



**IMPERIAL**  
LOGISTICS  
INTERNATIONAL

Reference solution

**Active fire  
prevention  
OxyReduct®  
in the automatic  
high rack storage  
with small-load  
containers**

An oxygen reduction system protects the automatic small parts storage at IMPERIAL Logistics International and assures the just-in-sequence flow of goods

**WAGNER®** 

## THE RISK ANALYSIS

Around-the-clock production – no time  
for downtime caused by fire

Possible cable fires due to overheating on conveyor drives or technical system faults are the most frequent causes of fire in automatic high rack storage systems. Once a fire has broken out, the extent of damage is both influenced by the design and the materials stored in the storage system. Even the storage height and properties pose a challenge in the field of fire engineering: High racks and narrow gaps create a risk of fire spreading quickly to the hall ceiling, therefore making it difficult to extinguish the fire using conventional means such as foam or water. The problem is increased by the large quantity of highly inflammable and combustible storage materials such as paper, cardboard or plastic, which enable an uncontrolled spread of fire.

### **Increased risk of fire from small-load containers**

The small parts storage at IMPERIAL holds complete cable harnesses for the car industry in small-load containers (SLC). These containers are standardised polypropylene plastic boxes of different sizes that can be used for storage and transport purposes. Both the small-load containers and the cable harnesses are problematic from a fire engineering point of view. Companies that produce and store plastic materials have experienced fires

resulting in significant material damage and even total loss.

### **Fire behaviour similar to a petrol fire**

There are two key problems when using small-load containers and plastics. One is the extremely good combustibility of the material. Polypropylene and polyethylene behave like combustible liquids in a fire and have thermal release properties similar to petrol. Given a sufficient pre-burning time and if enough material has liquefied, a so-called pool fire occurs within the storage constellation. The burning, dripping material ignites all adjacent materials, while the high thermal energy fuels the fire

further. The second problem is that this type of fire is difficult to extinguish because of the difficulty in applying water to plastic surfaces. The water drips off because plastic can not be pre-moistened like, for example, cardboard.

## THE PROTECTION OBJECTIVE: RELIABLE PRESERVATION OF THE SUPPLY CHAIN

The top protection goal for the customer when planning a suitable fire protection solution was to minimise the risk of a fire breaking out or spreading. This includes the following:

- Primary objective: personnel protection and environmental protection
- Protection of investments and assets
- Protection of ongoing operating processes and high availability of the storage facility and of stored goods
- No water damage, particularly not from a sprinkler system

## THE CUSTOMER

**320 cable harnesses per hour, around-the-clock, every day – IMPERIAL Automotive Logistics GmbH supplies four car manufacturer assembly lines with cable harnesses from a fully automatic just-in-sequence store in Northern Germany. Redundant systems ensure that the flow of goods is never interrupted. As a fire protection solution, the company chose the energy-efficient fire prevention system OxyReduct® from WAGNER.**

In August 2014, IMPERIAL Automotive Logistics GmbH relocated its logistics centre to nearby Wolfsburg, Germany, due to inadequate capacity at the previous site. The company set up an automatic small parts storage facility in a 10,000-square-metre hall on a site spanning around 22,500 square metres. The automatic small parts storage facility can hold around 54,000 containers for supplying the production of different vehicle models by a large car manufacturer.

### **Just in sequence – maximum security and maximum flexibility**

The cable sets are delivered directly to the assembly lines, where they are installed in engines and car interiors. To ensure that 160



The service portfolio of IMPERIAL Logistics International is bundled into two divisions: IMPERIAL Transport Solutions and IMPERIAL Supply Chain Solutions. The company employs over 7,500 people worldwide.

vehicles of different types can be supplied with 320 cable harnesses per hour around-the-clock, a highly developed, fully automated and high-redundancy solution is essential. IMPERIAL has intentionally not used robots, relying on sequencers (1 per assembly line) and container stackers instead. The processes and data technology for delivering parts on large-load containers, entering parts in the automatic small parts storage, relocating parts to the high availability area, retrieving parts, loading parts on lorries and transporting parts to the plant are optimally coordinated to rule out failures as far as possible.

An interruption in delivery would not only be a catastrophe for the logistics company, but also for the car manufacturer, who would fail to meet production targets.

