

Maximum security for your crew and your systems.

With the oil mist detection systems from the global market leader Schaller.



SCHALLER
AUTOMATION 

Dear readers, customers, and all those interested,

“Safety first!” is not just an empty phrase or an advertising slogan at Schaller. It has been a key component of our company culture for over 50 years - every single day. Our primary aim has always been the safety of those using our detectors: crews on numerous ships, power station staff, and the companies of our customers.

Since entering the business of oil mist detection systems at the end of the 1960s, Schaller has constantly been carrying out important pioneering work in this field. The focus on quality has made us the global market leader. More than 55,000 systems have since been equipped with our VISATRON systems. Of the approximately 48,000 merchant ships currently in service around the world, at least half are sailing with an oil mist detection system (OMD) made by Schaller. This makes sailing the seas of the world as safe as technically possible, and reliably protects against explosions in the engine room!

This is something we are, of course, proud of. But we also see it as an incentive and obligation to continuously invest in the further development of our products and therefore in the safety of our customers.

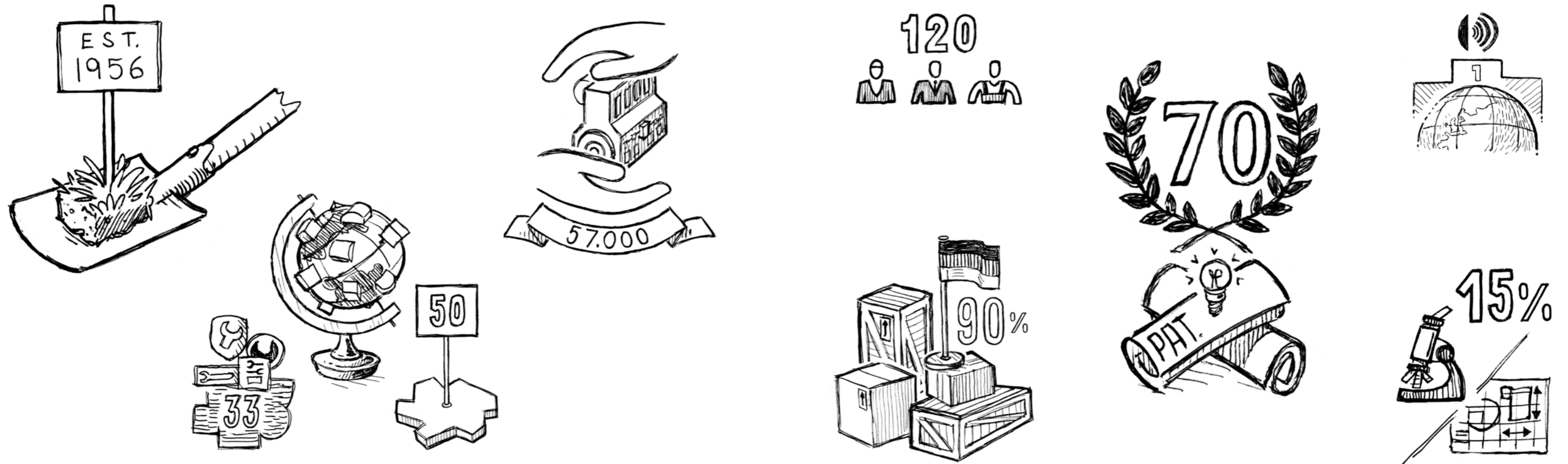
Here, the main issue is early detection, i.e. Condition Monitoring, to combat oil mist and its potentially dangerous consequences before it occurs.

Another extremely important aspect is the new engines that can be operated with gas (LNG) and need entirely new approaches to detection. As an innovation leader, Schaller can already offer suitable solutions for these important future issues regarding oil mist detection. This is where decades of experience and our eventful history come into play. In our new brochure for the SMM 2018, I would like to invite you to find out more about the most interesting features of Schaller's past, present and future oil mist detection systems.

**Our motto, now and in the future,
is and always will be: “Safety first!”
Safety for you and your engine.
You can rely on us.**



Stephan Schaller, Managing Director of
Schaller Automation GmbH & Co. KG



Safety with system – 50 years and counting

Schaller Automation Industrielle Automationstechnik GmbH & Co. KG, based in Blieskastel (Saarland in Southwest Germany), has been successfully active in the sector of automation technology for over 60 years.

Schaller has been developing, producing and selling safety systems for large diesel, gas and dual-fuel engines for the past 50

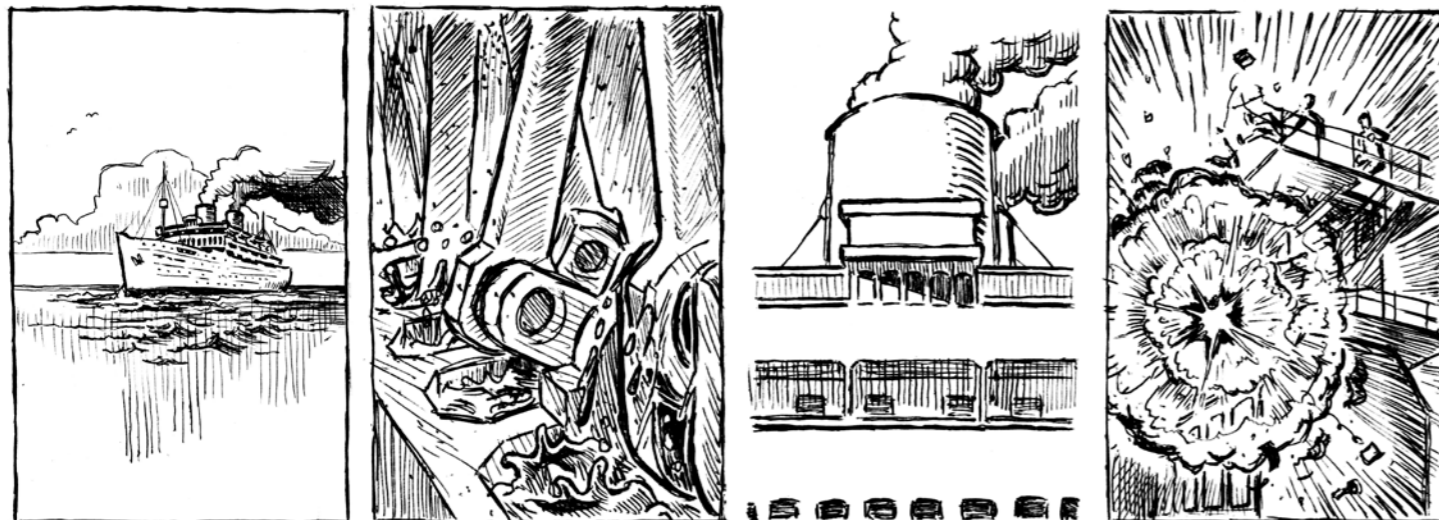
years. These safety systems, so-called oil mist detection systems (OMD), have been successfully deployed in ships and power stations around the world.

