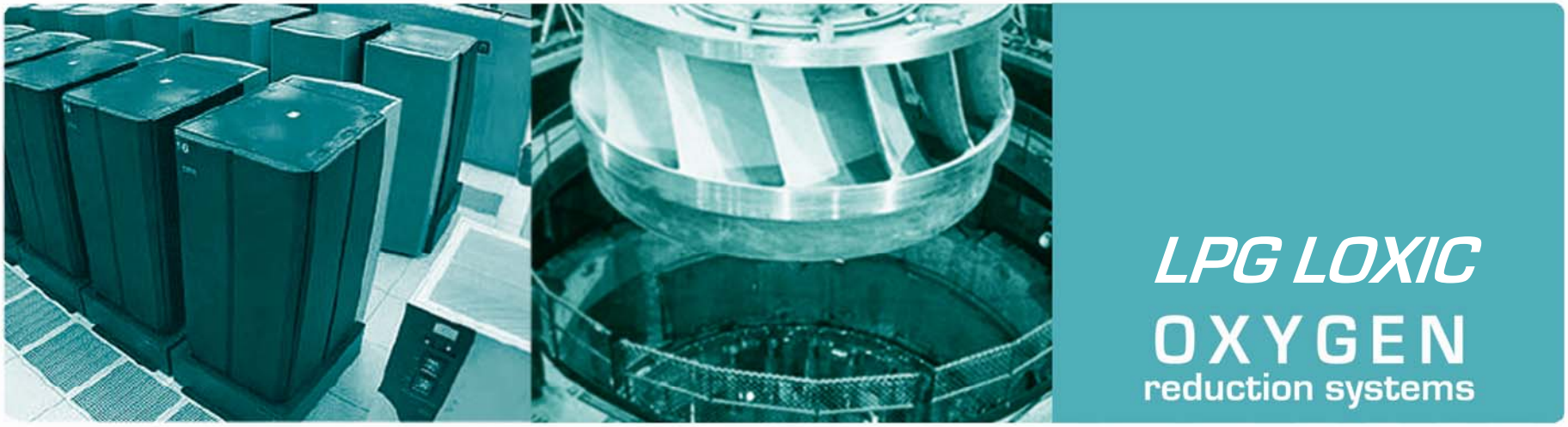


LPG LOXIC

OXYGEN
reduction systems

LPG Técnicas de extinción de incendios S.L. • Mestre Joan Corrales 107, 08950 Esplugues de Llobregat (Barcelona-Spain) • Tel.: +34 934802925 • Fax: +34 93 4737492 • e-mail: lpg@lpg.es • www.lpg.es

FIRE TRIANGLE

Fire must have three elements to ignite and spread: heat, oxygen, and fuel. Removing any one of these three will prevent fire.

Traditionally, reactive measures activated by the presence of fire, such as water sprinklers and chemical fire suppression systems, were used to suppress a fire after it ignited.

Now, **LPG LOXIC** revolutionary **hypoxic fire prevention** method removes a small portion of the oxygen before the fire ever ignites. This completely eliminates the chance of fire and the need for fire suppression. The benefits are obvious - no fire, smoke, water, or chemical damage, and no risk to human life.

LPG LOXIC

LPG LOXIC hypoxic system prevention can be employed to protect critical locations where fire - or even the risk of fire - can not be accepted under any circumstance.

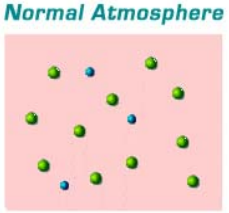
Ordinary air contains approximately 21% of oxygen and 79% nitrogen. Air in a hypoxic systems protected space typically contains an oxygen percentage of 14.5 to 15.5%.

With this concentration the majority of ordinary fuels cannot ignite and they do not represent a risk to people.

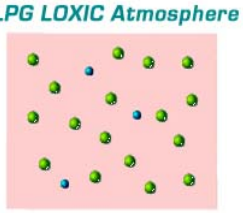
To obtain these conditions a hypoxic current with an oxygen concentration of 10% is needed.