### **The ultimate in safety: maximum fire prevention**

An optimal safety system for the new store also had to be found in the form of a new fire protection solution that could be adapted individually to the special conditions and challenges of automatic high rack storage facilities. It was particularly important to ensure that the risk of fire development was prevented from the beginning so that the delivery capability of the company – one of its major strengths and a significant competitive advantage – would not be endangered.



## THE SOLUTION

Fires are difficult to extinguish –  
it is easier to stop them happening in the first place

The high level of automation of the small parts storage, delivery obligation and reliance on the just-in sequence processes of the car manufacturer, mean that the delivery capability must not be interrupted due to fire. IMPERIAL Automotive Logistics GmbH have chosen a highly-sensitive earliest smoke detection system using TITANUS *PRO·SENS*® air sampling smoke detectors to ensure that even minor smoke particles can be detected in the early phase of a potential fire outbreak. As a further preventive measure, the operator also relies on active protection: The fire prevention concept using oxygen reduction drastically

reduces the risk of a fire outbreak and of fire spreading and creates a protective atmosphere where personnel can still move around without restrictions. The fire prevention system OxyReduct® from WAGNER was chosen.

### **The principle of oxygen reduction**

Releasing nitrogen into the protected area lowers and maintains oxygen concentration to a level just below the specific ignition threshold for the materials present. The available oxygen is no longer sufficient to sustain a fire or to enable it to spread. Eliminating the possibility of fires also eliminates

any potential for consequential damage through smoke, soot or extinguishing agents. The residual oxygen content in the protected area is defined as <14.6 vol% in accordance with the VdS directive. This is below the ignition threshold of polypropylene, the critical plastic material used by the small-load containers.



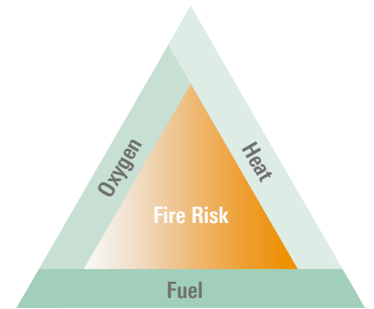
The fully automatic high rack storage with small-load containers is protected from fire danger via an air sampling smoke detector system and active fire prevention.

**Protected using OxyReduct® even in case of an emergency**

The OxyReduct® fire prevention system consists of three key components: The nitrogen generator, the OxyControl control panel and the OXY·SENS® oxygen sensors. The control panel monitors the specified oxygen concentration and controls the nitrogen supply as required. It also monitors the displays and alarm equipment as well as the electrical lines, and issues relevant information if failure occurs. In the event of a power failure, its own emergency system supplies power to keep it running for a minimum of 30 hours. The OXY·SENS® oxygen sensor constantly measures the oxygen

content in the air within the protected areas. Eight independent, high-quality oxygen sensors with a measurement accuracy of  $\pm 0.1\%$  of measured values are used in the protected area for this purpose. All system parts are redundant, meaning that operation is guaranteed even when individual components fail or maintenance work is being carried out.

## FIRE TRIANGLE



The ratio between oxygen and heat determines the ignition point of a combustible. Fire needs to develop oxygen, heat and fuel.

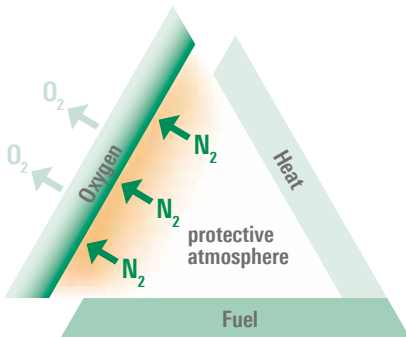


TITANUS® air sampling smoke detector system for highly-sensitive and false alarm-proof earliest smoke detection



E 1905001 & S 6040001

When the limits of conventional fire protection systems are reached, the patented OxyReduct® fire prevention system comes into action