Our daily mission at Schaller is the detection of hazardous operating conditions in which damage to bearings can lead to the escape of hazardous oil mist. This oil mist contains minute oil particles and can, in

extreme cases, lead to an explosion in the engine crankcase. Schaller oil mist detection systems represent the last reliable safeguard against such accidents.

At the same time, we are also developing highly sensitive, intelligent monitoring systems for early detection of damage in order to prevent any formation of oil mist before it starts.

Small particles, great danger: Engine room explosions due to oil mist



The history of oil mist detection began with the growing success of low-speed two-stroke engines and medium-speed four-stroke engines with sealed crankcases. For a long time, the developers and users of this drive technology - which was novel at the time - failed to recognize a major hazard: the possibility of oil mist explosions due to lubrication defects. This changed in 1947 when 28 sailors on board the ship *Reina del Pacifico* dramatically lost their lives due to explosions in the crankcase of their ship's engine.

New Rules for safety at sea: OMD becomes mandatory

As a result of this tragedy, the intergovernmental International Maritime Consultancy Organization (IMCO) was founded in 1948 and started its work on January 13, 1959. As a specialized agency of the United Nations, it was renamed International Maritime Organization (IMO) in 1982. 173 states are full members of the IMO, and another three are associated members. The motto of the IMO is: **Safe, secure and efficient shipping on clean seas.**

To implement this policy, the IMO has drawn up numerous international conventions that are constantly being updated. These include the fifth version of the International Convention for the Safety of Life at Sea (SOLAS), which came into effect on July 1, 2014. Chapter II-1 of this Convention regulates oil mist detection. It specifies "the use of oil mist detection systems, bearing temperature sensors, or similar equipment for combustion engines with an output of more than 2,250 kW or cylinder diameters greater than 300 mm". SOLAS is in turn monitored by national classification societies, the majority of which are part of the International Association of Classification Societies (IACS).

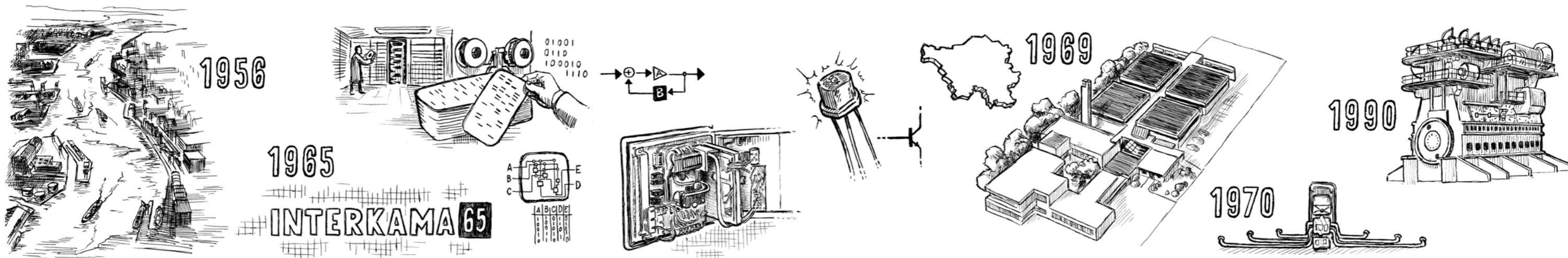
The first oil mist detection systems in the 1960s

Companies working in the fire-alarms sector launched the first oil mist detection systems in the early 1960s. These worked on the principle of light absorption and used the only light sources that were practically available at the time: filament lamps which had very inconsistent light emissions. The measurement principle works in a similar way to the temperature monitoring of exhaust-gas average values: Oil mist is sucked out from between two main bearings of the crankcase compartments. If the oil mist concentration in one compartment increases in comparison to the average value of the oil mist concentration in the other compartments, the alarm is sounded.

Increasing OMD requirements

However, the demands on these oil mist monitoring systems increased rapidly. Both the low-speed crosshead engines and the medium-speed diesel engines continued to develop ever better power-to-weight ratios. This, in turn, led to higher levels of material stress and stricter requirements regarding the lubrication of moving engine parts. From the 1960s, the OMDs could no longer be restricted to the warning of crankcase explosions due to the increased risk of overheating. Instead, they had to detect the start of overheating damage as early as possible.





Pioneers of sensor technology

From the engineering office to the successful mass production of sensors

Schaller Automation can look back at over 60 years of company history. It was founded by the graduate engineer Werner Schaller in 1956 as an engineering office for automation and rapidly grew into a successful medium-sized company. Initially based in the port region of Mannheim, the company changed its location in 1969 and moved to Blieskastel in the Saarland region. Only one year later, the company had grown to 60 employees.

In the early years, Schaller developed and supplied controllers in small and medium-sized series for the relatively new relay technology field, which offered technical and economic advantages compared to established contactor technology. Typical customer projects were production and process-control systems designed with

contactless electronic technology. Electronic, contactless logic-systems based on the brand-new semiconductor technology (transistors) were already on the market in 1960.

