects of increased admixture of hydrogen on the ultrasonic technology and tested the FLOWSIC gas flow meters for this new requirement. Ultrasonic flow meters from SICK can measure hydrogenous natural gas. Measurement uncertainties which result from the admixture of up to 10% hydrogen are either negligible low or are compensated by the FLOWSIC.”





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*“Ultrasonic gas flow meters from SICK measure natural gas containing hydrogen. Measurement uncertainties which result from the admixture of up to 10% hydrogen are 100% compensated for by the FLOWSIC.”*

*Jörg Wenzel, Head of Product Marketing Services at SICK*

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#### What exactly does that mean?

The gas flow meters from SICK are resistant to hydrogenous natural gas: Electronic housings, electronic adapters and parts which come in contact with media such as ultrasonic sensors, O-rings, flow conditioners, plugs and protective tubes. This is the result of a study by the Federal Institute for Materials Research and Testing (BAM).

The changed density and viscosity of the gas mixture as well as the new flow and sound velocity do not influence the reliability and quality of the measurement results of FLOWSIC gas flow meters. A recalibration is also not necessary if up to 10% by volume of hydrogen is fed in. Similar data was published in a technical report in the magazine *gwf Gas + Energie* in May 2013. At a 20% admixture of hydrogen, the speed of sound probably increases by 10%. The amount of hydrogen admixed in the natural gas is therefore known and the plant operator is informed of the availability of the plant.

#### Regarding explosions

Hydrogen has a different specific ignitability than natural gas and is in explosion group IIC with stricter requirements on equipment than for natural gas measurements. Explosion group IIA is sufficient for measuring natural gas. In September 2016, BAM – the Federal Institute for Materials Research and Testing – published its report entitled “Safety properties of natural gas/hydrogen mixtures”, looking into the effects of

admixing hydrogen with natural gas on explosion behavior and requirements for the explosion group.

According to the German Gas and Water Association (DVGW), work is underway to further develop the rules. The new regulation is intended to increase the admixture of hydrogen into the natural gas network to 20% by volume. It is clear based on the current publications, that the electronics and the ultrasonic sensors of the installed FLOWSIC600 and FLOWSIC600-XT gas flow meters from SICK meet the explosion protection requirements for a natural gas mix with 10% hydrogen by volume. Correction is not necessary.

#### A great deal of commitment with vision

In industry, very different limit values are currently being named for the admixture of hydrogen to natural gas. They range up to 25% by volume. What seems to be clear is that the proportion of hydrogen will increase steadily over the coming years. How quickly this happens will certainly depend on the speed of investment and the progress made with developing power-to-gas technologies. SICK is continuing to study the measuring capability of its ultrasonic measurement devices for hydrogen contents exceeding 25 % by volume and will adapt the gas flow meters if necessary. Operating entities of gas plants can also continue to rely on the precise custody transfer gas volume flow measurement by SICK – and power-to-gas plants as well.

#### POWER-TO-GAS:

Admixture of hydrogen from renewable energies into the natural gas grid and the associated suitability of SICK ultrasonic gas flow meters.



Download white paper now:  
[www.sick.com/8025071](http://www.sick.com/8025071)



# AT THE BEGINNING THERE WAS HYDROGEN

VERSATILE GAS ANALYSIS IN THE  
PRODUCTION OF AMMONIA

It is the material which influences food production like no other: ammonia. As the main component in the production of nitrogen fertilizers, ammonia is used in a wide range of industrial processes due to its physical and chemical properties. The basis for the production of ammonia on an industrial scale is hydrogen. Since hydrogen typically does not occur as a natural resource, it is generated on a large scale by various chemical processes.

>> The most important processes for hydrogen generation are steam reforming of light hydrocarbons, partial oxidation of hydrocarbons or carbon and water electrolysis. Steam reforming of natural gas is the dominating technology with about 90% of worldwide production of hydrogen. SICK offers customized gas analysis for process and emission monitoring for industrial processes related to ammonia production.

#### Controlled world growth

As a starting material for a wide range of products such as fertilizer and nitric acid, ammonia is one of the most produced chemicals in the world. More than 150 million tons were produced in 2018 alone. The Haber-Bosch process for ammonia synthesis is considered as one of the most important chemical processes of the 20th century and has a huge effect on the world population due to its widespread use in fertilizer production. The hydrogen needed for ammonia synthesis is produced and purified in several steps as described above in the steam reforming process. The hydrogen then reacts with atmospheric nitrogen at high pressure and temperature and becomes ammonia. The high reaction speed and material throughput requires efficient process control in every step. Continuously measuring extractive gas analyzers can monitor  $H_2$ ,  $CH_4$ ,  $CO$ ,  $CO_2$  and  $NH_3$  and offer significant advantages compared to gas chromatographs thanks to their robustness and ease of use. In the ammonia synthesis,  $CO$  and  $CO_2$  would function as catalyst poison and cause salt formation. That is why they must be removed before the synthesis step. To minimize disruptions by  $CO$  and  $CO_2$ , even very small amounts in the ppm range must be detected.

#### “Bread from air” fertilizer from nitrogen

Nitrogen is one of the bases for the growth of plants. The nitrogen contained in the air we breathe cannot be absorbed by plants. Through ammonia synthesis and the fertilizer created in this way, nitrogen is offered to plants in a form in which they can use it as nutrient. The “bread from air” comparison was created during the discovery of the Haber-Bosch process about 100 years ago. And interestingly, the property of “air”, or more accurately the composition of the gases, still plays a decisive role today in the successful process of ammonia production. Gas analysis systems with a modular design are extremely useful for monitoring and guaranteeing this condition.

For example, SICK's product range includes a special solution for monitoring the efficiency of the steam reformer and control of the downstream shift converter by measuring methane ( $CH_4$ ) and carbon monoxide ( $CO$ ). This solution can be implemented by SICK with the S700 or GMS800 extractive gas analyzers from SICK. However, there are different licenses available for the industrial production of ammonia with various technologies. Which license is selected also depends on the raw materials used as well as the surrounding conditions. In principle, the solution described above can be transferred to other licenses for ammonia synthesis based on steam reforming. Customer and system-specific adaptations required for this measurement can be implemented by SICK.



#### The highest level of gas analysis

SICK offers analysis solutions for the entire ammonia synthesis process and some subsequent processes. Experts from SICK support in the selection of the right products for the respective application. The S700 and GMS800 therefore build the foundation for customized gas analysis for process and emission monitoring for hydrogen and ammonia production. All relevant gas components for this process can be measured both with the S700 and the GMS800 – with up to three or even six different analysis modules.

Different housing types are available depending on the measuring task, location of use and ambient conditions. This also includes a wall housing with ATEX certification for explosion-hazardous areas which is suited for industrial environments. Equipped with modern software, the GMS800 also features all the interfaces required for remote monitoring via networks through to the connection to a distributed control system.

## HOW THE “FIRE MASTERS” FROM SICK SAVE ENERGY WITH EXHAUST GAS ANALYSIS

# MEASURING TO THE LIMIT

The steel in electric arc furnaces bubbles in light orange hues. Flames blaze from the thin gap between the vessel and exhaust manifold; the heat is intense. This is what steelworkers unemotionally refer to as a “harsh environment” – but behind it are such extreme conditions for humans and devices that it takes special skills to master them. SICK has tried-and-tested solutions for exhaust gas measurement in electric arc furnaces – and for the no less intense monitoring of cement kilns – which serve to optimize processes. In addition to safety aspects with gas analysis and leakage monitoring, this means above all energy savings.

>> In the face of increasingly scarce resources, even small savings have great importance in heavy industry. The exhaust gas analysis technology from SICK is setting new benchmarks with fascinating solutions. In principle, the modern fire masters work with the elementary rules of combustion. Perfection, and therefore efficiency, are only achieved when the combustible components of the furnace exhaust gas burn free of residue and without waste. A campfire which smokes and crackles is not nearly as efficient as one which heats with a light flame. When monitoring furnace processes, SICK relies on this principle and analyzes all gases involved in the combustion for their composition. Perfect regulation of the gas compositions is subsequently achieved based on these measurements. The idea is the same for the steel and cement production. In both industries is the composition of gas atmospheres in furnaces a decisive factor for efficient function. However, due to the different circumstances for the process gas analyzer system METPAX300 for electric arc furnaces and the SCPS system for gas measurement directly in the rotary oven, measurements are done using different principles.

