OxyReduct®

The fire prevention technology
with long-term effect

BETTER SOLUTIONS IN FIRE PROTECTION

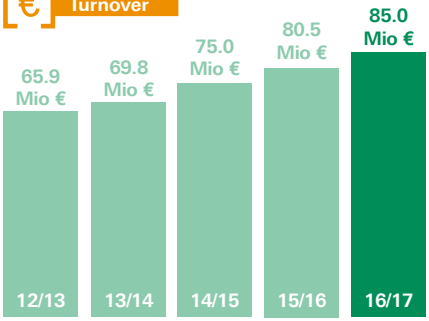
WAGNER®

WHO IS WAGNER?

"Fire sparks our passion" is the motto of WAGNER Group GmbH. The WAGNER Group GmbH has been developing technical fire protection systems since 1976 and has established itself internationally as an innovative provider of solutions and systems. Our product range focuses on the following four systems: fire detection (TITANUS®), fire prevention (OxyReduct®), fire extinguishing (FirExting®) and risk management (Visu*LAN*®), which are used in fields such as IT, logistics, archives and railway vehicles, amongst many others. WAGNER is one of the world's technology leaders in the field of fire detection and fire prevention and covers design, project planning, system construction and service. The individual, tailor-made solutions have proven to be a great benefit to customers such as BMW, the State Parliament of Lower Saxony, The British Library, Elbe Philharmonic Hall, Preferred Freezer Services, NewCold, noris network AG, Siemens AG and many more. WAGNER has subsidiaries, affiliates and sales offices in Europe, Russia, Singapore and the USA.

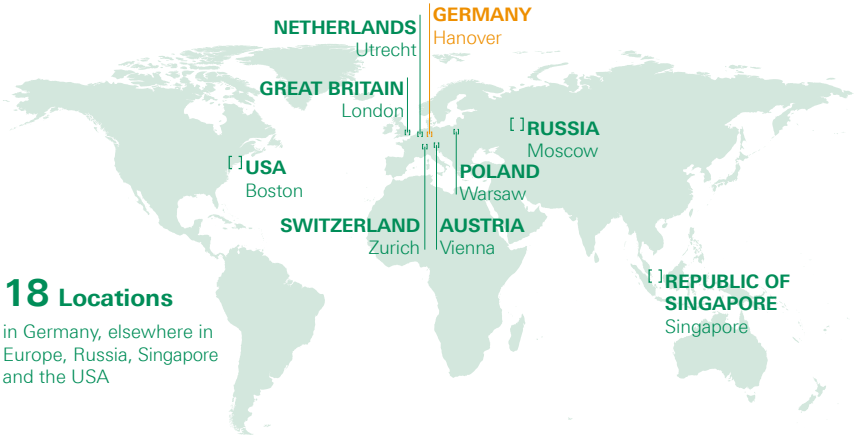
▼ Company headquarters in Langenhagen (near Hanover), Germany

Turnover



Employees

Locations



18 Locations

in Germany, elsewhere in Europe, Russia, Singapore and the USA

Certificates

VdS Vertrauen durch Sicherheit · CNBOP · LPCB · ISO 9001 · AEO · CSIRO · c UL us · NF · FM APPROVED · SA · VKF AEAI · GL · CE · EN 54-20 · ISO 7240-20

BETTER SOLUTIONS IN FIRE PROTECTION

Solving problems has always been WAGNER's top priority. This philosophy shaped by Werner Wagner is lived by the whole company. "Nothing is impossible" – that has always been the attitude. Every new innovation is based on a problem that had to be solved. On many occasions it is customers who approach WAGNER requesting a solution to a specific problem. Through tasks such as these and the constant pursuit of perfection, our own development and application departments have succeeded in continuously developing new and improved, ever more efficient and durable products for comprehensive fire protection – and it is all from a single source.

▲ The management board of the WAGNER Group GmbH: Dipl.-Ing. Torsten Wagner (left) and company founder Dipl.-Ing. Werner Wagner (right)

And that includes sustainable company management. The company's growth has to be in harmony with the employees and the company's economic efficiency. And WAGNER takes this seriously: every expansion has to be socially compatible. This means putting sustainable company development ahead of rapid profit maximisation. To enable this the partners do not make private withdrawals, instead profits are reinvested within the company.

"We pursue organic growth based on our own strength – even though that may take some time."

Dipl.-Ing. Torsten Wagner
Head of Material Management, Development and Applications

ENVIRONMENTAL PROTECTION AT WAGNER

Climate and environmental protection have a long tradition at WAGNER. Ever since the company was founded, great attention was paid to designing energy-saving – and thus environmentally friendly – products. WAGNER has already replaced chemical extinguishing gases with natural gases generated from the ambient air as far back as the 1990s. The problem with using chemical gases to extinguish fires is that they disintegrate at temperatures of roughly 480 °C and can form compounds with other substances which can be very harmful to people and the environment. Nitrogen is an inert gas, as are argon and carbon dioxide. They do not form chemical compounds with other substances, enabling them to put out fires without leaving any residue behind.