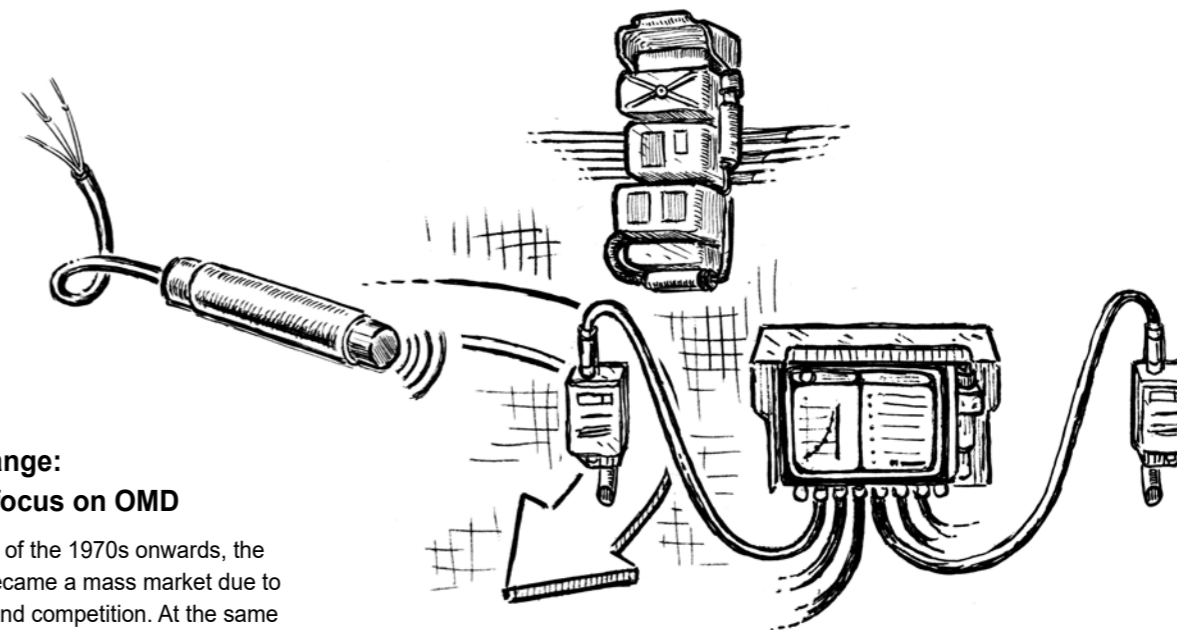
In addition to the process-control systems that Schaller mass-produced as a subcontractor for companies such as Freudenberg, Eichenauer and Siemens, the company recognized the potential for its own products at an early stage. In 1965, the strong demand for digital sensors, urgently needed as input devices for the intelligent automated control of process-control systems, gave the company the opportunity to establish its own product line with capacitive and inductive proximity sensors. Immediately after they were presented at the leading trade fair INTERKAMA in 1965, incoming orders increased so rapidly that production was running at full capacity by 1969.

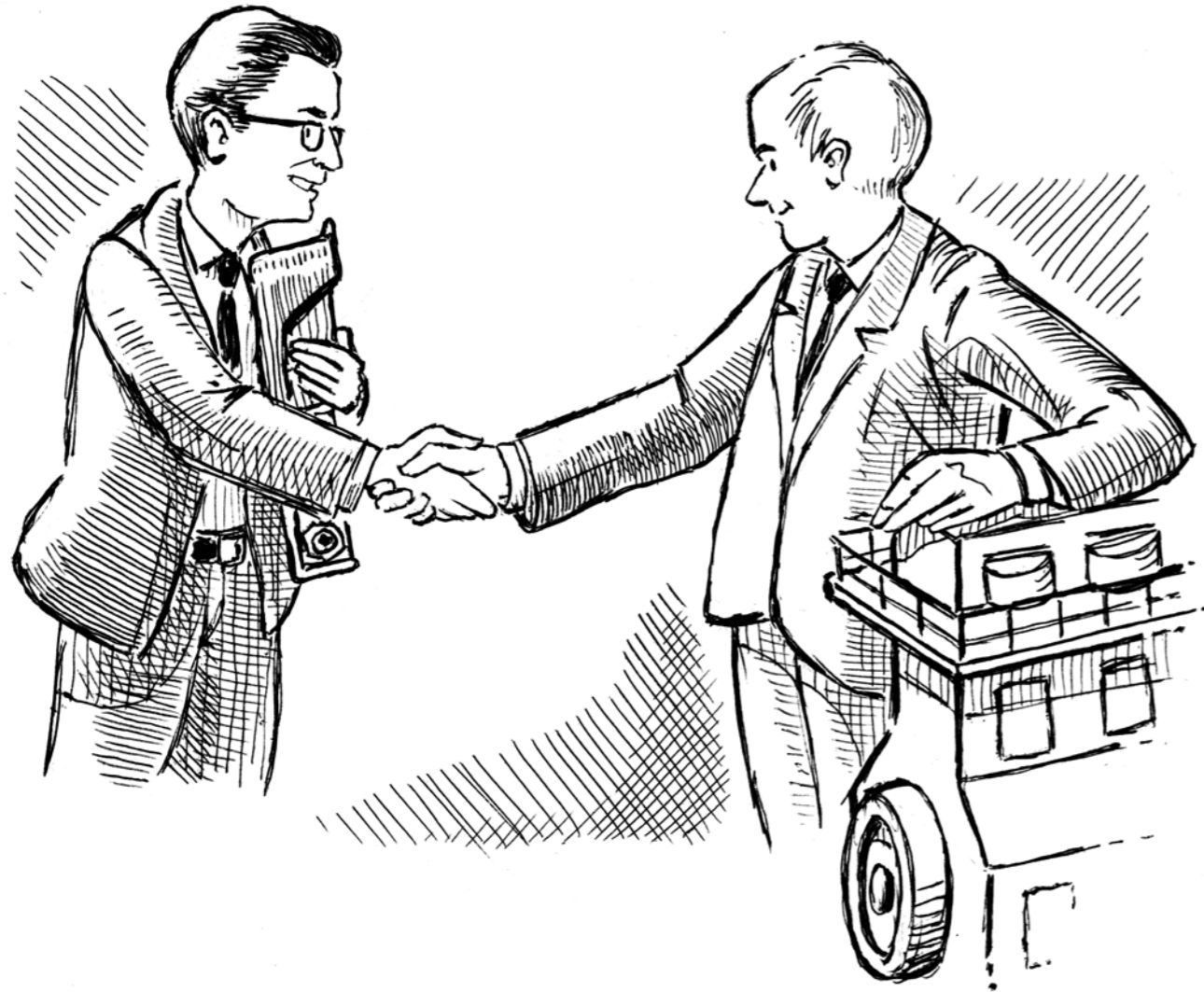
Key technology in mass production for industry