### Efficient due to optimal combustion

Transparency plays an important role in the production of steel and cement for operating entities of electric arc furnaces and cement kilns. Permanent monitoring of the process ensures complete insight and overview and therefore ensures product quality. The data collected during gas analysis is the important

basis for detecting incomplete combustion or the development of poisonous by-products and is thereby preventing their creation. This increases both safety and efficiency. In cement production, the temperatures are about 1,400 °C, and these reach up to 1,800 °C in steel production. To compare: The frictional heat of a spacecraft returning to the Earth atmosphere is right in the center at 1,600 °C. It's no surprise that a correspondingly high amount of energy is expended for such extreme temperatures. A huge potential for savings.

### Creating a safe process with sophistication and durability

Both systems used by SICK are characterized by the high level of durability corresponding to its usage sites. For example, the SCPS features rugged sample probes whose effective cleaning mechanisms prevent residue deposits and caking through targeted movements and rotations of the probes. This minimizes maintenance effort and secures the production process.

But safety aspects, which are to be taken literally, also play a role. The METPAX300 also fulfills another important safety function in crude steel production. As soon as the balance between the different gas constituents is disrupted, the risk of explosion increases. Leaks in the cooling system can also present a problem. For this reason, the system also detects the H<sub>2</sub>O concentration and, optionally, the H<sub>2</sub> content of the exhaust gas. This sophisticated information is used to quickly and reliably identify leakages in the water cooling system in the

furnace cover or the side panel of the electric arc furnace, therefore preventing massive faults.

### Dirty, difficult and dangerous – overcoming challenges

SICK is known for its huge portfolio of clean and intelligent solutions in factory and logistics automation. In process automation, on the other hand, things can get really hot. Insiders like to describe the conditions in a striking way as “dirty, difficult and dangerous” - the 3D business. But exactly in this field of challenging ambient conditions, SICK once again proves its own versatility and the ability to find new and innovative paths for and with the customer. The solutions for furnace process monitoring with the METPAX300 and the SCPS are an important testament that even the toughest conditions can be mastered. And this goes far beyond the initial installation. SICK provides a worldwide service organization with capable experts. The customers can select from a wide range of offers corresponding to their tailored solutions – clean, easy and safe!



*Intelligent sensors ensure efficient and safe production and trouble-free processing along the entire value chain.*



EXHAUST GAS MEASUREMENT FROM SICK CONQUERS THE SEVEN SEAS

# FROM LAKE CONSTANCE TO THE HIGH SEAS

International shipping emissions have been pushed into center stage over and over again in the last few years. In coastal regions, pollution from sulfur oxides, nitrogen oxides and fine dust is a huge danger to humans and the environment. Until now – and in contrast to almost all emissions sources on land – continuous monitoring of ship exhaust gases was not required. Interestingly enough, the SICK success story in the field of exhaust gas measurement on ships all started in Überlingen, Germany, on Lake Constance.

>> The reduction of emissions is increasing in significance in shipping as well. The emission of sulfur oxide (SO<sub>x</sub>) and nitrogen oxides (NO<sub>x</sub>) from ships are limited both on a national and international level. The internationally valid limit values for SO<sub>x</sub> were reduced by 85% on 1/1/2020 and apply worldwide for all ships – roughly 55,000 of them. The ship operator can select whether to use low-sulfur fuel or to continue to run the vessel with low-cost heavy fuel oil. In case of the latter, however, an exhaust gas scrubber must be installed and the efficiency monitored with an emission measurement device. This is a major transition for the entire global shipping industry with changes that are unique and result in considerable structural upheavals.

#### New territory for proven premium products

SICK has been working on ship emission measurements since 2009. The MCS100 produced in Überlingen was used for initial installations; it is otherwise used in power plants or waste incineration plants. The ship installation site really was new territory for SICK. The special requirements for the measurement technology were mastered. Due to the early arrival in this future market, a new device family was developed in

2013 which is designed only for harsh on-board use. The MARSIC200 and MARSIC300 were launched in 2015. The MARSIC300 features unique attributes, is certified by a total of seven international classification societies and therefore has the highest level of acceptance in the global market of maritime emission measurement devices.

#### A wave of conversions due to policy

As is so often the case, the market first followed the strict legislation for exhaust gas measurement. In October 2016, the International Maritime Organization (IMO) definitively stated that strict limit values for sulfur oxide would be obligatory worldwide from 2020. This was a wake-up call for international shipping companies, which have been continuously equipping their ships with exhaust gas treatment systems ever since. When the wave hit, SICK was perfectly prepared. In a short period of time, the products of the MARSIC series became worldwide bestsellers. Since the production capacities at the Überlingen site were no longer sufficient anymore, a completely new production line was built at SICK's facility in Hamburg. And in line with the increasing sales numbers, SICK is also offering an extensive service portfolio for customer support beyond the mere purchase.



#### Beyond the horizon; decarbonization continues

But with the changes to environmental protection conditions, there is no land in sight on the seven seas. Shipping is undergoing large upheavals such as decarbonization and digitalization. It is predicted that additional national and international legal requirements will curb operation with heavy fuels. In the mid-term, liquefied natural gas (LNG) will drive worldwide shipping, and in the long-term, synthetic CO<sub>2</sub>-neutral fuels will prevail. These are challenges which SICK is happy to take on. Especially when it comes to increases in efficiency, energy transparency and certified emission reporting, there are countless options for using sensors intelligently and sustainably. And digital business models with apps and smart solutions are also looming on the horizon.



More information:  
[www.sick.com/maritime](http://www.sick.com/maritime)

## PERSONAL AND PROPERTY PROTECTION: SICK PROVIDES RELIEF FOR MANUFACTURERS AND OPERATING ENTITIES

# PLAYING IT SAFE

Retrofitting? Modernization? Protecting new plants? Each interruption in machine safety must be executed and documented one-hundred percent. SICK offers certified complete safety solutions for the commissioning of automated guided vehicles, autonomous platforms or human-robot collaboration scenarios. Operator risks are therefore detected and reduced to the minimum in line with standards. For operating entities, this means great relief. Sensor solutions cover other protection options beyond functional safety.

>> Automated processes simplify physically strenuous work and the sensors integrated in the process in combination with data evaluation reduce error rates. This increases product quality and ultimately efficiency and productivity. In the future, humans, machines and autonomous systems will work even closer together. The transformation is in full swing. That is why it is only logical to rethink safety concepts for protecting humans and adjust them intelligently to new workplace conditions. As individual as the requirements on the different areas and operating processes are, the more individualized the safety solution must be. This affects production, the warehouse, the packing and logistics department as well as IT, administration or building management.

### Certified experts

Employers must ensure the health, safety and well-being of their employees at work in a constructive, technical and organizational manner. Analysis of weak points and risks assessments must therefore be done in an organized way. For companies, it is therefore more important than ever to get informed about standards and legislation in a timely manner. But there is not enough time and manpower everywhere.

Each process humans are involved in must be proven to be safe. Safety solutions minimize operating and process risks. The consequences of avoidable accidents could be dramatic. With the right expertise and a suitable safety solution, for example a machine or production line can be refurbished, modernized or test-

ed very quickly. Certified safety experts from SICK provide their customers with professional project management which follows exactly defined processes. Engineering documentation makes the entire process – from planning to execution to approval of the machine – transparent, both for the modernization of existing systems as well as the protection of new plants. The solution portfolio from SICK protects a wide range of hazardous points with a wide selection of sensors, sensor systems and software. A function test with documentation, test report and the SICK VERIFIED SAFETY quality mark completes commissioning. The customer receives a fully equipped and operation-ready safety solution.



The externally audited quality seal is now used to label safety projects in a large number of plants and applications. This includes protection of stretch film wrappers and packaging machines as well as safety-oriented operating and rear area monitoring of vulcanizing presses in the tire manufacturing industry, or accident and collision avoidance at material transfer stations in intralogistics processes.

### Closing security gaps

Production and IT are growing closer and closer together. The advantage is that digital networking of the production chain is much more flexible, efficient and less expensive. This simplification

also allows for security gaps, allowing hackers to triumph. SICK specifically protects sensors from manipulation so that this does not happen. Even before the development of new products starts at SICK, cybersecurity is considered and encompasses the entire infrastructure, from sensors to safe industrial gateways and production networks into the cloud. Complex cybersecurity measures and established encryption technologies protect sensors from unauthorized access and separate untrustworthy sensor data.

