

& Telematics

TEMPERATURE MONITORING

by Intermodal Telematics



Paul Wauters
Harbour Master
Port of Antwerp



Konstantin Kubenz
CEO/Owner
Kube & Kubenz



Bernard Heylen
Sales Director
Intermodal Telematics BV

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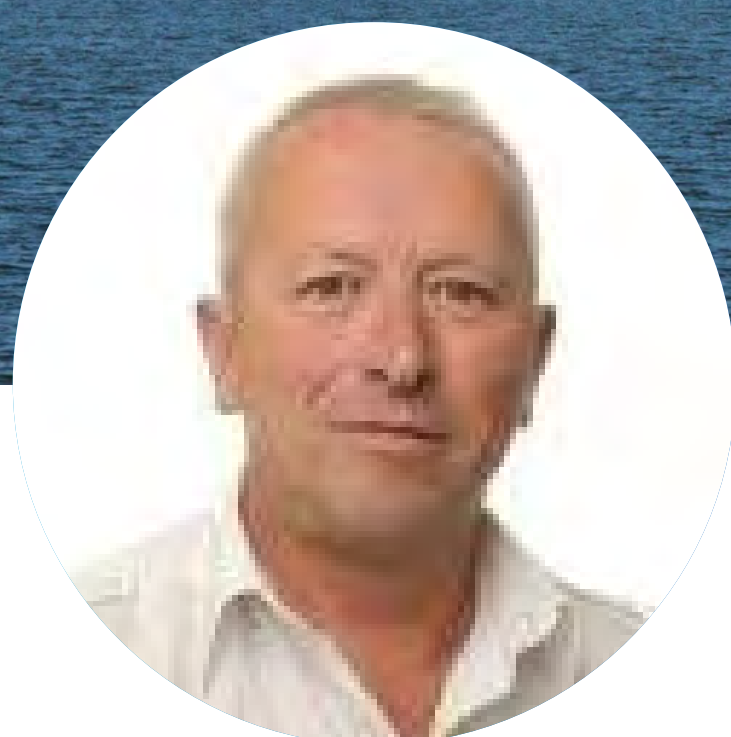
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Safe transport of dangerous goods in the Port of Antwerp



INTERVIEW

Paul Wauters
Harbour Master Port of Antwerp

As Harbour master for the Port of Antwerp, Paul Wauters is, together with his team, responsible for the efficient and safe day-to-day shipping of goods within the Port of Antwerp.

This is a major responsibility as 20% of all shipped goods contain hazardous products. With a view to the future, the Port Authority is not only working on safety and efficiency but also on the port's sustainable development, as well as embracing all kinds of innovations at the same time.

To stand out from the competition in the world market, companies must be able to call on the best possible supply chain to get cargo to its final destination. Reliability, quality, sustainability, flexibility, total cost and lead time are key performance indicators (KPI) for supply chains. Here the Port of Antwerp is a crucial link, offering high-performance solutions to meet client supply chain targets.

With an annual volume of more than 231 million tonnes of maritime freight handled, the presence of the largest petrochemical cluster in Europe and extensive storage capacity, the Port of Antwerp is the largest integrated maritime, logistics and industrial platform in Europe.

A major asset of the Port of Antwerp is its inland location. No less than 60% of the European purchasing power is located in a radius of 500 km around Antwerp. Shippers who ship their goods via Antwerp can bring their goods very close to the European customer.

Reliability and efficiency are paramount

However, this is not all, as shippers are not only looking for a quick link to their final destination. Paul Wauters, Harbour Master: "Reliability and efficiency are paramount in their search for the most suitable partners in their supply chain. Antwerp can meet this demand with an extensive network of highways and railways, inland waterways and pipelines which transport goods to their destination in the hinterland in no time at all.

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There is a lot going on about transport visibility and data sharing to increase the efficiency of supply chains and ports.

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With all this focus on reliability and efficiency, Antwerp can't jeopardize the safety within the port. Certainly when you know that 20% of all container activities involve the transport of dangerous goods in bulk, gas, LNG or liquid. Dangerous goods have risks associated with them that change from one good to another. It is highly important for the Port to know what dangerous goods they are dealing with in case of an emergency. This is so that they can respond adequately to an unsafe condition."

Biography

Paul Wauters

Paul Wauters studied at the "Hoge Zeevaartschool". After his studies he became a long-distance captain in 1974 and sailed for CMB and Ahlers. He specialised in dangerous goods and became an active member of Febetra's ADR committee, and chairman of the dangerous goods committee at the International Road Transport Union IRU in Geneva.

Paul Wauters is not only well-known in port circles, but also in the road transport sector: until a few years ago he was the manager of Wauters Tanktransport. Since 2017 he has been the Harbour Master in the Port of Antwerp, where his specialism in dangerous goods is very useful.

Creating more visibility

"There is a lot going on about transport visibility and data sharing to increase the efficiency of supply chains and ports," says Paul Wauters. "The port of Antwerp is using this new transport visibility trend to change the dangerous goods declaration process with the ultimate goal to have a better overview of what type of dangerous products are located in the harbour.

