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Comprehensive Fire Protection with

OxyReduct[®]

TITANUS[®]

VisuLAN[®]

Reference solution
Archive

Active fire prevention and very early smoke detection already protect millions of books inside the British Library. Newspapers will now experience the same protection.

WAGNER[®] 

THE BRITISH LIBRARY

Intelligent and state of the art fire protection solutions are being used to effectively protect the written treasures of the British Library stored at Boston Spa, West Yorkshire.



The Additional Storage Program (ASP) at Boston Spa (West Yorkshire)

They belong to the greatest written treasures in the world: the Magna Carta, Leonardo da Vinci's Notebook, the Gutenberg Bible, Beatles manuscripts and the recording of Nelson Mandela's Rivonia trial speech. They are not only of significant importance for our history, but they are all stored in the British Library – the national library of the United Kingdom and one of the largest libraries in the world.

The British Library was established in London on 1 July 1973 and is responsible for the safekeeping of more than 150 million items in about 400 different languages including maps, manuscripts, newspapers, magazines, prints and drawings,

music scores and patents. About seven million items are stored in the Document Storage Centre in Boston Spa, West Yorkshire. To meet the ever-increasing storage requirements, the centre was extended from 2006 - 2008, first with the ADDITIONAL STORAGE PROGRAM (ASP) project and then with the NEWSPAPER STORAGE BUILDING (NSB) project (completed 2014). Today the centre is the world's leading document supplier providing items to customers all over the world.

Increasing the storage capacity
The £26m Additional Storage Program was brought into service in December 2008. In more than 100 km of shelving the UK's "printed treasures" are kept safe. The total

storage capacity of 85,000 m³ is split into two areas of 35,000 and 50,000 m³ each. In both areas books – many historical – periodicals, magazines and other mixed media are stored in about 140,000 barcoded plastic containers in automated high-rack stores that reach 25 m high. As robots retrieve containers the need for personnel within the storage area is eliminated. The £33m Newspaper Storage Building was successfully brought into service during February 2014 after three years of construction. It holds the National Newspaper Collection and contains newspapers from about 400 years ago. They are stored in stacks on metal trays, which are retrieved automatically by a computerised picking system.

HIGH FIRE RISK ANALYSED

Keeping books, magazines and newspapers safe from fire and damage from sprinkler water by deploying technology with lowest capital cost of ownership.



The high-rack stores, with small gaps between racks, provide ideal conditions for the flames to spread quickly. Rising fumes heat goods in higher racks very quickly; therefore flames can reach the roof in no time. And even a small amount of soot, smoke and heat can contaminate stored books and newspapers. The fundamental problem with conventional fire detection systems is that a fire has to start for

them to operate. Hence, the ideal way to protect all valuable assets is to minimise the time span between the start of a fire and the extinguishing. With the priceless archives held in the British Library this cannot be done by sprinklers. The destruction caused by sprinkler water would be devastating. So another fire prevention solution was needed – an effective solution without potentially destructive side effects.

The general risk for an outbreak of a fire inside an archive or document store is normally low. Books and newspapers are dry material and cannot ignite themselves. For a fire to start it needs a source of heat. Inside automated storage buildings the electrical machinery and equipment used can become such a source.

A single fire can have major consequences

The problem is not about how often an equipment fault causes a fire, but the consequences one single fire can have. The collections stored in Boston Spa are of great historical value. They are contemporary witnesses and intellectual property of past centuries. The British Library has the biggest and largest collection in the UK and one of the most impressive collections in the world. Paper itself is particularly vulnerable. It burns quickly once alight.

THE PROTECTION OBJECTIVE

Items of historical significance need optimum fire protection.

When it comes to fire protection in the British Library at Boston Spa the millions of copies of newspapers and books have top priority. In case of a fire not only their value would be at risk. Most of the items are unique and can be traced back hundreds of years into the past. Items that are part of the collective memory of the 19th, 20th and 21st century could be destroyed forever. Therefore, a water-based extinguishing system was no option, as it puts books, magazines and newspapers in even greater danger.