### The right equipment for an even higher level of safety

In addition to functional safety to protect humans, every company must tackle other safety aspects and perhaps even optimize them. With the goal to reliably monitor, control, protect and warn. Set the best example with SICK sensor technology: For collision warning in both indoor and outdoor areas, for explosion protection, on packaging routes, at barriers and approach points, for building safety and security, plants and premises.





Increase your productivity now:  
[www.sick.com/safe-productivity](http://www.sick.com/safe-productivity)



RELIABLE  
SUPPORT

**More relief through remote support:** The security architecture of the SICK Remote Service provides a secure, high-performance remote maintenance connection. This enables reliable remote diagnosis by experts even during operation. Hazards are detected early on. Maintenance and calibration are much faster. Availability and life time of the measurement devices increase.

RELIABLE  
SECURING

**Protecting assets, managing information:** In order to extend response times to intrusions, SICK recommends concentric protection: From perimeter protection and monitoring of the building exterior and the interior. Ceilings, walls, and windows are monitored along with doors, gates, and security door systems. SICK is ready for concept development with intelligent sensor systems.

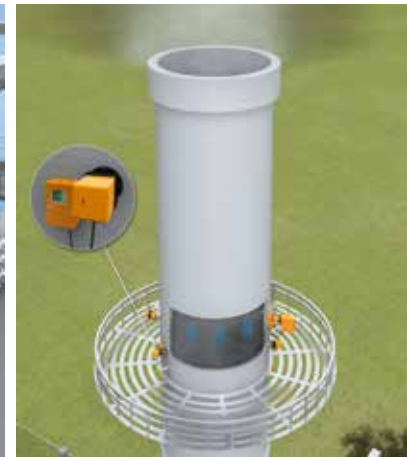
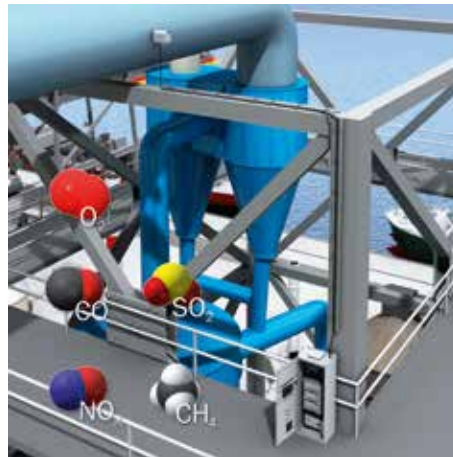
RELIABLE  
WARNING

**All-round preventive protection:** The larger the vehicle, the larger the blind spot and the area that cannot be seen by the driver. Collision warning and user-guidance systems help to prevent accidents and to reduce machine damage with downtime. Productivity increases. Thanks to its technological diversity, SICK has been providing assistance with its expertise in front and rear area protection.

SAFE  
PROTECTION



**Quick and reliable packaging:** Every industry has its own special performance requirements. Off-the-rack solutions are often not enough. The modular construction of modern packaging machines requires an intelligent and flexible safety concept. SICK safety solutions ensure the protection of humans and machines, thereby optimizing production, reducing machine footprint requirements, and decreasing downtime. From the rugged, moisture-proof photoelectric sensor for glass identification via intelligent camera sensors, checking packaging element position through to protecting robotic loaders with safety laser scanners – SICK sensors and systems meet the requirements of the packaging industry.



RELIABLE CONTROL

**Not for everyone:** Only authorized persons or vehicles may pass. Barriers control the modern day-to-day running of the factory, because security on the factory premises plays an important role for a smooth and efficient flow of business processes. SICK leads with detection products and with a broad portfolio of solutions SICK also supports the development of holistic and standard-compliant monitoring concepts.

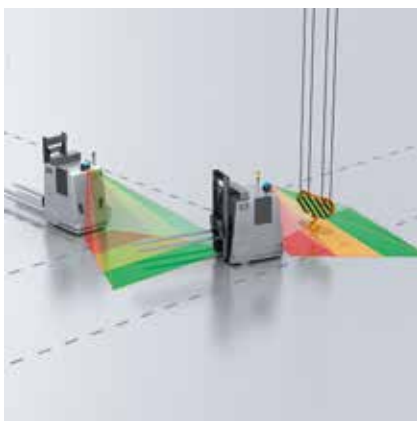
RELIABLE PROTECTION

**Setting limits for explosions:** Regulations and standards for the prevention of explosions differ worldwide. SICK therefore continues to develop and certify its devices according to international standards. The measurement technology from SICK is being employed successfully, and the wide variety of devices for gas and dust measurement offers tailored solutions, even under the most stringent measurement conditions.

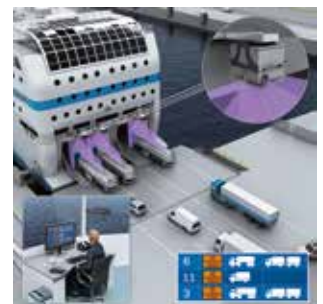
RELIABLE MONITORING

**The air is clean:** Environmental and climate protection is currently taking center stage in economic orientation – doubtless a herculean task with international character. The standards and regulations for emission monitoring and reporting are getting stricter in nearly every country in the world. In order to comply with requirements, many customers are turning to SICK to cover their needs for monitoring solutions for dust, volume flow and continuous gas emissions.

SAFE DETECTION



**Driving without a driver:** Safety laser scanners have prevailed worldwide for the safe detection of people around automated guided vehicles. SICK offers a complete product portfolio with a variety of different scanning ranges and fittings. Up to 128 freely-definable protective fields allow for fine-tuned adjustment of person detection to the current driving scenario. The vehicle thereby achieves its maximum transport performance. Forward warning fields trigger speed reduction as soon as a person or an object is detected. The vehicle immediately spots when the protective field zone is reached.



Vehicles posing a fire risk must be detected and unloaded before they leave with a ferry.



Free navigation of service robot on ship decks

OPTIMIZING PROCESSES IN SOLAR POWER PLANTS

# SOLAR ENERGY





Depending on the system capacity and location, solar power plants can supply entire regions with environmentally-friendly energy all day long. Operating entities are not happy until systems are working optimally – with a high degree of efficiency, reliable availability and profitability. That is why the use of sensors is absolutely necessary in many points of the process chain. With the right equipment, the sun shines every day.

>> Solar power plants should produce as much power as possible. Thousands of reflectors are in operating full swing all over the world. In a first-class plant, the number of reflectors even reaches well into the six-digit range. The expansive power plants are often located near to the equator and are therefore often far away from civilization. This makes it clear as daylight that all components installed in the plant must work free of faults for long periods of time. Service work for remote regions cannot be organized and performed in a hurry.

That is why you are always on the sunny side of the street with reliable sensor performance. And SICK sensors are known for their reliability. They measure accurately and stably, and also score points with their long service lives. And, in addition, the SICK Remote Service program is a welcome offer and a service promise. Not only does commissioning and maintenance work run as a matter of course, but spur-of-the-moment service support is also fast and flexible. At the click of a mouse, experts fix problems in a timely manner. The customer-specific cloud solutions are designed in accordance with strict safety standards. The combination of intelligent

sensors, quick service and networking of data reduces costs and also increases plant efficiency: From the solar cell to the heat exchanger to back-up gas fired power plant. And should on-site service still be necessary, the web-based service platform noticeably minimizes planning and setup times.

#### Solar tracking for higher energy yield

In heliostats, parabolic troughs and solar modules in a photovoltaic solar park, reflectors and solar cells must be aligned to the sun all day. The sensors measure the tilt or rotational movement of the reflectors and solar cells in one or two dimensions without making contact so that they can track the sun using the position data.

Like real outdoor professionals, the sensors also measure on hot, icy, dusty or wet days. The electronics are highly resistant and therefore nearly failsafe. Using encoders, the mirrors can concentrate the sunlight precisely on the solar tower, which then utilizes the energy accordingly. With concentrated solar thermal energy, thousands of mirror systems bundle solar radiation on an absorber surface. At this focal point, molten salt or thermal

oil heats up and then flows through lines into heat accumulators or directly to the steam power plant.

The TDC (Telematic Data Collector) gateway system collects and saves measurement data from sensors using various interfaces. This data flows non-stop to a server or the customer cloud via mobile communication integrated in the system. The incoming and outgoing data increases transparency and can be utilized to increase productivity in downstream process optimization sections. SICK offers optional customer-specific cloud solutions for this purpose.