Each time a product is loaded or unloaded, the product owner changes. The port wants to be notified when product ownership changes so that at every given moment in time when a dangerous situation occurs, they can assess the risks that flow from having these types of dangerous products stored at a certain location."

The Port of Antwerp is home to the largest integrated (petro)chemical cluster in Europe. The high degree of integration and diversity throughout the value chain is unique in the world.

- | | |
|----------------------|----------------------------------|
| 1 BASF DOW HPPO | 14 Lanxess |
| 2 BASF | 15 Lubrizol |
| 3 Ineos Styrolution | 16 Borealis |
| 4 Air Liquide | 17 Total (Refinery) |
| 5 Eurochem | 18 ExxonMobil (Ref. + Petrochem) |
| 6 Gunvor | 19 Total (Olefins + Polymers) |
| 7 Ineos oxide | 20 Nippon Shokubai |
| 8 Bayer Agriculture | 21 Kuraray |
| 9 Eastman | 22 Praxair |
| 10 Evonik | 23 3M |
| 11 Covestro | 24 Inovyn |
| 12 Ashland | 25 Ineos Olefins & polymers |
| 13 Monument Chemical | 26 Ineos Phenol |
| | 27 Arlanxéo |
- * non-exhaustive list



Port of Antwerp Facts & Figures

- Largest European integrated (petro)chemical cluster.
- Extensive pipeline connections.
- Short transit times through multimodal connectivity.
- ca 231 million tonnes total maritime cargo (2020).
- ca 69 million tonnes liquid bulk maritime cargo (2020).
- Every important global chemical company is present, either with their own production plants or by using Antwerp as a distribution hub.
- With up to 130 trains daily entering/leaving the port and 225 weekly (tank)container rail shuttles to 70 destinations in 20 countries, Antwerp is a key rail hub for the (petro)chemical cluster.

Importance of telematics in temperature monitoring

“Transport of temperature sensitive products has not only led to unsafe conditions in the port. Therefore a series of chemical companies have strict procedures to follow up the temperature values when transporting these products.

Tank container and tank rail telematics have proven to be successful in monitoring and controlling these temperatures, and therefore lowering the risks involved. When the temperature increases and exceeds a certain threshold, the operator is notified that this tank needs to be looked at as there is potential risk.

Actions can immediately take place to tackle the further escalation of such a risk. Sharing this type of notification when tanks with temperature sensitive products enter the harbour can for sure help to act quicker in case of an emergency,” explains Paul Wauters.

Future of innovation

The chemical industry has a big influence on the further digitisation of any mode of industrial transport. As the Port of Antwerp embraces innovations such as Tank Telematics, the future looks bright for the safe transport of dangerous goods.

THE TELEMATICS SHIFT

BERNARD HEYLEN, SALES DIRECTOR IMT



The world around us is changing, fast. Telematics is taking hold and transforming how we work and how we communicate. We see in all segments of the tank container and rail car market, from shippers to leasing companies, that great benefits are achieved by the deployment of telematics. These companies are opting for a total solution, in which the digitization process brings about a complete transformation in the way they work.

With a complete digital transformation, they can now better meet the needs of their customers and offer a better service. Peter Hinssen, internationally renowned technology entrepreneur says: *"While Industry 3.0 had a clear focus on the automation of single machines and processes, Industry 4.0 is about the end-to-end digitization of all physical assets and the integration of all partners in the value chain into a vast digital ecosystem."*

No company can evolve from 3.0 to 4.0, this migration takes place in different phases. We see that companies that start this transformation process benefit immediately. In doing so, they do look beyond a cost perspective. Digitization is more than digitizing administrative processes. It is about big data and AI applications.

To take a simple example: transport of temperature-sensitive goods. In the analog world, the process might look like this: the product is loaded at temperature x. During transport, the product could be heated again. Before arriving at the customer, the driver manually checks the temperature on the analog thermometer and reports it to the office.

"While Industry 3.0 had a clear focus on the automation of single machines and processes, Industry 4.0 is about the end-to-end digitization of all physical assets"

In the digital world one would gather automatically temperature data at all times. AI will tell you if you need to heat during the transport. Thresholds will notify the office when a temperature incident occurs. The temperature of the product when entering the customer's site will be automatically sent to the office.

This is just one example of digitalization in your business. It will not only help you to potentially save costs. It will also change processes; your customers can be automatically informed/involved about the quality of their products during transport. And last but not least, digitization contributes to increasing quality and safety during transport.



THE IMPORTANCE OF MONITORING TEMPERATURE

Telematics solutions to
avoid unstable conditions
and/or polymerization

Temperature sensitive products have been transported safely for many years by multiple modes of transport but require the necessary precautions to do so, as many of these materials have the ability to polymerize. A chemical reaction in itself that forms “polymers”.

Polymerization of these products can be very violent, evolving considerable heat and pressure and ejecting hot vapor and polymer, which may auto ignite. If polymerizing product is contained in a tank or container, an explosion may follow due to extremely rapid pressure accumulation.

In which circumstances, in spite of the precautions taken, may materials start to polymerize?