Compared to procedures of nitrogen injection **LPG LOXIC** spends less energy on filtering. Energy is saved and the size of the equipment can be reduced.

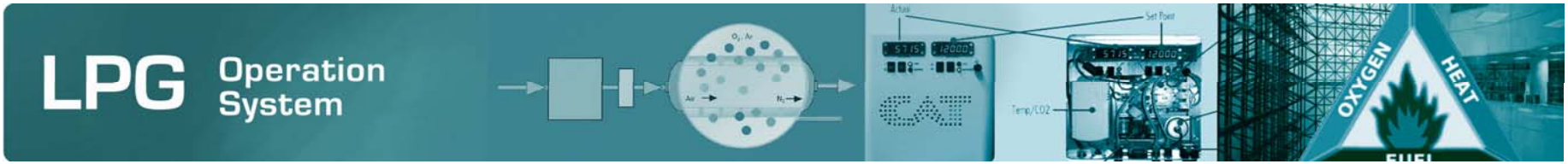
Hazardous conditions are prevented altogether. There is no risk for people, not even within close proximity to the injection points.



O2: 21%
N2: 79%
Pressure: Low



O2: 15%
N2: 85%
Pressure: Normal



Action

With the **LPG LOXIC** system oxygen molecules are replaced by nitrogen molecules.
The increase in nitrogen molecules serves as a 'fire blanket' around each oxygen molecule, preventing combustion.

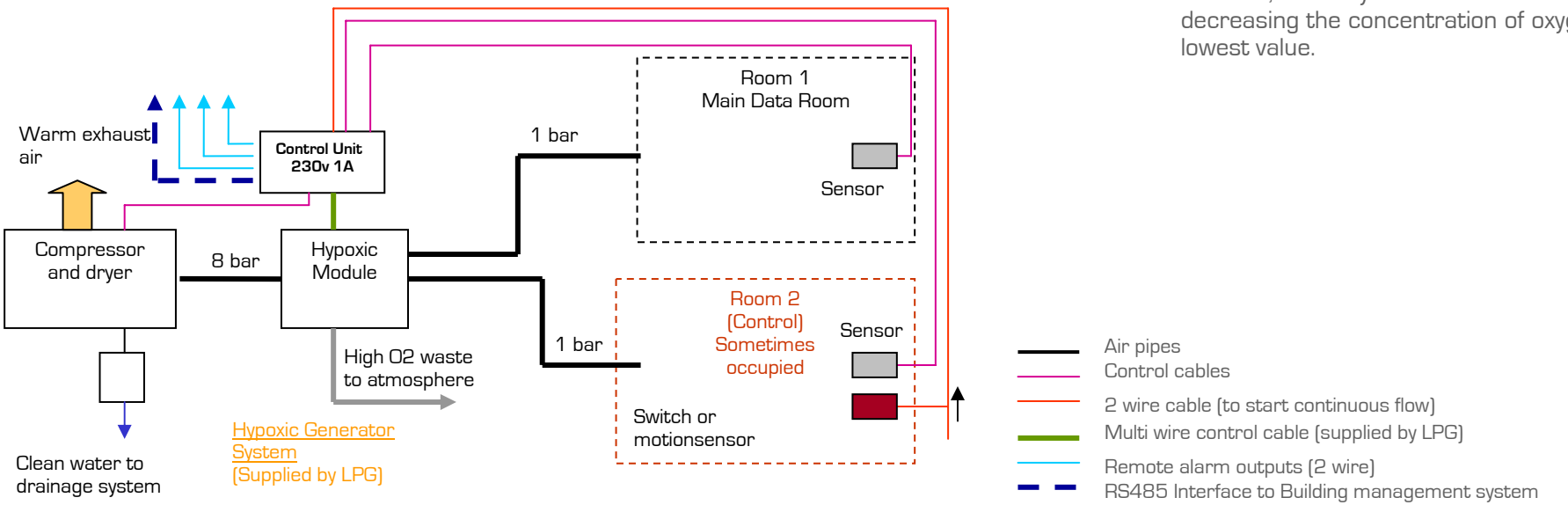
The **hypoxic air current** is generated by a simple on-site process through preferential separation of oxygen molecules.
The CO_2 molecules are also filtered, as well as particles and odours. This creates a high quality air.