### Efficiency increase in heat accumulators

Heat exchangers in heat accumulators or heat conversion plants generate steam to drive the turbines to generate power. The measurement quality of the steam flow frequently involves making compromises. Inaccuracies in the flow rate and pressure loss are tolerated. Even leakage hazards are often not precisely identified. But this does not need to be the case. The FLOWSIC mass flow measurement has proven itself in challenging and high-quality installations for steam quantity measurement. These ultrasonic sensors do not lose pressure, which results in higher system availability. The FID analyzer from SICK monitors organic carbon in low concentrations to protect against leaks in the N2 blanketing system. The MCS300P process gas analyzer checks whether steam or water escapes into the heat transfer oil.

### Who works during the night?

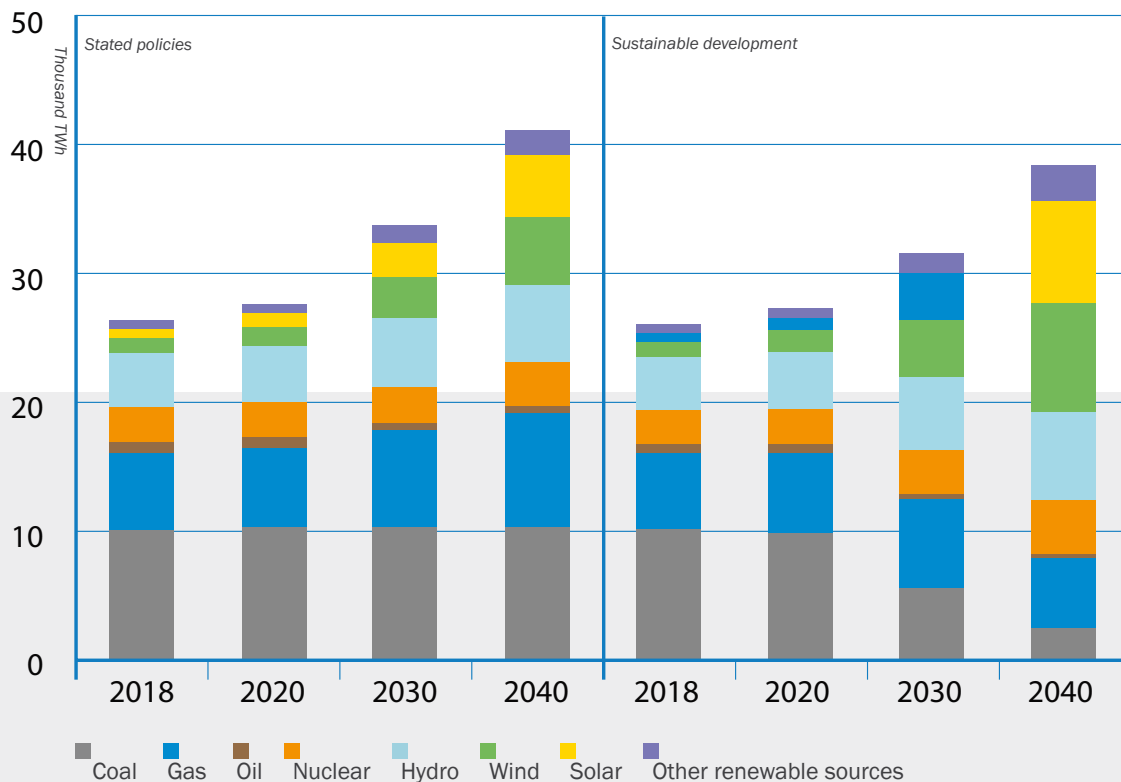
The sun delivers so much energy that solar power plants can produce sufficient power and heat and are a real alternative to conventional power generators. With SICK, you can have your reserve power generation in attached gas-fired power plants under control. Monitoring of the natural gas flow to or within the gas-fired power plants with ultrasonic gas flow meters is also important for correct invoicing. Nobody wants to pay too much. And with products for emission monitoring, complete solutions can be created from a single source.

### The future of solar energy continues

Power generation using solar cells is becoming increasingly attractive amongst regenerative energies. In 1958, US Americans started the solar revolution by equipping the “Vanguard 1” research satellite with solar modules. Satellites continue to use solar energy today. This success was at the same time the precursor for solar energy on earth – and then back up into the air. Swiss pilot André Borschberg, in his “Solar Impulse 2” powered by solar energy, flew 8,300 kilometers nonstop between Japan and Hawaii.

This has been the world record since 2015. The development of the solar market remains highly innovative with rapidly growing technology development.

## POWER GENERATION ACCORDING TO FUEL AND SCENARIO, 2018 – 2040



Source: IEA All Rights Reserved.  
[www.iea.org/reports/world-energy-outlook-2019/electricity](http://www.iea.org/reports/world-energy-outlook-2019/electricity)

### Improved automation in solar cell production

SICK sensors are also qualified for the production of solar modules – from simple detection tasks to significant sensor systems in a complex production process. Cameras and software are specially designed for very low-reflectance solar cells and modules. Intelligent track and trace solutions have been proven in quality control. In production, sensors protect humans from dangers in the workplace.

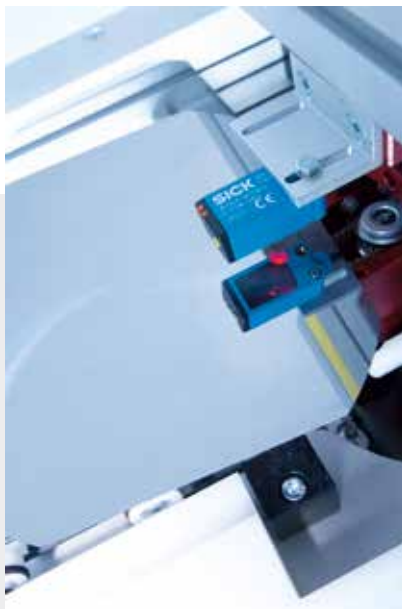
For the last few years, there has been a trend towards more flexible modules. In production, flexible materials are being used as a replacement for rigid and very breakable glass. The flexible modules are much thinner than conventional solar modules. However, their production considerably reduces energy input, which in turn significantly reduces production

costs. Without sensor technology, the fragile modules can quickly be damaged beyond repair in automated production processes.

The integration of flexible modules in roofing materials and facade elements enables cost-efficient system solutions.



2D vision solutions from SICK monitor position and possible breaks when handling solar cells.



Special sensor variants reliably detect both the strongly reflective wafers as well as the cells that absorb the light in the production of solar cells.





FEEDING BULK MATERIALS ON A RUNNING BELT

DOSAGE AND MIX MUST BE RIGHT



Sensors from SICK measure the volume flow of raw material on the conveyor belt from the bunker onto the main conveyor belt to the combustion process and thus ensure the metered supply of secondary material.

>> The conveyor system in the cement plant is impressively large. If all band lengths were added up, the total distance would be several kilometers. Conveyor belts are usually in operation around the clock, bringing material to the right place in a controlled and efficient manner. A large number of monitoring tasks are carried out along these routes. The long transport route does not automatically have to be accompanied by a higher metrological challenge. It is often the smaller conveyor belts that create special tasks for the measurement technology. The cement plant belonging to HeidelbergCement AG in Lengfurt, Germany has found a powerful solution for short routes with the Bulkscan® LMS511 from SICK and is precisely regulating the feed of secondary raw material on the raw meal belt.