Our new mass-production program sensors and analyzers paved the way to opening the doors of industry for Schaller. These sensors became a key technology (for example, for filling systems and plastic processing) in every process in which production could be automated. The demand for special solutions regarding shape, color, and switching technology increased, too: Schaller therefore developed flexible circuit boards (Flextechnik, Flexifoam) that made it possible to create the circular design of the sensors which is standard today – another pioneering benchmark. Business was so good that employee numbers had risen to 120 by the 1970s.

Strategy change: Production focus on OMD

From the middle of the 1970s onwards, the sensor sector became a mass market due to increasing use and competition. At the same time, the niche market that was destined to become today's core market continued to prosper at Schaller: oil mist detection. As a result, a decision was made in the 1990s to reduce the sensor business to just a few special sensors and to switch production entirely to oil mist detection systems





Oil mist in our sights - with VISATRON

Sensor expertise plus LED technology: A new quality of oil mist detection

The route to oil mist detection was essentially laid out for Schaller by its customer Motorenwerke Mannheim (MWM), formerly Daimler Stationärer Motorenbau. MWM was using a device from a different manufacturer which was highly prone to malfunctions, as it used a filament lamp as a light source. Schaller immediately became involved in the optimization and new development of an oil mist detection device. This was possible because Schaller was already focusing on the applicable future technologies which were state-of-the-art at the time: semiconductor elements such as transistors, light-emitting diodes (LED) that provided a constant light source less prone to malfunctions, and their counterpart, the photodiodes. This transfer of sensor expertise combined with state-of-the-art electronic components to the oil mist detection application scenario – with MWM as a first-class reference customer – quickly smoothed the way for Schaller to enter the market of large-engine monitoring.

Mission: Damage prevention Safety becomes the core of the company's philosophy

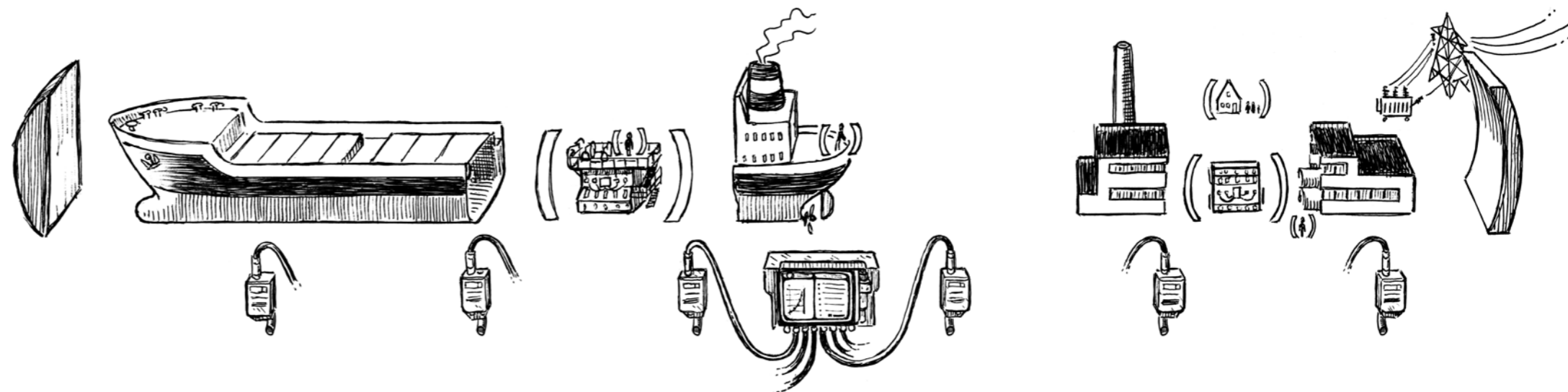
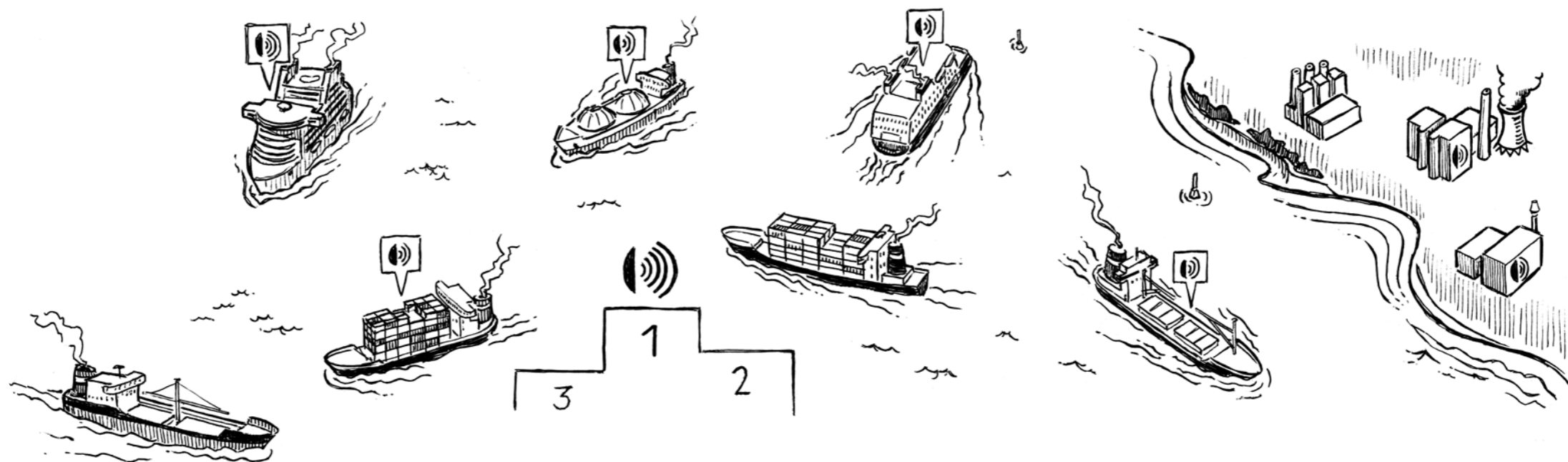
The first oil mist detector was delivered to MWM in 1967. The new product sector of optical detectors for oil mist was also immortalized in the product's names: VISATRON (VIS derived from "visual") has ever since stood for Schaller's optoelectronic sensor technology. The former niche market of oil mist detection systems slowly became one of the main pillars of the company – and both the management and the employees continued to focus increasingly on the task of preventing accidents, and **keeping humans and machines safe.**