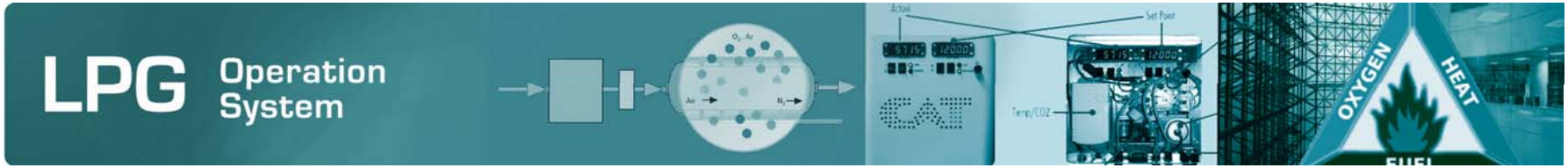
The system is designed to function in a cycle, within an oxygen concentration range determined by specific sensors installed inside the protected room.

When the system starts to operate, the oxygen concentration is reduced to the lowest configurated rate. However, due to the fact that no building is 100% airtight, the oxygen concentration will increase again gradually.

When the highest acceptable value is attained, the system will start off again, decreasing the concentration of oxygen to the lowest value.

General layout





Hypoxic systems vs. nitrogen injection

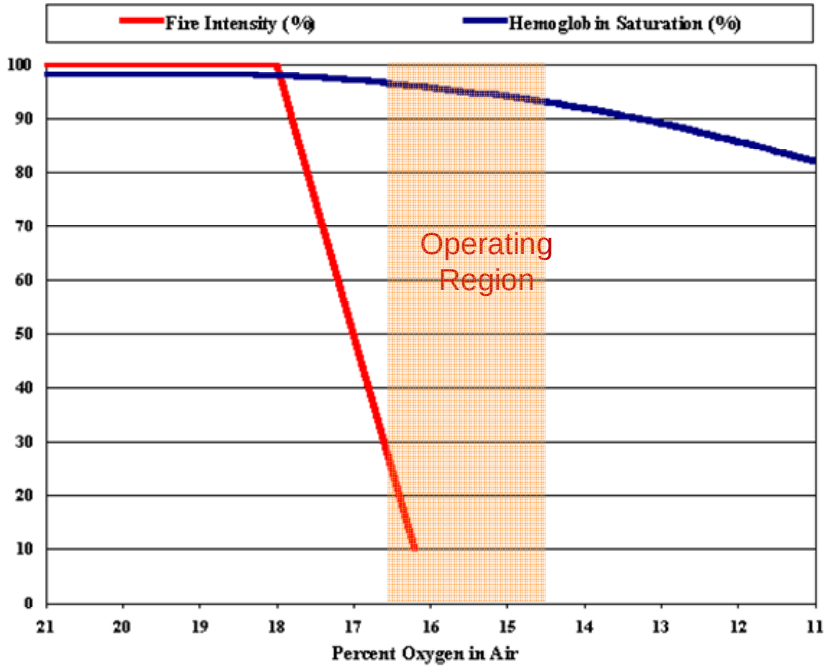
Hypoxic Systems are radically different to Nitrogen Injection systems available in the market.