WAGNER constantly endeavours to refine its products and make them ever more energy efficient and environmentally friendly. Over the past ten years, for instance, we have reduced the energy required to produce one cubic metre of nitrogen for fire prevention by up to 80%. The proven TITANUS® air sampling smoke detector systems are modularly designed for specific applications so as to prevent unnecessary over-sizing. Compared to competing products, they have the lowest power consumption. Likewise, the system is easy to retrofit. Regular maintenance ensures that the products and systems will have a long service life, which conserves resources.

”We are fully committed to using nitrogen.”

Dipl.-Ing. Werner Wagner
Head of Sales and Marketing, Accounting, Human Resources and IT

The CFC Prohibition Ordinance banned the use of halon throughout Germany on 1 August 1991. What this meant for fire extinguishing was that a replacement had to be found. In the years that followed, many trials were carried out with the gases and gas mixtures nitrogen, argon and carbon dioxide, including combinations thereof. Since carbon dioxide is toxic and thus hazardous to human life, WAGNER sought other, harmless methods of effective fire fighting. **WAGNER was a pioneer in Germany** when it became the first company to introduce nitrogen as an extinguishing gas in a fire fighting system in 1997. No other company in the country has used nitrogen in this capacity to date. The use of nitrogen in an oxygen reduction system is VdS certified.

Carbon dioxide vs. nitrogen – a direct comparison

- Carbon dioxide has very good fire extinguishing properties, but it is toxic
- It is harmful to health at concentrations of as little as 5 vol% in inhaled air
- Everyone has to leave the area before a CO_2 extinguishing system is discharged
- Since CO_2 is heavier than air, the gas has to be suctioned off before flooding
- CO_2 tends to form fog
- Nitrogen has very good fire extinguishing properties and is non-toxic
- It poses no danger to health at oxygen reduction for fire prevention within a range of 13 – 17 vol% oxygen
- The oxygen content can then be increased back up to normal by ventilating the room
- Does not form fog
- And as a natural part of air, it is easy to generate

One of the first buildings to be equipped with an OxyReduct® fire prevention system was:

- The TÜV Rheinland data centre in Cologne
- Protected area of approx. 600 m³
- OxyReduct® membrane system
- Went into operation in 2000

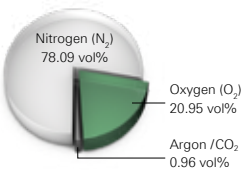
FIRE PREVENTION INSTEAD OF FIRE EXTINGUISHING

In 1998, WAGNER published the document "Inerting rooms with nitrogen – ideal fire protection for people and equipment alike." This marked the birth of fire prevention technology for enclosed areas – which went on to be known as OxyReduct®.

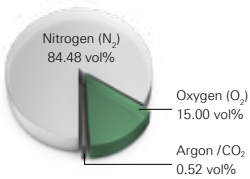
The idea behind it: to use the inert gas nitrogen to reduce the oxygen concentration to the point that fires can no longer break out or develop in the protected areas. **Active fire prevention is superior to reactive fire extinguishing systems, which have undesirable side-effects such as contamination with extinguishing water or damages caused by a heavily developed fire**.

However, keeping inert gas for oxygen reduction on hand in bottles is not cost-effective for large application areas. The steel containers and their required storage space cost money and expend raw materials. To solve this, WAGNER developed on-site nitrogen generation from the ambient air. This solution is space-saving. Also, the technology is very flexible in use, because nitrogen is generated from the natural ambient air.

Natural atmosphere



Oxygen-reduced atmosphere (15 vol% in this case)



Natural ambient air has an oxygen content of 20.95 vol%. If this proportion is reduced, the risk of fire will also be reduced in turn.

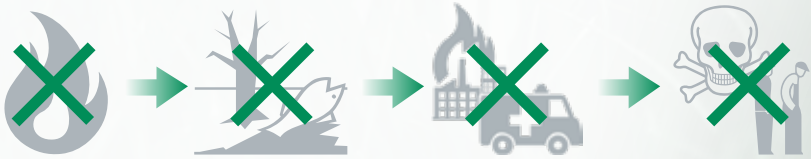
OxyReduct® – A SUSTAINABLE FIRE PROTECTION CONCEPT

Sustainable fire protection is always based on active fire prevention. What this means is: do not even let a fire start. After all, the smoke, soot particles and pollutants given off in a fire not only pose a risk to people and companies, they harm the environment and can even cause long-term damage.