From the bunker to the transfer point to the main transport belt, measurement of bulk materials with rugged measurement technology is required. It is very dusty in the hall in which the conveyor belt transports additional ferrous material on a length of only a few meters. The conveyor was originally used for different purposes and now, after a plant conversion, it dispenses additives. To comply with the defined clinker mineralogy, the output values of the installed measurement technology must be absolutely reliable so that the cement properties are correct in the end. For a conventional belt scale, it is nearly impossible to identify the mass flow of the material. The belt is only 60 cm wide and the belt loading system is only a few centimeters high. In addition, installing a belt scale is time-consuming and cost-intensive and involves large mechanical modifications. The

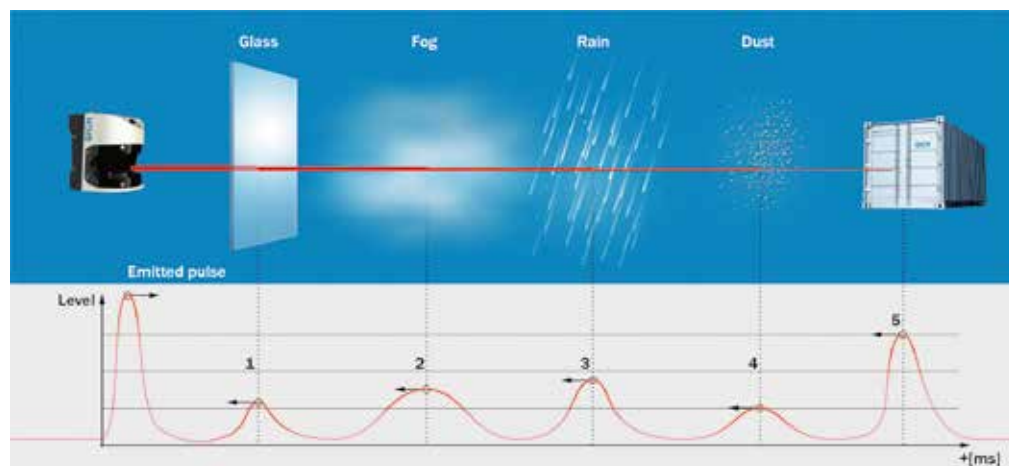
Bulkscan® LMS511 is mounted above the conveyor belt. The system must not be at a standstill during installation and, in contrast to belt scales, the conveyor belt does not need to be separated.

#### Quick view

The Bulkscan® LMS511 measures from above. Because everyone knows you have the best view from there. The non-contact, laser-based volume measurement system above the conveyor belt thus provides an exact overview of the transported quantity. With the proven 5-echo pulse technology, the laser volume flow meter generates a reliable flow signal using the laser's time of flight and the belt speed information. The technology filters out interfering echoes caused by dust, fog, glass or precipitation, thereby delivering reliable measurement results. In addition to the volume flow, the sensor also delivers the mass flow in combination with the material density. It is completely irrelevant how fast the belt is running or which bulk materials

are being transported. Furthermore, the Bulkscan® LMS511 contributes to optimal operation of the conveyor belt due to its integrated detection function for center of gravity, material height and belt drift and the associated reduction in downtime. Even falling bulk material cannot harm the sensor due to its position over the conveyor belt. The sensor perfectly underlines the smooth application solution from SICK.

The Bulkscan® LMS511 has exceeded the customer's expectations: The exact measured values of the laser scanner transmitted to the control room ensure precise control of the dosage in the interface. The smooth, optimal production process saves a huge amount of work, time and money. And the maintenance effort of less than an hour a year is also a plus.

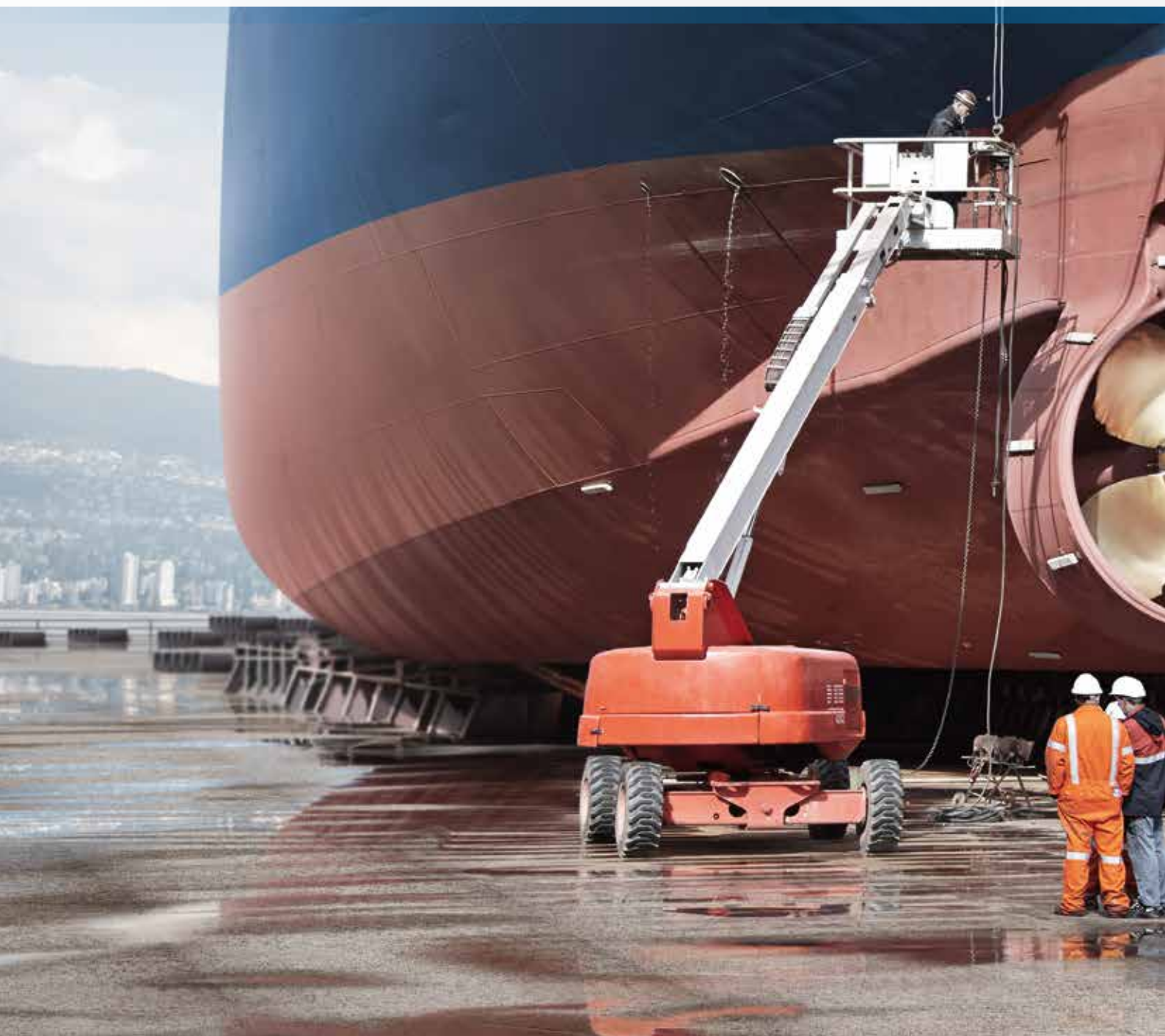




WIND OF CHANGE.

THIS IS **SICK**

Sensor Intelligence.



The shipping industry is facing a period of major change such as decarbonization and digitalization. SICK is ready for the implementation of these changes and is supporting shipping companies and shipbuilders with countless possibilities for employing intelligent and sustainable sensors: for better energy transparency, more efficiency, effective loading and unloading, and reliable object and hazard detection. With cloud solutions. There's something new on the horizon: wind for ship propulsion. Sensors from SICK are ahead of time and already monitor sail tension and alignment. We think that's intelligent. [www.sick.com/maritime](http://www.sick.com/maritime)



## FLOW METERING SYSTEMS

# AN IMPORTANT KEY COMPONENT TO INCREASE ENERGY AND RESOURCE EFFICIENCY

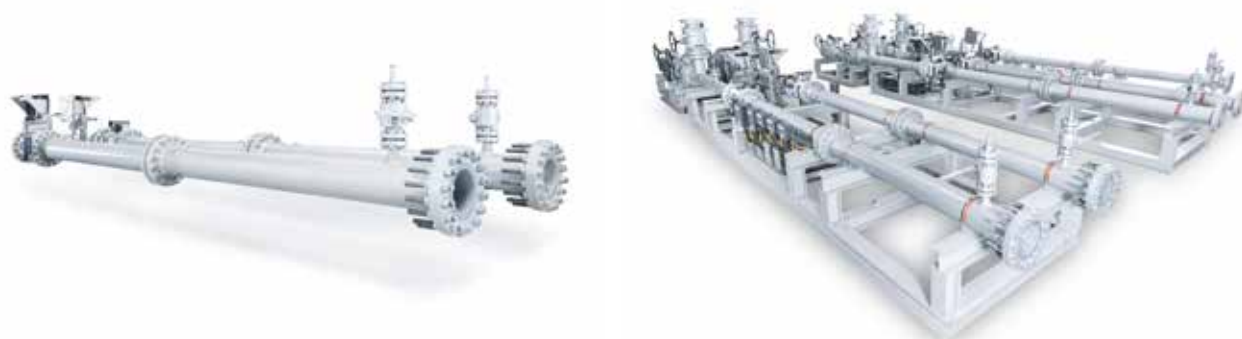
Flow metering systems from SICK incorporate leading ultrasonic metering technology and are delivered as customized turnkey solutions in the form of metering skids or metering runs. The use of the ultrasonic flow meter, as the heart of the system, ensures precise measurement of the gas. The requirement for lowest measurement uncertainty will fulfill all requirements for custody and non-custody transfer purposes.