Safety for you and your engine

The name Schaller Automation has been a synonym for oil mist detection systems around the world since the 1970s. Most renowned manufacturers of large engines trust in Schaller systems. The company is now the leading OMD supplier in the world market.

For this, there are good reasons: Firstly, consistent implementation of the maxim "Safety for humans and machines" at all company levels. Secondly, continuous investment in innovation at the highest possible level:

Schaller is the main innovator on the market.



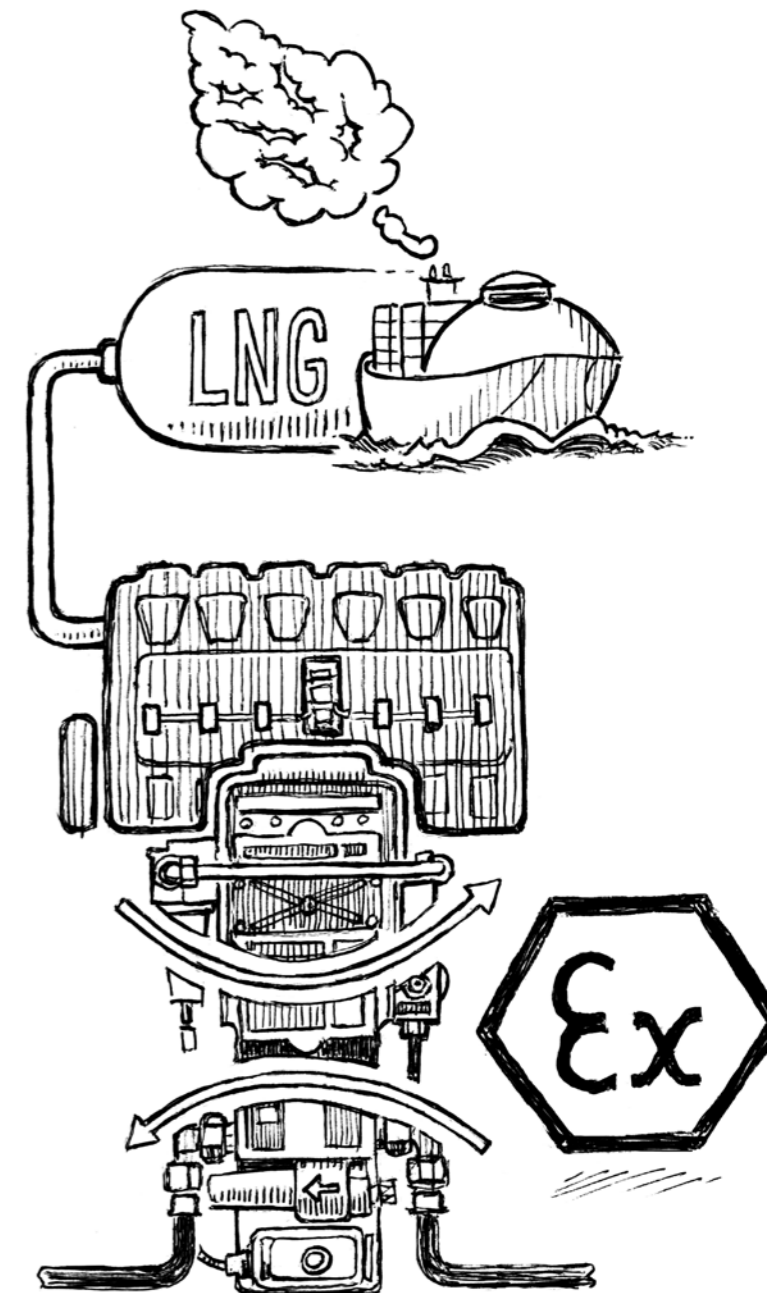


Exceptional expertise in innovation

Research and development (R&D) plays a special role at Schaller. Around 15% of its turnover is invested in R&D – this is more than double the average invested by German electronics companies. We collaborate closely in the field of oil mist research with various renowned universities and research institutes such as the RWTH Aachen, University of Rostock, University of Saarland, HTW Saarbrücken, FH Flensburg and HS Bremerhaven. Some of these partnerships have been running for years.

An example: Innovative protection against explosions during gas operations – with ATEX

Schaller is the first supplier to have explosion-protected detectors in its portfolio that comply with the ATEX guidelines: VN115/87plus Ex and VN301plus Ex. With these products, the company has reacted rapidly to the modern dual-fuel engines that can also be operated with liquefied natural gas (LNG). An innovative zone separation system was implemented in the measurement area in order to prevent methane explosions in the detector and subsequently in the crankcase. This means that critical components can no longer come into contact with the ignitable atmosphere.