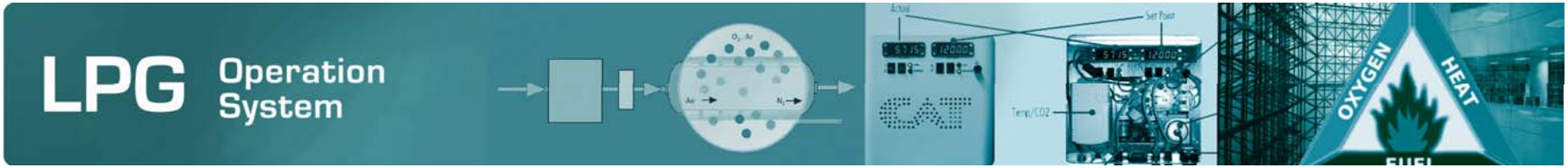
Nitrogen injection systems use almost pure nitrogen to reduce the oxygen level in a room to around 15%, at which point they shut down. However, should there be a major control system problem or mechanical valve failure that results in the system not shutting down, nitrogen will continue to be injected, resulting eventually in a lethal atmosphere being created.

Equally, anyone breathing very close to the injection point could be subjected to a harmful or even lethal level of nitrogen.

LPG LOXIC hypoxic system do not suffer from these potential problems. Hypoxic Systems only ever produce air that is at all times fire preventing as well as being safe for people. **Nitrogen is never present anywhere in the system** and there is no failure mechanism that would give rise to a lethal atmosphere being created.

As a result, Hypoxic Systems can be used in occupied spaces, where they can deliver a continuous stream of ultra filtered, fresh hypoxic air.





MAIN ADVANTATGES

Demonstrable reliability
To prove that the system is operational is as easy as verifying the concentration of oxygen in the room.

Lasting protection
The system operates 24 hours a day under the established conditions. There is no risk of extinguishers being activated unexpectedly.

Eliminates any possibility of fire
This is an active prevention system and not a system for fire extinction. Therefore it is impossible for a fire to break out.

Less space required
In comparison with traditional systems the space required for storage is much smaller, particularly regarding the protection of big spaces.

No elements for pressure relief needed
Due to the limited throughput of hypoxic air, the installation of pressure relief dampers is not necessary.

Reduces oxidation process
The system helps to preserve protected goods.
Storage in an oxygen reduced environment reduces oxidation and the metabolic activity of germs and parasites.

Easy to assemble
The system consists of few elements and is easy to install. Installation of distribution-ts is not required in order to distribute the hypoxic current.

Easy maintenance
Costs of maintenance are low. Due to the simplicity of the equipment, few elements need to be controlled.

LPG Implementation Options

The system operates preventively by default. The protected space is maintained at a 'fire-safe' level of oxygen, ensuring that no fire can start. The system can be configurated according to the following options:

Multiple rooms protection

For the separate protection of rooms additional channels for the distribution of hypoxic air can be included in the system. It is made up by oxygen sensors applied to each protected room and a flow distribution system of the output flow of the separation modules so that the hypoxic mixture is only inserted into the rooms where it is required.

Dual Flow®

During standard functioning, while oxygen is reduced, the equipment also renews the air inside the room.

Occasionally, a more thorough exchange of the air can be required, e.g. to eliminate smells or vapours caused by storage.

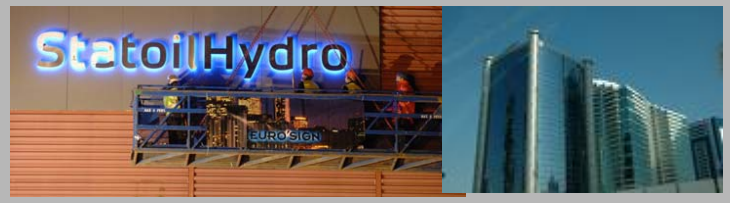
Dual Flow® allows this exchange, when oxygen concentration is within the required margins and the system is on hold. During this period the system is setting up to generate a current with an oxygen content within the protection range, typically 14, 5% (A lower concentration is not necessary. Nor should it be higher, because that would reduce the protection of the room.)

PROJECT EXPERIENCE

Oxygen reduction systems are a new and revolutionary concept. They are already being used for important projects.

Statoil has selected oxygen reduction systems for the protection of Control and Data Rooms.

The systems have also been chosen to protect a part of the Norwegian National Archive of the University of Oslo.