Measurement errors, uncertainties and lost gas (gas that is lost in the asset) from leakage, inefficient metering systems, pressure changes or gas quality changes quickly add up to considerable financial losses.

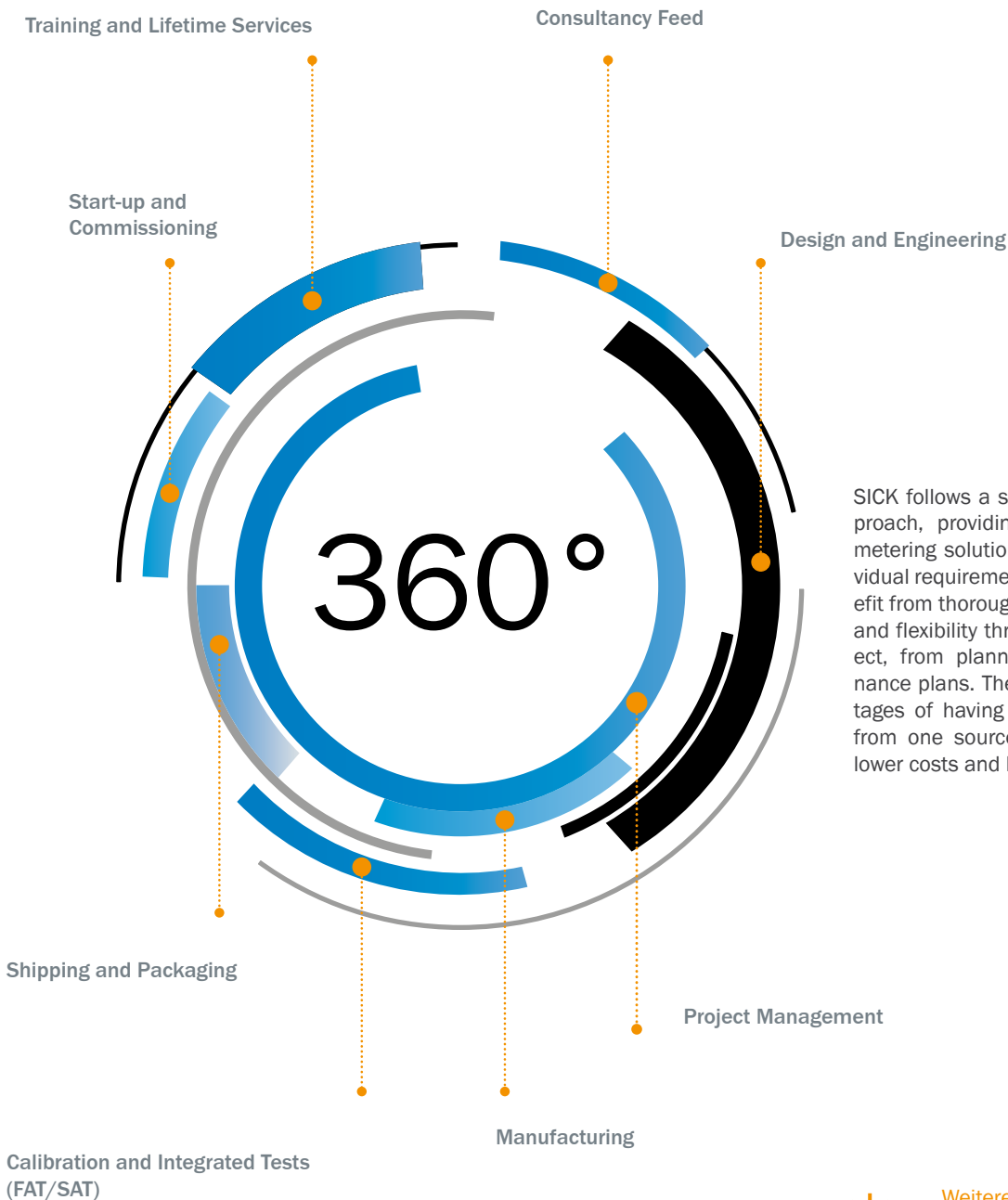
Highly accurate and reliable measurement at production, distribution and custody transfer points allows for more transaction transparency and control over costs and processes. It is essential for meeting international regulations and requirements, and, ultimately, for making most efficient use of natural gas as a commodity.

Flow metering systems by SICK employ leading ultrasonic metering technology and are delivered as turnkey solutions. SICK offers solutions that can be integrated into every installment. Our portfolio ranges from small scale metering runs to large scale metering skids, including stationary analyzer systems.

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| Factory-installed options | Gas composition measurement | Volume measurement | Pressure measurement | Temperature measurement | Flow computing | Supervisory system |
|---------------------------|-----------------------------|--------------------|----------------------|-------------------------|----------------|--------------------|
| FLOWRUN600                | -                           | ●                  | ●                    | ●                       | ●              | -                  |
| FLOWSKID600               | ●                           | ●                  | ●                    | ●                       | ●              | ●                  |



SICK follows a solution-driven 360° approach, providing customers with gas metering solutions tailored to their individual requirements. Our customers benefit from thorough personal consultation and flexibility throughout the entire project, from planning to lifetime maintenance plans. They also enjoy the advantages of having all their demands met from one source: improved schedules, lower costs and lower risk.



Weitere Informationen:  
[www.sick.com/8024139](http://www.sick.com/8024139)  
[www.sick.com/flow-metering-systems](http://www.sick.com/flow-metering-systems)

SICK IS AN INNOVATIVE COMPANY. IT PROVES THIS EVERY DAY, WITH IDEAS AND PLANS AND IN NEW PRODUCTS AND SOLUTIONS. YOU CAN SEE HERE WHAT WE ARE CURRENTLY WORKING ON, WHAT IS OCCUPYING US AT THE MOMENT AND WHAT WE WILL BE DOING IN THE FUTURE. TO SAY IT IN THE LANGUAGE OF PROCESS AUTOMATION: LOOK AT WHAT WE HAVE IN THE PIPELINE.

## MAKING DATA TRANSPARENT

With Smart Data Solutions, SICK already offers data-based solutions today for the industry of tomorrow. These solutions detect, visualize and monitor data from sensors, machines and plants. This foundation makes it possible to precisely predict machine and plant events. Two examples of our data-based services are:

### Installed Base Manager: Digital recording of your real assets

With this app, you digitally record all your assets, saving valuable time. With the SICK Installed Base Manager, recording serial numbers, positions or photos is also very easy. All product information is only a few clicks away in the digital world. The correct information concerning your assets is therefore quickly accessible to you.

### Monitoring Box: Monitor and increase performance

The Monitoring Box offers virtual access to sensors and machines and improves on-going production operation every day. With the history view and log book, no events or developments pass you by. The Monitoring Box monitors integrated devices of your company and ensures hundreds of pieces of sensor and machine data. Continuous status monitoring and notifications if limit values are exceeded mean you can react in a timely manner and thereby reduce downtime.



More information:  
[www.sick.com/smart\\_data\\_solutions](http://www.sick.com/smart_data_solutions)

# PROJECTS IN THE PIPELINE

## FULL TRANSPARENCY IN THE MATERIAL FLOW

Localization provides transparency in all areas of automation: Even in partially and non-automated areas, SICK is providing a new localization system. Based on ultra broadband technology, it determines where which goods and products are currently located.

The data recorded and merged by the system are then available for evaluation thanks to the Asset Analytics platform developed by SICK. Asset Analytics offers a decisive additional advantage, as it gathers the data recorded by the hardware components, merges it and provides it to the user for further use – locally or in the cloud. Knowledge which is becoming increasingly interesting for logistics in process automation and is already being substantiated by customers from the mining field.



More information  
[www.sick.com/8024008](http://www.sick.com/8024008)

## BIG DATA, DEEP LEARNING

Deep Learning technologies improve the functionality of sensors based on self-learning algorithms. In this way, sensors perform intelligent acts in the automated detection, testing and classification of objects or features which were reserved for humans until now. Humans and machines are growing closer together.