Testing under real conditions – in the laboratory and on customer premises

Schaller also differentiates itself from the competition through its significantly comprehensive investment in its own testing technology. Each product is subject to a complete one-hundred-percent testing procedure before being delivered. This guarantees the highest possible reliability during operation – which from Schaller’s point of view is absolutely essential.

The following equipment and measures are available for such tests:

- Test Vessel:**
 A test unit in which an approx. 1m³ crankcase is installed and actual operating conditions can be simulated: for instance, where lubricating oil has been splashed around (splash oil) or the pitching movements of a ship of +/- 22.5° in both directions.
- Shaker:**
 This electrodynamic fatigue-testing machine simulates acceleration in three spatial directions.
- Climatic chamber:**
 All products are subject to a final test in the climatic chamber. Functionality is tested under unfavorable conditions at temperatures between 5 °C and 70 °C.
- Hatz:**
 Two Hatz single-cylinder diesel engines are purposely damaged in the new test laboratory in order to record damage signals and thus validate reliable detection algorithms.
- Testing on customer premises (OMDEA):**
 On request, detectors are tested on real engines at the customer premises. Massive production of oil mist is simulated, and the trigger time of the sensors is tested. Schaller is the only supplier to provide this service.
- Training for customer employees:**
 Installation and operation of the OMD requires experience and expertise. Schaller therefore offers training for the employees of their customers, from engine manufacturers to end users.

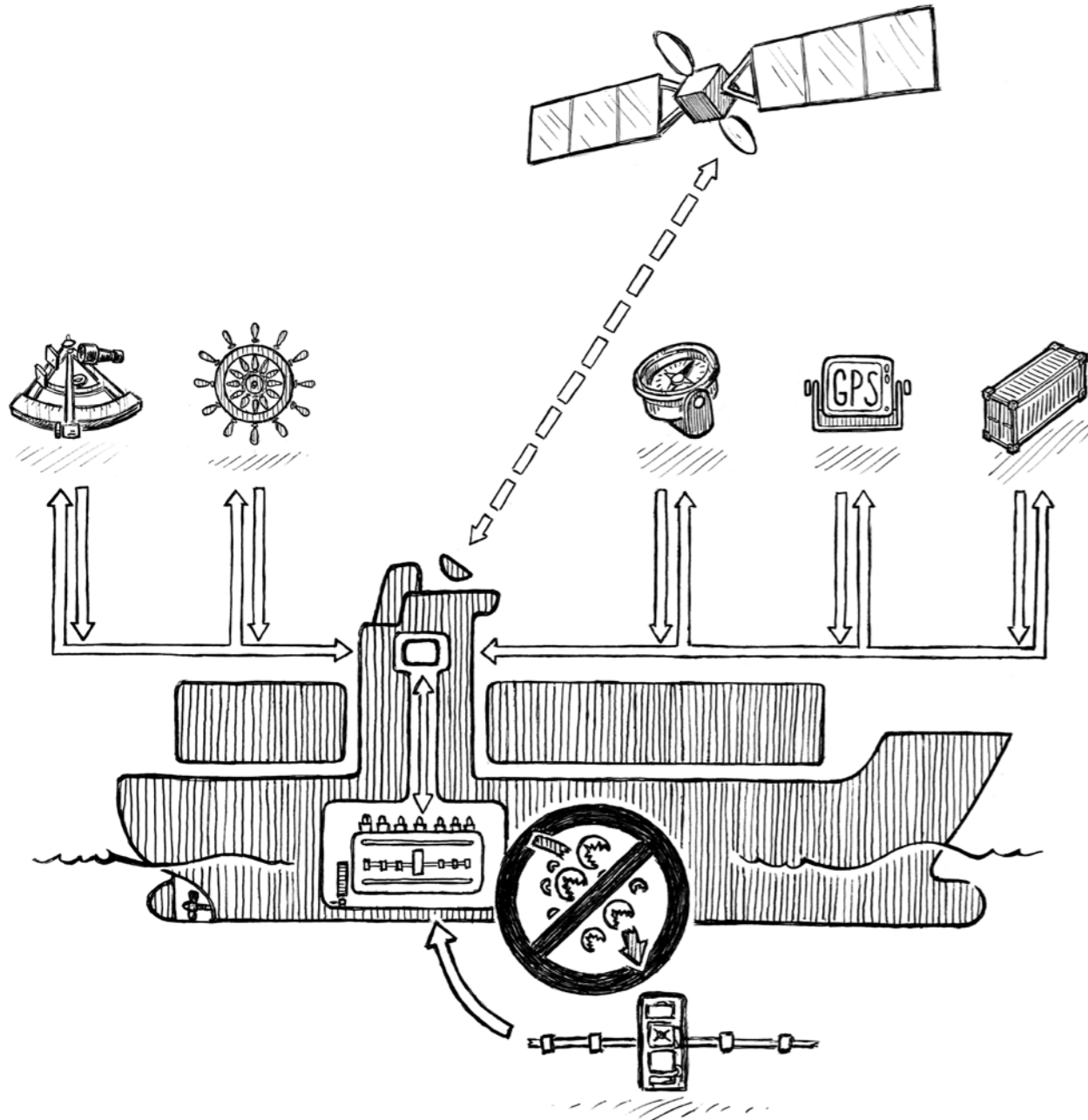
Commitment to safety: Setting standards

Schaller has not only set the standards with regard to quality and reliability of OMDs, it is also actively involved in expert bodies on the formation and definition of official guidelines, for example IACS UR M10 and IACS UR M67. Schaller sees this as an immensely important contribution to the safety of humans and machines at sea, because these guidelines ensure that the detectors are correctly mounted and functional under all operating conditions.