- Inappropriate heating;
- exposure to sustained high temperature;
- improper thawing;
- contamination with residues of substances carried previously in a transportation container or equipment;
- contact with rust inside the tank; or,
- removal of oxygen inside the tank, especially through the use of nitrogen (oxygen is necessary to activate the inhibitor).

Telematics solutions to avoid unstable conditions and/or polymerization

Inappropriate heating

The most common cause of inadvertent polymerization is temperature related, which in most cases is caused by overheating of the products in the depot.

Telematics solutions can help to avoid unstable conditions and/or polymerization by making it possible to easily monitor and log the heating conditions of each tank. In a web application you can set thresholds for a specific product.

The sensor on the asset will gather the cargo values. When one of the preset thresholds is exceeded, an immediate notification will be sent, so you can respond adequately to this risk in a timely manner and prevent unsafe situations. A heating sensor gives you the possibility to measure the heating temperature remotely.

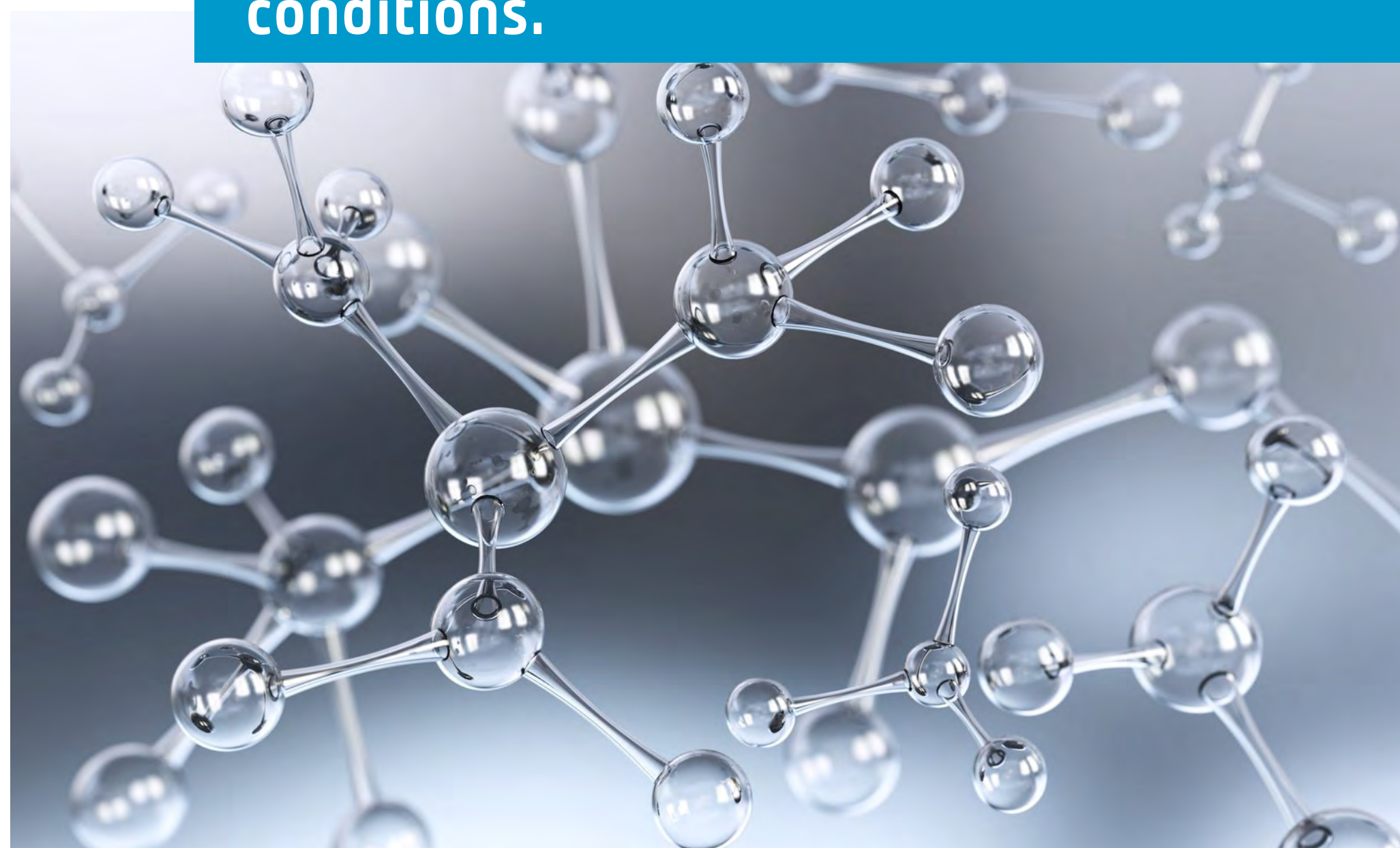
Exposure to sustained high temperature or improper thawing

During transport the temperature needs to be logged by the driver every 4 hours. This is to make sure the cargo temperature doesn't increase or decrease more than $x^{\circ}\text{C/hr}$ nor exceeds its lower or upper threshold.