Using water to put out fires has considerable economic and ecological drawbacks:

- A large supply of water must be kept on hand, and water consumption may be great
- Water may cause more extensive damage during the extinguishing process
- Extinguishing water has to be disposed off
- In refrigerated and cold storage areas, the extinguishing water must be mixed with antifreeze, which must subsequently be disposed off properly
- Sprinkler technology cannot necessarily be used in areas with hazardous substances without causing problems

OxyReduct® prevents fires from breaking out without causing side-effects and consequential problems

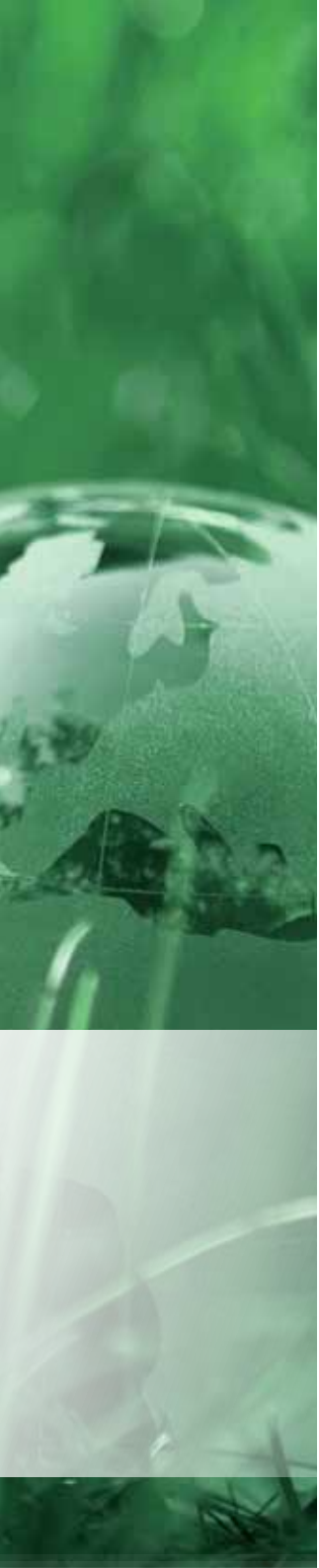


No fire, no fire fighting

No damage to plants and animals

No harm to people or the environment

No health hazards, no job losses



ECONOMIC ADVANTAGES OF OxyReduct®

- The resource management for sprinkler systems consisting of e.g. pipe systems, water storage and personnel deployment is high compared to fire prevention. Moreover, after fire extinguishing the used water has to be disposed and the reservoir has to be restocked. The OxyReduct® system has a compact design and uses the already existing ventilation system to spread the nitrogen which is generated from the ambient air. Restocking is not needed at all.

- If a sprinkler system is installed in a high-bay storage warehouse, sprinkler heads are placed at different levels. The weight of the pipelines and water have to be considered when installing the racks. This might cause additional costs, because the racks have to sustain more load than only of the stored goods. An oxygen reduction system does not need such upgraded racks. There also has to be a certain space between the sprinkler head and the goods, which creates a "dead volume" that cannot be used for storage. This increases the building costs per m^3 storage volume. Unused storage volume does not occur with a fire prevention system.

- The cost-to-benefit factor of an OxyReduct® system is thus quite high, while the risk of fire hovers around zero.

AN EXAMPLE: A FIRE

Severe consequences

If a large warehouse (for food, medical products or blood bottles) catches fire, the destruction caused could have great consequences if products cannot be delivered (**interrupted supply chain**) or the **goods are destroyed**, for instance. If there are people depending on medication or blood-based products, the consequences could even be **life-threatening**.

If fire breaks out in an IT area (in large data centres, for instance), the power usually has to be **shut down** for fire extinguishing which is an absolute **disaster** for banks, online sales companies and insurance providers. Even a brief moment offline often causes severe economic losses.

Harm to market position

If large-scale fire breaks out at a company, statistics according to the German Chamber of Industry and Commerce show that the company usually will not survive much longer on the market. In general, such companies disappear from the market due to **harm to their image** and **loss of their assets**. And the events are much worse for small logistics companies when compared to large corporations.