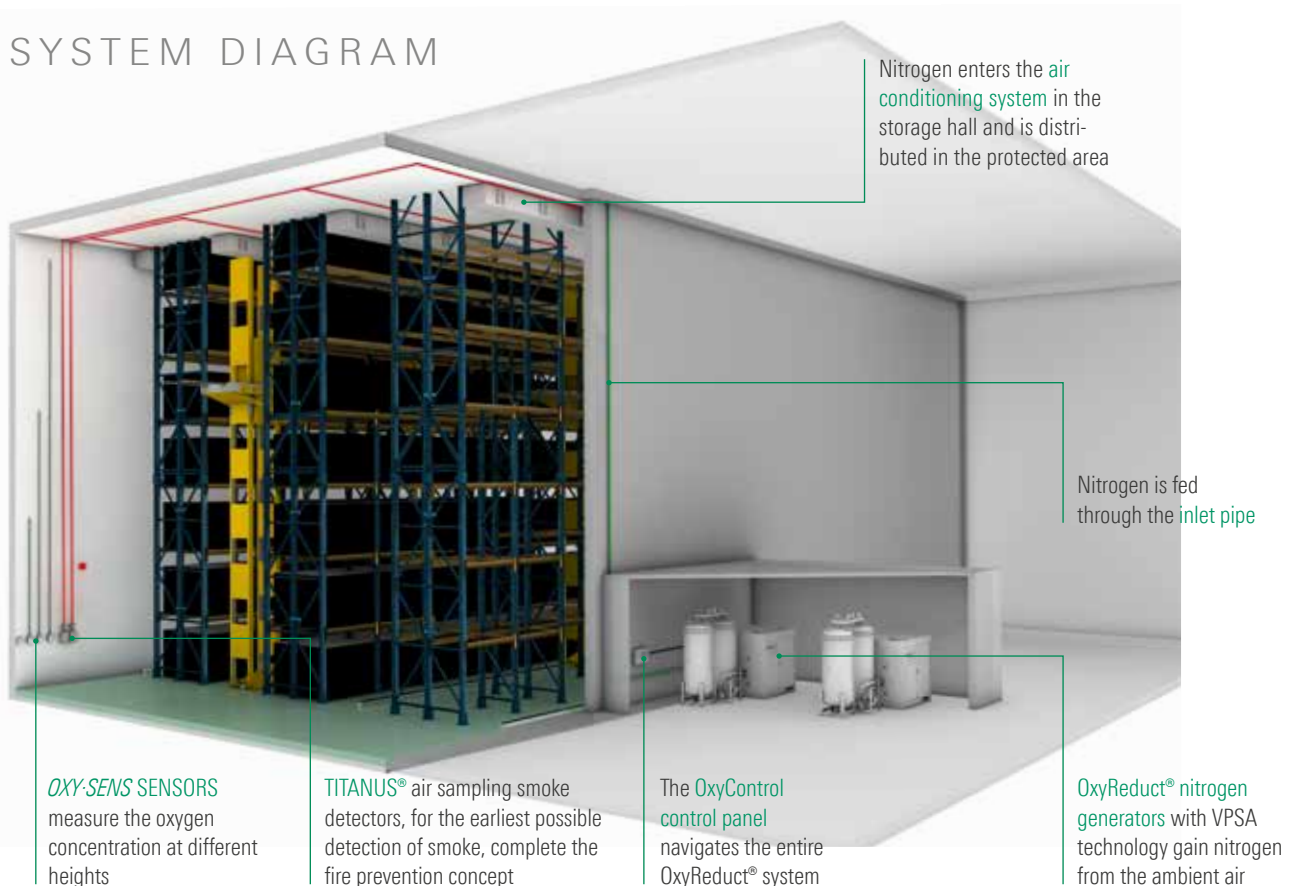


The inflammability is reduced through the reduction of oxygen by introducing nitrogen.

### Summary

Automatic high rack storage facilities have special fire prevention requirements to ensure that goods and people are protected and to guarantee delivery capability and competitiveness since a company can not afford downtime. With the OxyReduct® active fire prevention technology, WAGNER established a solution that fulfils these requirements and protects stores from fire-related disruptions in operation and delivery.

## SYSTEM DIAGRAM







Adjacent plant room with OxyReduct® system for fire prevention. The waste heat from the nitrogen generator machines is used to heat the adjacent sorting and picking area.



Large-load containers and small-load containers ready for delivery, as well as empty small-load containers ready for refilling with cable sets.



WAGNER sets standards for innovative and comprehensive solutions in fire protection: with very early fire detection systems, TITANUS® for aspirating smoke detection, FirExting® for fire-extinguishing, OxyReduct® to actively prevent fires from breaking out and VisuLAN® for hazard management. [www.wagner.eu](http://www.wagner.eu)

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