To avoid improper logging of the temperature by the driver, the portal will log all measured temperatures which can be remotely monitored on the web application. Different threshold levels can be set to notify you when an upper and lower threshold is exceeded, and a gradient temperature alert will notify you when a product has increased or decreased more than $x^{\circ}\text{C/hr}$.

Telematics offers you different hardware solutions to measure the cargo temperature via the tankwall or in the heart of the product.

All in all, telematics includes both hardware and software solutions ready to prevent Polymerization of products which result in unsafe conditions.



All in all, telematics includes both hardware and software solutions ready to prevent Polymerization of products which result in unsafe conditions. Eliminate the existing room for error and digitize your fleet with Tank Telematics when transporting temperature sensitive products.

Note: in this Special you'll find the telematics solutions that IMT offers for the above mentioned situations.



IMPROVING SAFETY & QUALITY

**KUBE &
KUBENZ**

TELEMATICS CASE STUDY



Telematics case study on how telematics helps logistics specialist Kube & Kubenz to improve the safety and product quality.



Mr. Konstantin Kubenz,
CEO/Owner Kube & Kubenz

Telematics is used by IMT customers for a wide range of applications, from pressure measurements to full-empty measurements. For the IMT Telematics Special "Temperature Monitoring" our esteemed customer Kube & Kubenz explains how they use telematics, and because of this, IMT, with a focus on temperature monitoring.

As a logistics specialist in chemicals, Kube & Kubenz transports and provides logistics services for liquid and free-flowing hazardous goods, and extremely sensitive gases. Digitization and networking of their tank containers enables Kube & Kubenz to automate, increase transparency, better utilize equipment, and to improve safety and quality standards, especially for the transport of sensitive and very dangerous goods.

Zooming in specifically on the spectrum of temperature monitoring of temperature sensitive goods, Kube & Kubenz uses IMT's telematics solutions in particular for safety, product quality and cost avoidance reasons.

Konstantin Kubenz, CEO/Owner: "When transporting chemicals, we see great advantages in using telematics in many aspects. For example, costs to manually check the temperature are no longer incurred and an accurate unloading date can be communicated to the customer earlier. In addition to an attractive price, we want to impress our customers in particular with our outstanding quality performance. Telematics provides important data to monitor and ensure delivery reliability and product quality.

In the process of choosing a suitable supplier, we conducted a benchmark. We examined a number of requirements in detail: accuracy, number of pings, web portal, interface, integration possibilities, additional sensor technology. After the pilot project we did with IMT, we have 100% trust in IMT and we will equip our entire fleet with IMT telematics solution.

“As we transport some very dangerous goods, safety is the top priority. Telematics makes an important contribution to this.”

What convinced us about IMT in particular was the systemic approach with the possibility of integrating additional sensor technology, the associated innovative power and meanwhile the number of pings and the accuracy. The visualization and operation of the IMT platform were also decisive. The IMT platform impresses in particular with its appearance and operation. We, together with our customers, are enthusiastic about its simplicity and appealing visualization. The possibility of generating individual container pools for customers also convinced us.

"Telematics provides us with valuable data that can be collected easier and more efficiently."



The Temperature Sensor (WT19-Ex) is used for our acrylate transports. For these types of transports, permanent monitoring of the temperature range is required.

As we transport some very dangerous goods, such as Ethylene Oxide or Acrylic Acid, safety is the top priority. Telematics makes an important contribution to this, especially in intermodal transport, so the use of telematics and our choice to equip our entire fleet is a logical step. When transporting chemicals, in addition to the legal requirements, our own high standards for safety and product quality also apply. And you also have to deal with the specific product characteristics.

This range of requirements demands a precise measurement of values, such as temperature, filling level and pressure. Telematics provides us with valuable data that can be collected easier and more efficiently, and data-based decisions can be made based on these values. What is needed in terms of temperature monitoring, for example, depends on the product.

Some conceivable requirements include temperature thresholds that have to be adhered to, automated alarms, avoidance of heating/cooling, but the focus is always on safety, product quality and cost avoidance. This wide range of regulations, guidelines and data indicates the complexity that you have to deal with as an operator.