Having had a good experience with OxyReduct®, the active fire prevention system installed in the Additional Storage Program by WAGNER, the British Library again decided to use WAGNER's solutions for the Newspaper Storage Building. However, the client requested improvement in the running costs compared to the Additional Storage Program because of modern whole life costs building regulation requirements in the UK.

APPROVED TECHNIQUE IN SERVICE

Combined active fire prevention and very early fire detection to protect written treasures effectively.



Active fire prevention for the Additional Storage Program

The Additional Storage Program with its two areas that total up to 85,000 m² has been protected by WAGNER's OxyReduct[®] technology as well as TITANUS[®] and VisuLAN[®]. This combination of active fire prevention, earliest fire detection and a hazard management system leads to a broad and effective fire protection solution. OxyReduct's[®] fire prevention membrane technology reduces the oxygen content in both areas inside the automated high-bay storage. This is done by continuously introducing nitrogen to both areas. The oxygen concentration is therefore constantly lowered to between 14.8 - 15 vol%.

This creates an atmosphere that is extremely fire retardant. With an automated retrieval system, no staff are required to enter the storage areas. Therefore, the protection system was designed with a lower oxygen content compared to normal breathing air, which contains 20.9 vol%. However, both areas remain accessible by staff – even with the reduced level of oxygen.

To optimise both the storage and the fire protection systems the temperature and the relative humidity are kept at constant levels of 16 °C (+/- 1 °C) and 52 % humidity (+/- 5 %). The nitrogen used for the oxygen reduction is generated via a membrane and distributed through a pipe system.

In addition 18 TITANUS *PRO-SENS*[®] air sampling smoke detection systems were integrated into the fire protection design.

In an event of fire the TITANUS[®] units recognise even the smallest pyrolysis particles as it actively takes samples from the ambient air. In contrast to point-type detectors, which can be limited in their environmental application, TITANUS[®] has a higher sensitivity – leading to quick and reliable fire detection. In the hazard management system VisuLAN[®] both fire protection systems are linked together. By integrating both systems into the management system, all relevant information can be monitored at a central location. From there appropriate actions can be initiated.

LEADING TECHNOLOGY NEWLY APPLIED

Energy optimised concept for the new built storage.

Efficient and cost effective: fire protection solution inside the Newspaper Storage Building

With a good experience of OxyReduct® in mind, the British Library chose to deploy the OxyReduct® active fire prevention system inside the Newspaper Storage Building. The building

with a footprint of 2,200 m² and volume of 45,000 m³ was built in strict accordance with WAGNER's recommendations – to ensure for the very best conditions for active fire protection. The air tightness of the building as well as the HVAC systems, which works in a full recycling mode, have been specified. Fast acting shutters on the interface

between support building and the newspaper repository also incorporates products recommended by WAGNER. The panels chosen for the fabric of the buildings used a proprietary sealing system and a 4 hour fire rating ITB compliant with BS 5454. The building also provides a n50 value of 0.0148. This high density solution is a

INSTALLATION LAYOUT OF THE AUTOMATED HIGH-BAY STORAGE



Fire prevention system in combination with air sampling smoke detection system

The OxyReduct® VPSA fire prevention system **1** reduces the oxygen level inside the automated high-bay storage. Sensors positioned at different heights **2** monitor the oxygen concentration and report the data to the control centre. TITANUS® air sampling smoke detectors **3** actively take air samples and can therefore detect fires as early as their pyrolysis stage.

Activity inside the NSB Support Building

1. Newspapers from British Library Colindale are temporarily stored in roll cages inside the NSB support building and are then transferred on roll cages on trays at any of eight work stations; stacks of newspaper cannot be higher than 400 mm.
2. Once stacks are placed in position on trays,

they are secured between steel cover plates using straps and buckles.
3. The tray, laden with newspapers, is then recorded into the computerised warehouse management system and is then physically ingested, via conveyors, through air-tight transfer lobbies into the low oxygen, temperature and humidity controlled void space.