Qatar Petroleum Offices

Leeds Metropolitan University (U.K.)
University of Leuven (Belgium)
Loughborough University (U.K.)
Proctor & Gamble (U.K.)
Gillette (U.K.)
University of Chichester and Plymouth (U.K.)
Technical Museum of Oslo (Norway)
Heritage Archive Store (Netherlands)
Qatar Petroleum HQ (Qatar)
Dubai Police (Dubai)
Hospital of Tanta (Egypt)

SECURITY

For people

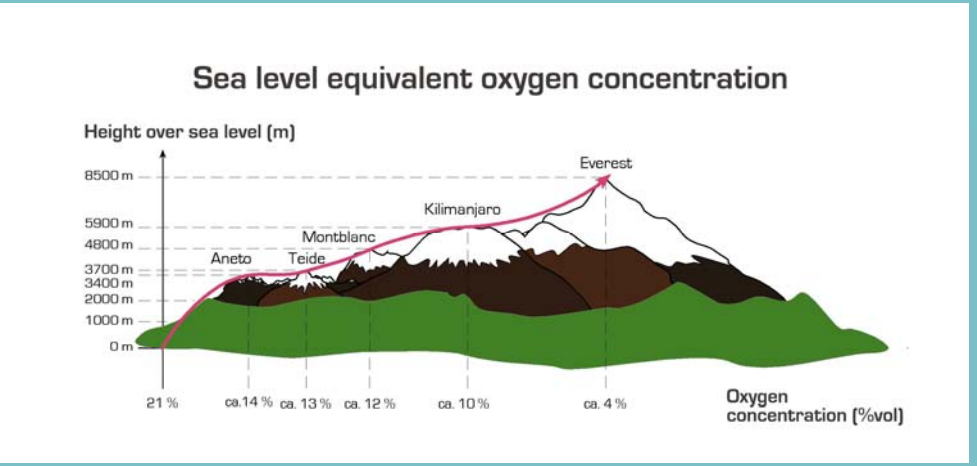
The oxygen level generated by the oxygen reduction systems under ordinary employment is equivalent to altitudes of 2000-3000 metres, where people can breathe perfectly. These values match the conditions in an airplane cabin. The only difference is that oxygen reduction systems do not lower the atmospherical pressure.

Oxygen reduction systems are increasingly **used in gyms and sports centres for the training of athletes.**

The exposure to atmospheres with a low oxygen level is also used in **health treatments** for the alleviation of different pathologies or states of fatigue, as well as in **anti-aging** treatments.

The working conditions exclusive to the oxygen reduction systems of **LPG** ensure that concentrations lower than 10% (characteristic value of oxygen concentration in the output flow of the unit) cannot be obtained in any part of the protected area, not even due to a malfunction of the oxygen sensors.

Certain countries (e.g. Germany) **allow habitual exposure to reduced concentrations of oxygen like those generated by LPG LOXIC.**
Areas with 13-15% of oxygen can be occupied by people, as long as the necessary breaks are taken and routine health analysis are made.



LPG Applications

*The application of **LPG LOXIC** fire prevention systems by oxygen reduction are especially indicated in the following cases:*

Automated parking lots

- The best systems for the protection of areas with complex and changing geometries.
- Flexible to changes of volume.
- Simple appliance that does not interfere with mobile devices for the placement of vehicles

Archives, museums

- Protection of unique and irreplaceable elements.
- Configured to maintain the humidity of the atmosphere.
- The low oxygen concentration helps preserve the protected elements.

Storage areas

- Adaptable to changes in location.
- Aplicable to different types of combustible material.
- Flexible to variable amounts of content.

Data centres

- Non-invasive installation into the protected space.
- Does not create overpressure on glass or any other fragile surfaces.
- Does not generate thermal shock.

Cold storage rooms

- Airtight rooms for maximum energetic efficiency.
- Good homogenization of the environment.
- Flexible to variations in the amount and placement of volume
- No temperature limits for the protected room.