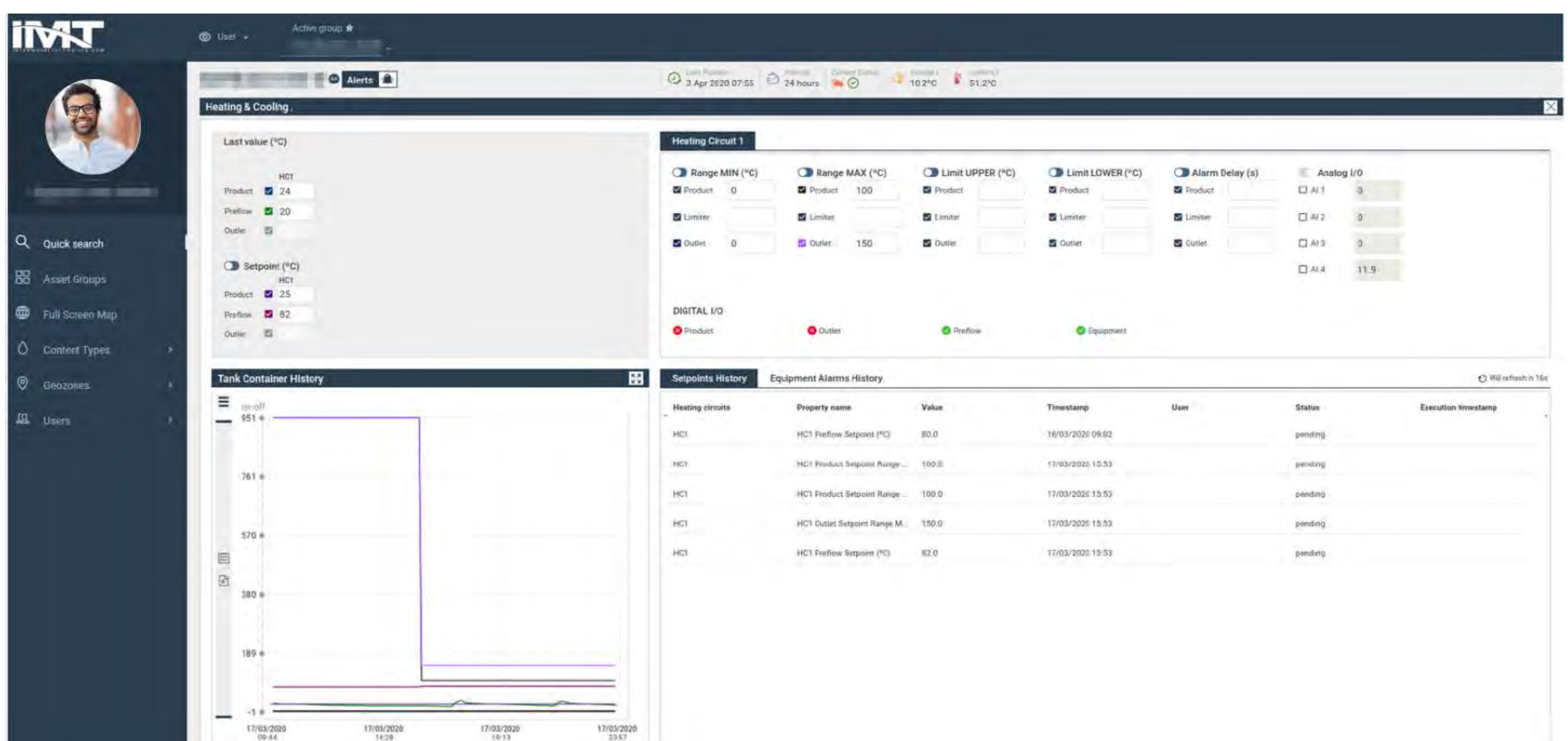
In addition to other sensors from IMT, for temperature and pressure monitoring we use in particular the Heating and Cooling Terminal (HCT18), the Temperature Sensor (WT19-Ex) and the solar-powered Communication and Location Terminal (CLT20-Ex).

In the chemical industry we transport temperature sensitive products such as Acrylic Acid and Ethylene Oxide. Thanks to the Heating and Cooling Terminal (HCT18), we are able to keep the product at the desired temperature on these transports as far away as Scandinavia or southern Italy, thus avoiding detours and delays via the heating station. We can also guarantee deliveries on Mondays. As well as being able to view the real-time geoposition, we can control the temperature and set the different temperature thresholds (e.g. product- and preflow temperature etc.) of our heating systems remotely via the very user-friendly IMT Platform.

"Conceivable are temperature corridors that have to be adhered to, automated alarms, avoidance of heating/cooling, but the focus is always on safety."



Thanks to the Heating and Cooling Terminal (HCT18), Kube & Kubenz is able to keep the product at the desired temperature.



The Temperature Sensors (WT19-Ex) are used for our acrylate transports. For these types of transports, permanent monitoring of the temperature range is required. For certain product-dependent temperatures there is a risk of a pressure increase in the tank. In such cases, an attempt is made to cool the tank or, if necessary, a re-stabilisation product is added. With the WT19-Ex we are able to constantly monitor the cargo temperature remotely and intervene in a timely manner thanks to the thresholds we can set in the IMT web application, and the alert notifications we receive in the case that a threshold is reached.

With the help of the telematics solutions, we can monitor our transport routings seamlessly and ensure that temperature or pressure-sensitive products are monitored automatically, thus increasing safety. The automated use of geo-fencing is also possible. The system therefore reports if a tank is not forwarded or misses its connection. In this way, additional costs can be avoided."

“

With the help of the telematics solutions, we can monitor our transport routings seamlessly and ensure that temperature or pressure-sensitive products are monitored automatically, thus increasing safety.

KONSTANTIN KUBENZ
CEO/OWNER

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About Kube & Kubenz

With its more than 90-year history, Kube & Kubenz today stands equally for tradition and decades of experience as well as for modern, sustainable logistics solutions in the field of liquid chemicals and gases. The fleet of Kube & Kubenz includes 1,250 tanks, 150 own tractor units, 350+ employees, and a 80m€ turnover. Kube & Kubenz is operating throughout Europe with a focus on DACH, BENELUX as well as France, Italy and Spain. Main locations are Worms, Bergheim, Rotterdam, Antwerp, Milan and Lyon. More information: www.kubekubenz.com | info@kubekubenz.com | +49 40 237207-0.