4. The transfer of stacks of newspapers onto trays is done manually; everything else is controlled by software and done fully automated.
5. The conveyor transfer lobbies have fast-acting air-tight shutters at each end which prevent loss of low oxygen atmosphere when trays laden with stacks transit through the lobbies.

combination used frequently in warehouse management but rarely in archives and libraries. With a fully automated storage system, this solution was ideal for a high standard fire protection system demanded by the British Library.

Continuous oxygen reduction creates an inflammable atmosphere

Four VPSA OxyReduct® systems have been installed in the Newspaper Storage Building. The active fire prevention system reduces the oxygen content by introducing nitrogen to the area, at a rate of approximately 240 m³/h. As staff are not present within the fully automated high bay storage area the oxygen concentration is continuously lowered to a level between 14.8 and 15 vol%. This creates an atmosphere where stored combustibles do not inflame and an open fire is impossible. Nonetheless the area still remains accessible for authorised staff. In comparison: normal breathing air contains 20.9 vol% oxygen. Furthermore, for the protection of the newspapers the relative humidity is lowered to 35 - 40 % and the temperature to between 12 and 14 °C.

Nitrogen is gained from the ambient air

The nitrogen required is not stored in pressurised bottles, but produced directly on-site from the ambient air by generators with the latest VPSA (Vacuum Pressure Swing Adsorption) technology. Under optimum conditions the system can generate energy savings of up to 80 % compared to conventional membrane systems.



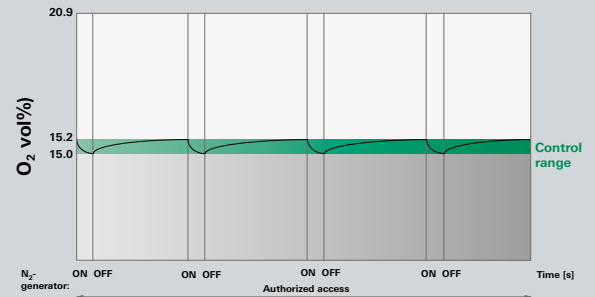
OxyReduct® VPSA can therefore be considered as particularly energy-efficient and climate-friendly as it reduces the running costs for the British Library. The higher investment costs of the VPSA system is calculated to pay back within two years.

In addition 16 TITANUS *PRO-SENS*® earliest fire detection systems as well as the hazard management system VisuLAN® were installed. Like in the Additional Storage Program TITANUS® is used to recognise even the smallest pyrolysis particles in the air. As it actively takes samples from the ambient air, the risk of a fire being unnoticed is minimised significantly – for the maximum protection of the stored newspapers in the building. VisuLAN® monitors the complete area and both fire protection systems to take action if necessary.

INTERVIEW



Patrick Dixon
Head of Engineering &
Construction, British Library



The oxygen concentration inside both storage buildings at Boston Spa has been decreased to approximately 15 vol%. OxyReduct® constantly maintains that level.



” OxyReduct® with VPSA-technology not only provides effective protection but also on the basis of lowest capital costs. ”

What were the reasons for choosing WAGNER again for the protection of one of your buildings?

WAGNER OxyReduct® was previously selected to protect our Additional Storage Building on the basis of lowest capital cost for both fire protection and the overall size of the building. After having had a good experience with this system, we again chose WAGNER.

What is the most important protection goal for the British Library?

To eliminate the risk of ignition or fire within our archives as far as possible, at the lowest possible cost of ownership. We have chosen a system which also provides remote monitoring and alarm data, from a reputable and reliable supplier.

Describe the importance of the Additional Storage Program and the Newspaper Storage Building for the British Library.

The key importance: The ASP houses 7 million volumes and enables our 2-site property strategy, together with the NSB

which is the new home of the National Newspaper Collection and contains over 664,000 bound volumes on 32 km of shelves. Both buildings are therefore unique, as they contain a combination of an automated high bay storage, including storage and retrieval systems, with environmental controls and reduced oxygen fire protection.

Why was VPSA-technology chosen?

Because of the significant energy saving over membrane technology.

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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 (VisuLAN®)