The concept of the sensor specialized with artificial intelligence can in principle be used on standard sensors such as inductive proximity sensors, photoelectric retro-reflective sensors, ultrasonic sensors and others. The findings collected in logistics automation also make the leap to process automation possible.



News from the world of data:  
Read stories, dive in, and get to grips  
with Sensor Intelligence.  
[www.sick.com/blog](http://www.sick.com/blog)

TRANSIC EXTRACTIVE MONITORS THE OXIDATION PROCESS DURING DESULFURIZATION IN THE MEROX® PROCESS

# CLEAN EXHAUST GAS THANKS TO EXTRACTIVE OXYGEN MEASUREMENT



The reduction of the sulfur content in fossil fuels such as natural gas and oil is one of the most important environmental requirements for clean air. There are several established processes for removing sulfur components from product flows in refineries and natural gas processing plants. One of the processes for desulfurization used all over the world is the MEROX® process. The right amount of oxygen is essential here – and this is a home game for the reliable and easy-to-integrate gas transmitters from SICK.

>> Mercaptanes and hydrogen sulfide smell bad – to be honest, they stink to high heaven. Processes in oil refineries or natural gas processing plants which remove mercaptanes or hydrogen sulfide are referred to in general as desulphurization processes (sweetening) since this results in products which no longer exhibit the sour, foul smell of mercaptanes and hydrogen sulfide. The liquefied hydrocarbon disulfides can remain in the

processed products or be used for other processes after separation.

#### Old standards and the same old problems

Paramagnetic O<sub>2</sub> analyzers are used by default in many plants all over the world. For many plant operators, the alternative is a weekly analysis in an off-line measurement system in a lab. However, both approaches for oxidation monitoring

have considerable weaknesses: After disulfide separation, sampling is a very challenging task. And it is sometimes impossible to keep all contamination away from the analyzer. Paramagnetic O<sub>2</sub> analyzers are very sensitive to contamination by oil, moisture and other adhesive materials. If oil penetrates into the measuring chamber, it cannot be cleaned, or only with difficulty, or the entire cell has to be replaced if it was damaged by



droplets of liquid. Only with a high level of monitoring and the use of a special filter before the analyzer can penetration of liquid into the measuring chamber be prevented. Both maintenance and repair as well as the replacement of the analyzer, if needed, are extremely costly and lead to lower availability. Due to these problems, many operators choose the alternative of external lab measurement and hence for a more than sub-optimal solution with all its disadvantages such as limited availability, high costs and enormous delay times due to lengthy analyses.

#### The easy answer from SICK: TRANSIC Extractive

There is an easy answer to ensure better availability even in the demanding MEROX® process: The TRANSIC Extractive from SICK is a rugged analyzer system for extractive oxygen measurement. It uses modern diode laser spectroscopy (TDLS) to very accurately measure the oxygen concentration in the air vent downstream of the disulfide separator. Due to its compact design, the TRANSIC Extractive can be used easily under difficult conditions and in contaminated gas-

es. The TRANSIC is well-protected from oily droplets due to the sample handling in front of the analyzer. Should droplets still reach this point, the integrated TRANSIC sinter Teflon filter prevents penetration into the device measuring path. The reliable and continuous oxygen measurement system delivers results as needed and not only when a laboratory is available.

#### Explosion protection as a plus

In addition to air regulation in mercaptane oxidization, the oxygen value is used as a safety measurement to prevent the formation of a self-igniting mixture if thermal combustion exists downstream of the exhaust air. To keep the oxygen concentration below five percent by volume, a sufficient amount of fuel gas is added to the vent gas before oxygen measurement in this case. A fire can sometimes only be prevented by ensuring the absence of oxygen. It is precisely this that TRANSIC Extractive reliably monitors.



More information:  
[www.sick.com/chemicals](http://www.sick.com/chemicals)

### THE MEROX® PROCESS

MEROX is an acronym for mercaptane oxidization and describes the catalytic process developed by UOP which removes mercaptanes from LPG, propane, butanes, light naphthas and kerosene in oil refineries and natural gas processing systems and converts them into liquid hydrocarbon disulfides. In this specific case, a TRANSIC extractive analyzer from SICK is used in a MEROX® unit for light cracked naphtha.



FROSTY GAS MEASUREMENT

## SICK LOWERS BOIL-OFF GAS LOSSES FOR ENAGAS

In the Huelva plant, Spain's largest LNG provider was experiencing unexpectedly high boil-off gas losses. The reason was strong turbulence due to unfavorable piping arrangement which was influencing the FLOWSIC600 ultrasonic gas flow meter. Neither pre-calibration nor removal were economically feasible. Instead, SICK solved the problem at low cost using a correction function based on CFD analysis. Since then, the device has been perfectly measuring the evaporation gas at  $-120\text{ }^{\circ}\text{C}$ .

>> Liquefied natural gas (LNG) is considered one of the most interesting ways to supply countries or industries with  $\text{CO}_2$ -low energy – independent of politically controversial overland pipelines. Liquefied natural gas is created when natural gas is cooled down to below  $-161\text{ }^{\circ}\text{C}$  ( $-258\text{ }^{\circ}\text{F}$ ). It then only has one six-hundredth of its original volume and can be transported anywhere with tankers. Since cooling cannot always be kept constant, evaporation or boil-off gas (BOG) is sometimes created in the tanks on land and on ships. It is usually used as reserve energy or burned off to prevent overpressure.

Spain has been covering 75% of its energy needs with liquefied natural gas for

years. Spanish energy group Enagas operates six LNG terminals in Spain alone. The delivered LNG is stored here and then transported by truck or regasified and fed into the 11,000 kilometer-long pipeline belonging to the company. Evaporation gas in the storage tanks can be economically recooled and burning off can be mostly avoided.

To most accurately calculate the BOG volume before the flare gas, the FLOWSIC600 2-path gas flow measurement technology from SICK was used in the 40" boil-off gas pipeline in the LNG terminal in Huelva, Spain. This is an ideal line-up since the device works superbly even at low temperatures down to  $-194\text{ }^{\circ}\text{C}$  and does not cause pressure

loss. After a few months of use, it was discovered that the total balance of the plant showed gas losses (unaccounted-for-gas) of 0,18%. A small number, but it corresponded to a monetary loss of 2 million euros a year.

Enagas asked SICK to help them find the cause. After an in-depth plant inspection and analysis of the installation conditions, it turned out that there was strong turbulence in the flow at the installation site of the FLOWSIC600. The cause were two  $90^{\circ}$  pipe bends before the inlet zone. This construction was not known at the time of device design. The pronounced turbulence influenced the measurement result of the 2-path measurement device.

Solution options were then developed. The option of calibrating the flow perturbation was eliminated due to the device conception and the large nominal pipe size. Another option was to extend the measuring paths, which would have resulted in mechanical modifications. Finally, Enagas and SICK decided on a solution with CFD (computational fluid dynamics). In this solution, the plant was reconstructed with a computer simulation and the flow profile in the measurement section was calculated. This made it possible to find the measurement error. Result: The analysis showed a measurement error of up to 7.4%.

In the last step, the computer simulation was used as a basis to determine a correction function. The transfer of this function into the real device was a complete success. The balanced gas loss was reduced by the correction of 0.1%,

or a million euros a year. The scale was acceptable for Enagas.

The FLOWSIC600 ultrasonic measurement technology has now been reliably measuring evaporation gas at  $-120\text{ }^{\circ}\text{C}$  for nearly 10 years. The CFD analysis helped to reduce the influence of undesired installation effects.





## MEASUREMENT OF PARTICULATE EMISSIONS IN FLUE GASES

# SOME HUNTERS LIKE IT WET ...

The Norwegian cement manufacturer Norcem, a member of the worldwide group HeidelbergCement, wants to do more for the environment and emit even fewer pollutants. To ensure that everything is done in accordance with legal requirements for low limit values, innovative dust measurement devices from SICK perform a decisive measuring task after the flue gas scrubber. Only when the plant operator Norcem Kjøpsvik is satisfied the high requirements are fulfilled.

>> Water droplets or dust particles? Only excellent vision can tell them apart. Humanly impossible? That's why there are measuring instruments that are specialized in measuring dust concentrations in wet gas. However, not all dust measuring devices control reliably to ensure that the emission limits can be compliant. The exhaust gas after scrubber systems is usually very cold and saturated with water. This fact challenges the measuring technology.