Road Map to Telematics

The introduction of a telematics solution for your organisation cannot be summed up in one roadmap. Below is a global overview of some of the steps that could occur in a roadmap. Whatever step you take in the telematics journey, it will always lead to more insight, more efficiency and more grip on your logistics process:

01

Explore what **insights** you would like to gain into your logistics process? Do you want a good overview of where your tank containers or rail cars are located? Or do you want more safety in the transport of dangerous goods, such as chemicals? Or would you like to be able to monitor the product quality, e.g. of the wine you transport, for your customers? These questions and needs are the starting point for defining your telematics requirements.

02

Are there **processes** you want to optimise and monitor? Do you want to organise your fleet management more effectively? Telematics can make processes more efficient because the data gives you more insight into what is happening to your assets and cargo, and when. You can, for example, set up heating processes precisely and remotely, so that the product arrives at your customer at the right temperature.

03

How long do you see the telematics investment for? Sensors and devices that have a **long service life** give you more overall return. Especially if you choose telematics solutions that comply with international certifications such as ATEX and ISO, and that are also future-proof. An investment in telematics solutions is more than just a matter of money.

04

Consider with which telematics company you want to enter into a **partnership**. A number of considerations and insights may help you on your way. A partner with years of experience in telematics can advise you on the basis of the insights they have gained. A total solution provider will most likely be able to provide you with a suitable solution. A telematics company that develops its own hardware and software knows all the ins and outs of the telematics solution. In short, think about who you want to work with as a telematics partner, and enjoy telematics benefits now and in the future!

Take telematics to the next level

DISCOVER THE ADDED VALUE
OF TELEMATICS IN
TEMPERATURE MONITORING

The driving need for intermodal solutions creates new challenges, as more different transport types are used. Telematics ensures that these different forms of transport become organized and manageable, especially when it comes to the transport of dangerous goods.



WIRELESS DATA TRANSFER

Any IMT sensor (temperature, pressure, heating...) sends the measured temperature values wirelessly to an IMT communication terminal (CLT, HCT), which in turn transmits the sensor data to the IMT web application.

SMART TANK OR RAIL WAGON

All smart sensors will serve the overall objective: improve transparency, increase safety, increase efficiency, reduce costs and make management by exceptions possible.

Take telematics to the next level

IMT offers a complete package of sensors, which we briefly explain below. Location, temperature, pressure, filling level, load status, and other values can be monitored. In the overview you see the specific sensors for temperature monitoring. Our product data sheets give the full description and technical specifications per sensor.



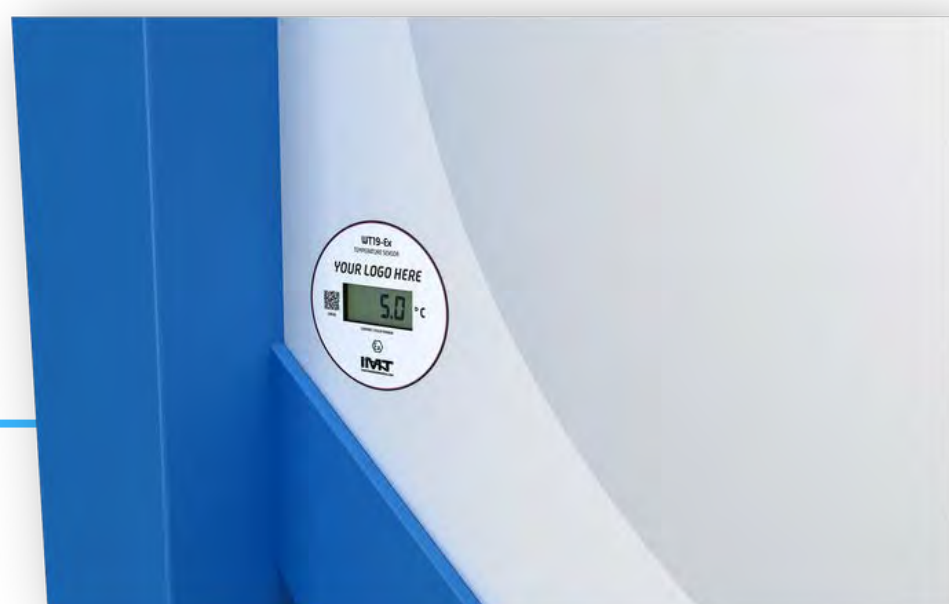
Communication and Location Terminal | CLT20-Ex Solar powered

A solar powered communication and location terminal which monitors the geolocation of the device and detects physical motion. Serves as a central hub for the sensors.