Full service and special expertise worldwide – Thanks to a strong partner network

Schaller’s success rests on numerous shoulders – worldwide. Our service partners in over 50 countries work every day to ensure that our customers’ machines are optimally protected. 33 qualified and specially trained partner companies stand for service “on board” and in power stations, as well as for the availability of spare parts around the globe. The maintenance, repair and replacement of all Schaller products is implemented as rapidly as possible: Schaller is always close to its customers.





The future of oil mist detection

Schaller always listens to its customers and keeps an eye on developments in maritime shipping and the power station sector. Customers are currently profiting from a whole series of innovative developments and technical advances in the sector of OMD. They also profit from the second division of our company, which is increasingly gaining importance at Schaller: the early detection of oil mist via Condition Monitoring.

OMD: Networked, individualized, maintenance-free

Using regular customer surveys, Schaller continuously works with the users to improve its products. Our "Voice of Customer" makes it all possible: whether you need a customized design that is aligned with installation requirements, optimized design (re-design) - as is currently being implemented on proven systems such as the VN87plus - or the customized retrofitting of redesigned systems. Customer requests also resulted in the early expansion of the product portfolio with systems for dual-fuel engines.

Schaller: Ready for Maritime 4.0.

All new product developments offer the latest interfaces and fieldbus systems for integration of signals in a central control system. Here, cybersecurity is the top priority: Schaller devices only have one outgoing interface and no incoming interfaces; vulnerable operating systems are not present, as our systems work entirely controller-based.

Schaller is ready for Maritime 4.0

Condition monitoring: Detecting danger before damage occurs

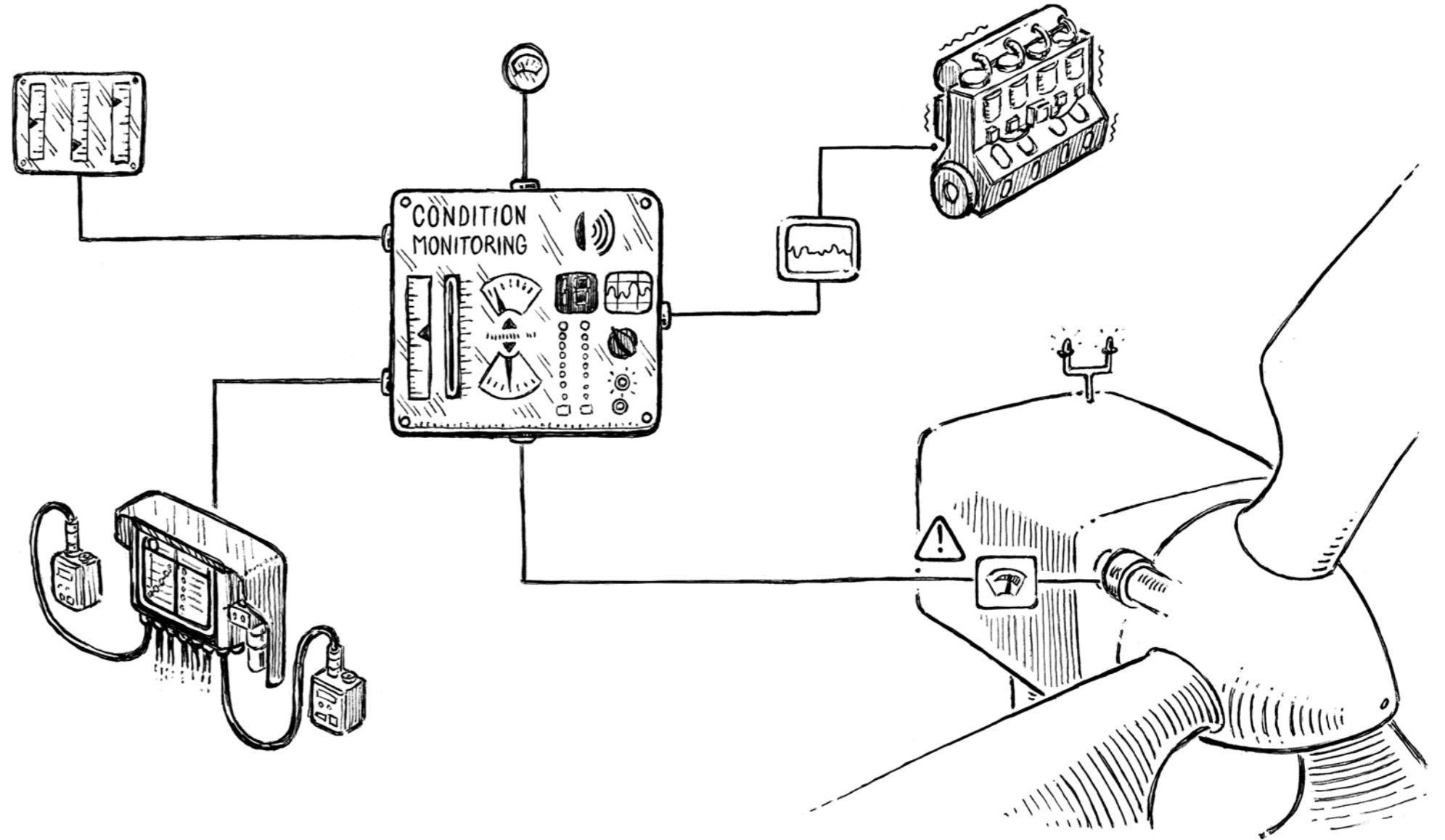
In addition to preventing dangerous oil mist explosions, our focus over the past few years has been on the early detection of oil mist. This means gaining a better understanding of the causes of oil mist formation, improving reliable detection, and preventing damage from the outset. New servicing strategies are the target – research and development is the way forward.