Great things are being done in the Arctic Circle. In the middle of the harsh Norwegian remoteness, the world's northern-

most cement plant – and the only one within a radius of 1,000 km – is taking on a remarkable task. Norcem Kjøpsvik produces cement for the domestic market. This is often not easy. The routes toward 68 degrees north are cumbersome and time-consuming. Because of the distance alone, the process chain and equipment must function perfectly. In addition, the sulphurous limestone has caused problems in the past. The sulphur content was too high and the plant increasingly exceeded the permitted emission limits. The limestone was extracted from the adjacent quarry. This meant short distances that made

economic sense. Now a constructive rethink was called for. First of all, Norcem changed its mining plan and extracted low-sulphur limestone from other areas, which significantly extended the transport distances. In the long term, this was not a sustainable change and therefore only a temporary solution. The situation transformed abruptly, however, when Norcem was able to invest in a flue gas desulphurisation (FGD) plant based on a seawater scrubber with the support of the state environmental fund Miljøfondet. This technology was used to remove SO<sub>2</sub> from the flue gas with a high separation rate. This made lime mining

in the adjacent limestone quarry possible again. Since then, the dust sensor technology from SICK has been measuring concentrated in the wet gas, confirming Norcem Kjøpsvik's emission limits, which are now in the green range.

#### Emission Reporting

Clean exhaust gas and compliant emission limit values are the cornerstones of success. The gas cleaning system was ready for operation in short time. The contract with the equipment supplier was signed in autumn 2017, installation work began in summer 2018 and hot commissioning took place in May 2019. In the meantime, more than 95% of the sulphur dioxide is washed out. The maximum SO<sub>2</sub> concentration at the stack outlet is limited to < 50 mg/m<sup>3</sup>, which is an excellent value. The plant uses only seawater instead of chemical absorbents. However, this challenges the continuous dust concentration measurement. What is a water droplet? What is a dust particle? In the wet gas duct, it is indistinguishable for standard devices. Accordingly, the inaccurately measured values of such devices are also unacceptable for emission reporting. The

measurement performance of the dust monitor from SICK, on the other hand, is light years ahead of the standard, because the FWE200DH is designed especially for difficult measurement conditions such as these.

#### Measuring dust at its best

According to the optical principle, the scattered light intensity determines the dust concentration. Disturbing water droplets must be removed before the measurement. The FWE200DH extracts sample gas from the exhaust gas flow. In the bypass system, the water droplets evaporate so that they no longer hinder the accurate measurement. The exhaust gas flows back into the gas duct after the measurement. The FWE200DH measures in many applications and industries worldwide, but the special installation conditions at Norcem Kjøpsvik were a new challenge for SICK's particle analyzer team. The tight geometric space conditions in the mounting flange made the use of a usual measuring gas probe for exhaust gas extraction impossible. For correct functioning, the sample gas probe must be mounted facing downwards, which would not have been pos-

sible with a standard probe design. This hurdle could only be overcome with a customer-specific probe geometry provided by SICK. During commissioning, it became apparent that the sample gas probe could be mounted without any problems. This made it possible to link the functional requirements with the real installation conditions. The facility is still running smoothly and reliably today.



## ... SOME LIKE IT DRY

In addition to the high sulphur volatiles from the raw material, the high chlorine input from alternative fuels also causes problems in cement production.

>> Not only sulphur volatile gases are relevant to the climate. In raw material and fuel there are many pollutants which are released by the pyro process. In addition to the high proportion of sulphur volatiles from the raw material, the high chlorine input from alternative fuels also causes problems in cement production. Switching to alternative fuels with biomass reduces carbon dioxide emissions, but in return usually increases the chlorine input and the risk of blockages in the

cyclones. To ensure that the preheater functions without restrictions, a bypass system extracts up to 60% of the process gas. This removes gas components that disturb the process from the pyro process. This gas stream is later fed back into the process where the raw meal is added. In normal operation Norcem operates the bypass with less than 10% of the exhaust gas volume.

Fabric filters are a particularly efficient and frequently used filter technology. The dust-laden flue gas flows into the filter chamber and passes through several filter bags. The coarse particles fall by



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*"Regarding the dust analyzers, there is not much to say. We oversee the equipment every fourth week and we haven't had a single problem since we installed them."*

*Erik Nilsen, Maintenance Manager NORCEM AS*

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gravity into the hopper. The fine particles accumulate on the surface of the permeable filter medium and form a layer of dust, usually called filter cake. Compressed air periodically cleans this filter cake. However over time, small holes can form in the fabric. As a result, the gas enters the exhaust air unfiltered and worsens the emission limits.

#### Measuring dust with comfortable ease

To prevent this from happening the DUSTHUNTER SB30 measures after the filter of the bypass. The dust measuring device reports in real time, signaling when filters are damaged. The scattered light measuring principle – in this case with backward scattering – monitors constantly and is not influenced by the flow speed or the dust particle charge. This is an important advantage over

other measuring methods, such as the triboelectric principle. The self-monitoring function is particularly user-friendly. Automatic test cycles reduce maintenance requirements and ensure that processes run smoothly. Norcem Kjøpsvik also found installation and commissioning to be effortless. After a few hours, the DUSTHUNTER was ready to start working. The dust measuring device was mounted on the exhaust duct on one side only. The additional effort for special alignments, as required for cross-channel transmission dust analyzers, was completely eliminated. Since this DUSTHUNTER SB30 has no measuring probe, so that a longer instrument lifetime is guaranteed. This is because aggressive gases would attack a probe and corrosion and abrasion would be the result.

The significantly higher detection sensitivity of the DUSTHUNTER SB30, combined with the cost-effective installation and maintenance, is the recipe for success across the board: increased performance with reduced total costs over the entire life cycle of the device.

The efficiency and profitability of the plant in Kjøpsvik has increased significantly – not only at the heat exchanger but in the entire exhaust gas cleaning system. Years earlier, SICK had already supplied gas analyzers for the rotary kiln of Norcem Kjøpsvik. Out of conviction, Norcem also decided to use dust measurement technology from SICK.

## EXPERTISE IN DUST, GAS AND FLOW MEASUREMENT

# BREF: WHEN THE BEST AVAILABLE TECHNOLOGY BECOMES THE REFERENCE POINT

Stricter emission limit values are not only the order of the day; they also drive technological research and development. This results in the newest BAT (best available technique), which in turn influences future legislation. In accordance with the emission guidelines of the European Union, environmentally-relevant industrial plants in particular must operate in accordance with the best available technique. SICK expertise helps with implementation.

The Industrial Emissions Directive of the European Union must be complied with as legislation both on the national and EU level. The goal is to prevent pollutant emissions into the air, water and soil. The "best available technique" (BAT) is used here. The BAT should not only guarantee the best possible environmental protection, but also consider the economic and technical feasibility for the operator or industrial plants. When defining the BAT, not only the individual technical components, but also the interplay between design, maintenance and production are evaluated.

### Many options require much expertise

Depending on the segment industry, emissions differ, and a corresponding reference paper is therefore created for each industry (best available technique reference = BREF). 32 different industries are currently described. These documents are updated regularly. In most cases the revision is done within the specified eight years. So, for example the new version of the Large Combustion Plant BREF in June 2018. The Waste Incineration BREF was published by the European Council (EIPPC - Integrated Pollution Prevention and Control Bureau)

by the end of 2019. This must be made into a national law within four years.

The application of the guidelines described in the BREFs requires extensive knowledge about limit values and the required measurement components. The many years of experience and expertise of SICK in all areas of dust, gas and flow measurement helps during consultation.

## BREF: SIMPLE IS NOW POSSIBLE

Who said the BAT reference document is complicated? With our **BREFSelector** tool certified by TÜV Rheinland, you get the emission limit values tailored to your plant within one minute. From the 986-page LCP Directive, the 747-page working draft for waste incineration and the 45-page BAT cement reference document, we have extracted the emission limit values for the different plant types while taking into consideration all relevant notes and exceptions in order to create a user-friendly database.

Try us out and make an appointment with your local sales contact to get a free consultation!



**BREF: EASY IS NOW POSSIBLE**  
SICK SUPPORTS COMPLYING WITH THE NEW BREF REGULATIONS

**SICK**  
Sensor Intelligence.



More information:  
[www.sick.com/8024120](http://www.sick.com/8024120)



Visit us online:

[www.sick.com/industries-pa](http://www.sick.com/industries-pa)

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