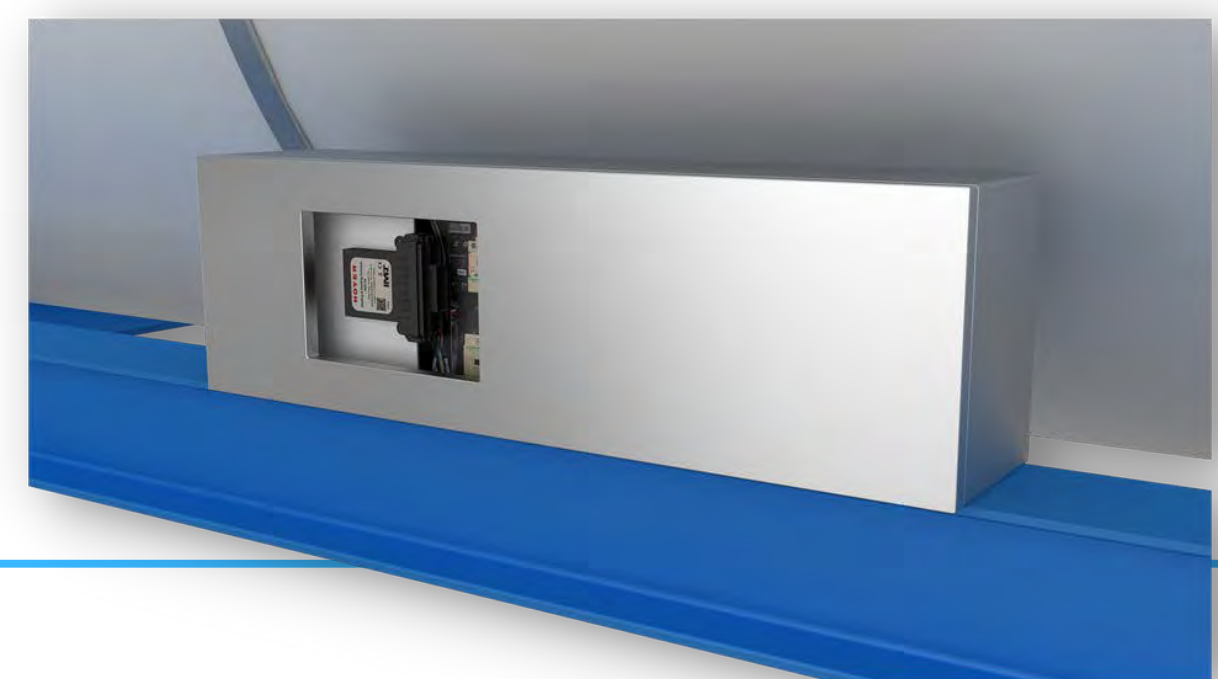
Temperature sensor | WT19-Ex

A digital, non-intrusive sensor used to monitor the content temperature of a tank's cargo. The WT19-Ex is ATEX IIC certified.



Heating and Cooling Terminal | HCT18

A multifunctional communication and location terminal that monitors the geolocation of the tank container, controls various heating and cooling equipment and detects physical motion and shocks.



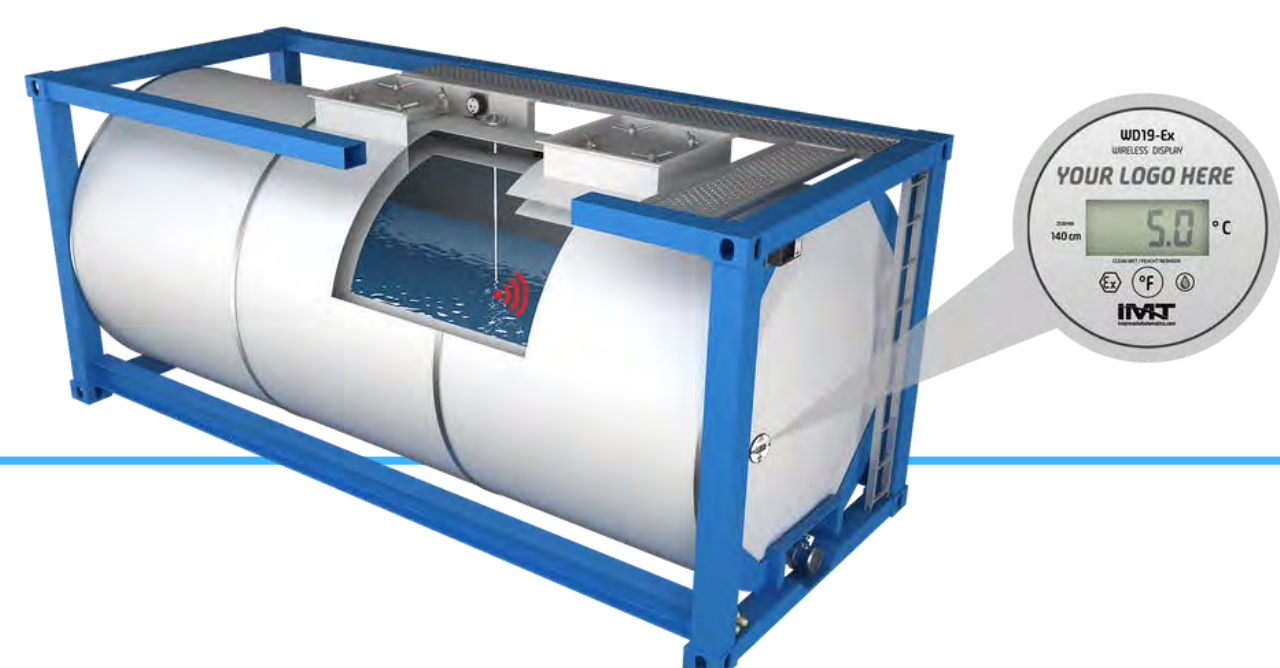
Heating sensor | HS19-Ex

A digital temperature sensor for tank containers and tank wagons to monitor the heating process of a tank container. The HS19-Ex is ATEX IIC certified.