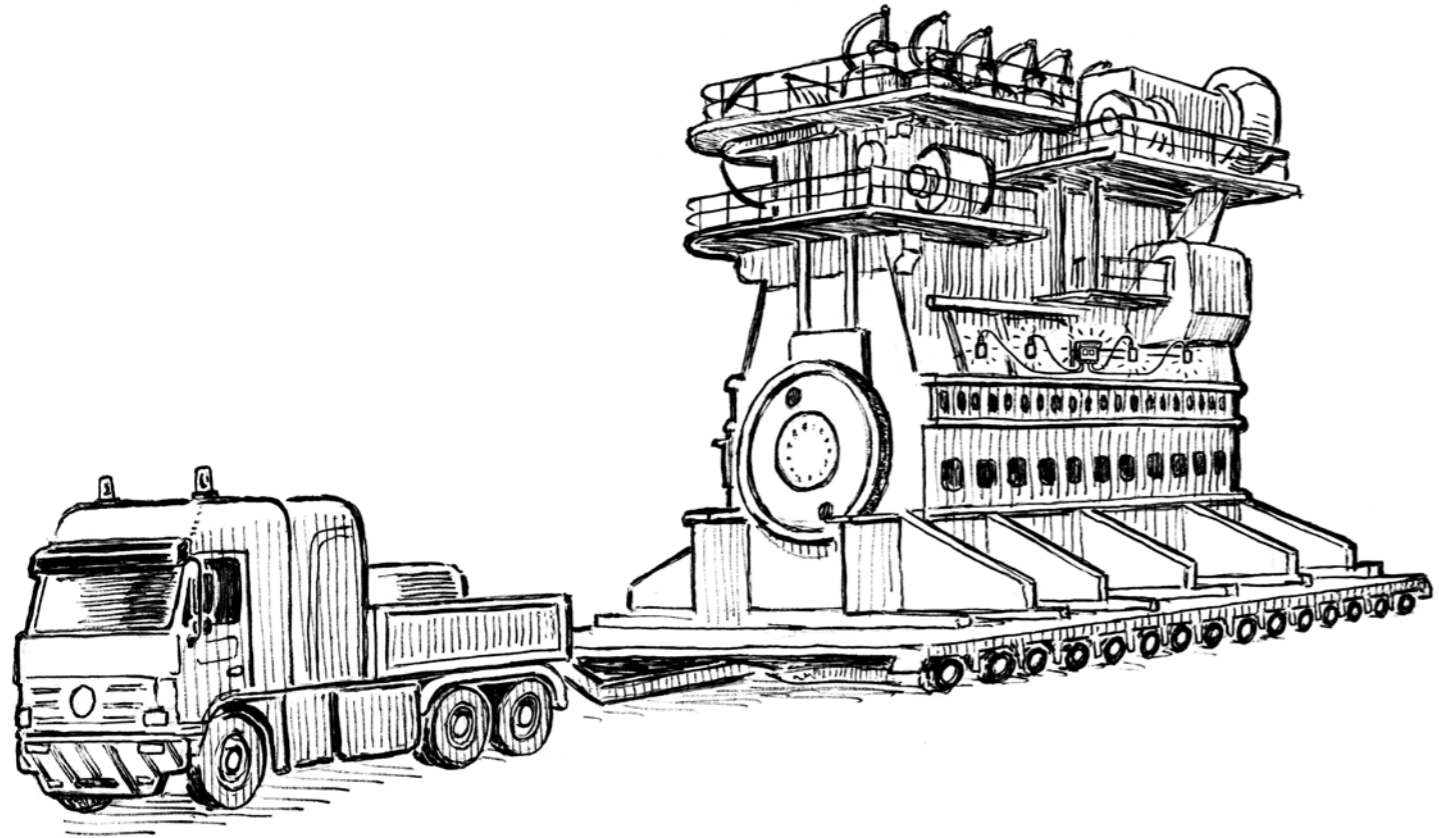
Optimized maintenance for healthy engines: Preventive and Predictive Maintenance

With regard to future maintenance of large engines, two approaches appear to be extremely promising and are increasingly being requested by the customers and classification societies. The first approach is “Preventive Maintenance” with the targeted monitoring of engine components. The primary advantage here is that only the parts that are actually worn down need to be replaced. The second approach is “Predictive Maintenance”, in which recorded data is used to develop statistical predictive models and the remaining service life of components can be precisely predicted. Both approaches significantly minimize maintenance outlay and costs, and increase economic viability. Fortunately, Schaller has already developed innovative technologies for early detection. Here are two examples:

ACCOMOS: Vibrations as an early signal
One premiere at the SMM 2018 was the 3-axis acceleration transducer ACCOMOS, which is used to detect anomalies. If you look at the theory of the origin of mechanical damage, changes in operating conditions are initially heralded by vibrations. In our new test laboratory, this scenario is simulated and examined using Hatz single-cylinder diesel engines.

Mixed-friction detection for early identification of journal bearing damage
Mixed-friction detection provides the basis for the early identification of damage in journal bearings. This is not only of interest for larger engines, but also for customers in the wind-power sector, as the majority of wind-power plants use journal bearings in their transmissions.







Headquarter:
SCHALLER Automation
Industrielle Automationstechnik GmbH & Co. KG

Industriering 14
D-66440 Blieskastel
Tel.: +49 6842 508 0

Fax: +49 6842 508 260
Mail: info@schaller.de
www.schaller-automation.com

Key Account
Management Center:

Singapore

Schaller Automation Pte Ltd.

114 Lavender Street
#09-93 CT Hub 2
Singapore 338729

Phone: +65 6643 5151 (24/7)
Fax: +65 6643 5150
Mail: info@schallersingapore.com

China

Schaller Automation
China

Room 401,
Juyang Mansion No. 1200
Pudong Avenue,
Shanghai 200135, P.R.China

Phone: +86 - 21 - 5093 - 7566
Mobile: +86 - 1390 - 1890 - 736
Fax: +86 - 21 - 5093 - 7556
Mail: info@schallerchina.cn

USA

SCHALLER Automation
Schaller Automation LP

811 Shotgun Road Sunrise,
FL 33326
United States of America

Phone: +1 954 794 1950
Mobile: +1 561 289 1495
Fax: +1 954 794 1951
Mail: info@schalleramerica.com