- Harmful air pollutants are given off during a fire. In higher concentrations, CO_2 will form, and – depending on the type of flammable material – CO, sulphur dioxide, chlorine, hydrochloric acid, hydrogen bromide, hydrocyanic acid, ammonia and/or phosgene may be given off as well.*
- When the smoke cools down, pollutants from the air start "raining" down
- Such residue from fires poses a risk to people and the environment alike

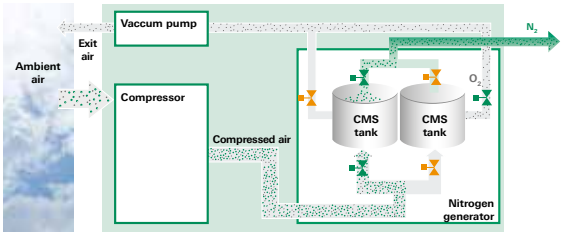
*Source: Bavarian State Office of Environment

LESS ENERGY, MAXIMUM PROTECTION

WAGNER has refined the OxyReduct® system to save even more energy in nitrogen generation. The result: Vacuum Pressure Swing Adsorption technology, or VPSA for short. This makes it even more efficient to generate the nitrogen needed for oxygen reduction from the ambient air on site. Thanks to this, no money need be spent on transporting or storing the nitrogen. Advantages:

- Lower energy consumption
- Allows continuous operation
- Up to 80% energy savings (under ideal conditions) per cubic metre of nitrogen generated in comparison with conventional technology such as a membrane system
- Oil-free air treatment

How nitrogen generation through VPSA technology works



A compressor draws in the ambient air and pressurises it. The compressed air is then treated and fed into one of the two alternating CMS (Carbon Molecular Sieve) tanks. The activated carbon they contain binds oxygen molecules to it. Nitrogen passes through the tank and can be fed into the protected area. For regeneration the oxygen bound in the activated carbon is simultaneously discharged outdoors by a vacuum pump.

The first building in which OxyReduct® VPSA was used was:

- The HAYAT Group's high-bay warehouse in Izmit, Turkey
- Health & beauty product manufacturer and logistician
- Went into operation in 2013
- Protected volume of approx. 600,000 m³

OxyReduct® VPSA – sustainable technology with future

Always driven to keep refining its own technology and make it more economical, ecological and sustainable, WAGNER has further plans for the OxyReduct® VPSA system. Combining it with a pressure swing adsorption (PSA) system yields the following benefits:

- **eco (VPSA) and power (PSA) combined**
- **Low space requirements**
- **Can be maintained during operation**
- **Heat recovery in power mode**
- **Energy consumption reduction**

PSA technology is developing constantly. Adapted to meet the needs of the US market, this fire prevention technology is used in the world's largest deep-freeze warehouse (with a protected volume of 1,050,000 m³) operated by Preferred Freezer Services.

SUSTAINABLE COMPANIES ARE NOW TURNING TO INNOVATIVE SOLUTIONS FROM WAGNER

”Without question, OxyReduct® is one of the best fire protection solutions currently available on the market.”

Teoman Duman, HAYAT Logistics Director

”Thanks to the high energy efficiency of the VPSA technology installed, we not only score points in term of safety, we also keep operation costs down.”

Georg Grewe, Managing Director of KLM Logistics

”After the very good experiences we had with the OxyReduct® system, we decided for WAGNER once again.”

Patrick Dixon, Head of Construction and Technology at the British Library

Dr. Oetker

- Automated cold storage warehouse in London, Ontario, Canada
- Deep-frozen pizzas from Dr. Oetker
- Protected area of 61,000 m³ at a storage temperature of –27 °C
- VPSA system with two VPSA compressors for redundant operation
- Protection level: 17.2 vol% oxygen concentration
- Went into operation in: January 2015

LaLorraine

- Cold storage high-bay warehouse in Kladno, Czech Republic
- Deep-frozen ready-made baked goods and pastries
- Protected area of 165,892 m³ at a storage temperature of –25 °C
- 4 OxyReduct® VPSA systems
- Protection level: 15.2 vol% oxygen concentration
- Went into operation in: August 2013

HAYAT

- High-bay warehouse in Izmit, Turkey
- Health & beauty products
- Protected area of nearly 600,000 m³
- 8 OxyReduct® VPSA systems
- Protection level: 14.0 vol% oxygen concentration
- Went into operation in: late 2013

WAGNER'S "GREEN WAY"

1976
Company founded by Dipl.-Ing. Werner Wagner

1997
WAGNER introduces nitrogen as a fire-extinguishing gas in Germany

2012
Winner of the German data centre award for “active fire prevention OxyReduct® for Green IT”

2014
Winner of the GIT safety award for OxyReduct® VPSA

1998
WAGNER introduces nitrogen for fire prevention for the first time in Germany

1999
First commissioning of a fire prevention system in the server rooms of Stadtwirtschaft GmbH Halle

2013
First commissioning of an OxyReduct® VPSA system in the high-bay warehouse of HAYAT, Izmit, Turkey

2015
Planned commissioning of an OxyReduct® PSA system in the world’s largest deep-freeze high-bay warehouse in the USA

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WAGNER sets standards in fire protection – with innovative and comprehensive solutions

Fire detection and alarm systems

Very early fire detection systems (TITANUS®)

Active fire prevention (OxyReduct®)

Fire extinguishing (FirExting®)

Hazard management (Visu*LAN*®)

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