Thermowell Solution

The IMT Thermowell Solution is a special thermometer solution that measures the temperature of the liquid in the middle of the tank container.



COLOPHON

IT'S YOUR TIME TAKE THE NEXT STEP.

THESE ARE EXITING TIMES. WITH EXCITING CHALLENGES.
IMT HELPS YOU TO ADAPT THEM. SO STEP UP TO THE
CHALLENGE. GET IN CONTACT AND TAKE THE NEXT STEP.

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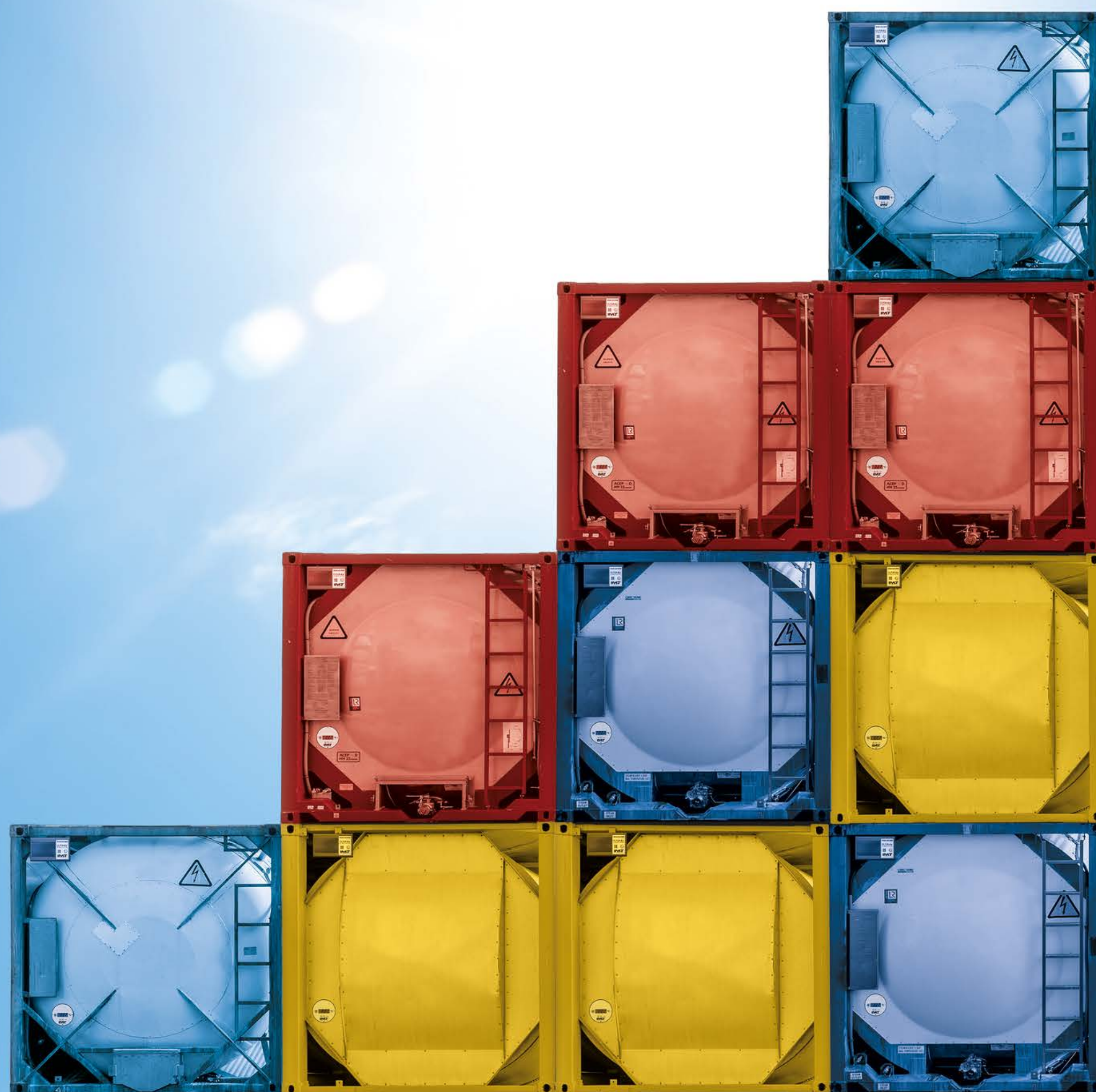
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IMT TELEMATICS SPECIAL TEMPERATURE MONITORING

TAKE
TELEMATICS
TO THE
NEXT LEVEL



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