

Explained | Small Enclosure Fire Suppression Protection

Herein referred to as *Rottguard, R-DLP* (Direct acting Low Pressure) systems as defined in LPS 1666



Fig. 1 R-DLP system protecting against fire in electrical control room switchgear of exported shipping container crane.

R-DLP systems make economic sense for the protection of critical assets, such as those seen in Fig. 1 when it is considered that 70% of businesses cease to trade within three years of a serious fire; many of which are caused by electrical faults.

Operation: R-DLP systems extinguish fire automatically in defined spaces, when its pressurized 6 mm tube, attached to the extinguishing agent storage vessel outlet, bursts; on exposure to flame; thus releasing the suppressant; orientated in the direction of the fire.



Fig. 2 - Ruptured tube at point of fire.

In localized fires, as represented under the blackened scorch mark in Fig. 2, only the faulty component needs replacement; saving on costs and downtime.

Extinguishant: R-DLP systems use HFC-227ea (FM-200®) which is respected worldwide, as it is environmentally friendly and is considered safe for use in occupied areas. Its -16.3 °C (2.7 °F) boiling point, enables it to quickly extinguish fire, principally by heat absorption. It is particularly suitable for the protection of electrical and electronic equipment, as it is nonconductive and leaves no residue on discharge.

Applications: R-DLP Systems are not intended as replacements for high pressure ones, which protect whole rooms as in Fig. 3; on which door fan air integrity tests are conducted; to ensure their capacity to retain the extinguishant's concentration over time.

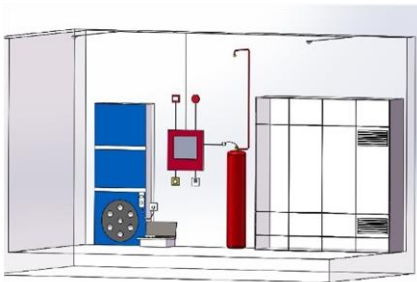


Fig.3 – Electrical switch room with high pressure fire suppression system, being tested for air tightness with a door blower fan test unit.

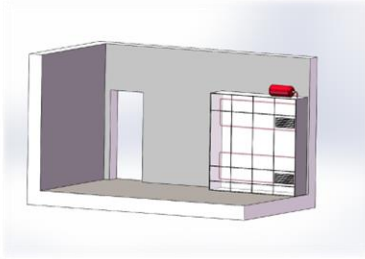


Fig. 4 – R-DLP system protects electrical cabinets within switch room.

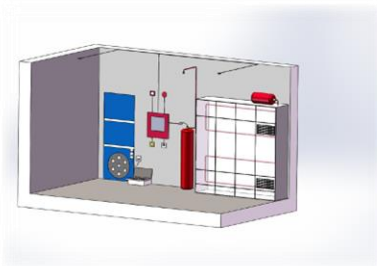


Fig. 5 – R-DLP system supplements an existing fire suppression system within the switch room.



Fig. 6 – R-DLP system with white extinguishant storage cylinders in a Saudi Arabian electrical substation.

R-DLP pre-engineered fixed fire suppression systems are an ideal standalone solution for the protection of the electrical cabinets as seen in Fig. 4. They can also be used to supplement those designed to protect whole rooms, as seen in Fig. 5.

This practice of having two fire suppression systems in the same area, is not uncommon; in instances where insurers perceive the risk to be high, in areas of reoccurring fires.

Fig. 6 shows a R-DLP system, as installed for the protection of electrical cabinets in a Saudi Arabian electrical substation; where the customer specified the use of white extinguishant storage cylinders.

The R-DLP system in that instance was an ideal cost-effective means of protecting the electrical switch gear alone, in what was otherwise a large empty substation.

As all modern electrical enclosures have IP rated door seals, it is not inconceivable that a gaseous extinguishant, might not permeate into their individual cubicles as quickly; from a system designed to protect the whole room; as that emitted within; from a R-DLP system.

The compendium of images to the right in Fig. 7 are representative of R-DLP system installations within electrical switchgear enclosures.



Fig. 7 – R-DLP system examples.

DLP – vs - Whole Room Fire Suppression Systems: While various direct acting systems have been widely accepted and in use for many years, their design hadn't been defined by any internationally recognised standard.

This may have resulted in part by the absence of a specialist test company having determined a consistent rate of flow of an extinguishant, from a ruptured point in the tube as used in R-DLP systems. The permitted rate of leakage of agent in any protected enclosure is also a consideration when designing such systems, as they are tested on perimeter fires and their total flooding capacity.

These variables could always be accurately determined for high pressure engineered systems using software, designed to calculate the hydraulic and flow calculations of an extinguishant; their discharge pipe and nozzle orifice sizes; in systems designed to protect whole rooms. Alternatively, manufacturers manuals could be used in designing pre-engineered systems.

In a similar manner, door blower machines and their associated software are required to carry out air integrity fan tests to calculate the rate of leakage in a protected room. The test results determine

whether a room has the capacity to retain the extinguishant at its design concentration; for a specific time after a system discharge; which in many instances is difficult to achieve. The use of relief vents in such rooms must also be considered, because of the high pressures associated with such systems.

R-DLP System History: In contrast to the above, R-DLP fixed fire suppression systems are classed as being pre-engineered and were developed specifically for the protection of electrical enclosures that are not airtight. They had always been designed on the principle of allocating an individual extinguishant agent storage cylinder, for each vertical section within an electrical cabinet. In instances where sections exceed a given volume, or where louvered ventilation openings are present in such enclosures; an additional agent storage cylinder is allocated for the protection of such cabinets.

R-DLP systems are intended for the protection of non-occupiable enclosures, where the extinguishant design concentration is not restricted to that pertaining for occupiable areas. This design concept has always ensured that there is more than enough extinguishant, to extinguish a fire in any given electrical cabinet, whether they are airtight or not.

The R-DLP design concept has served well in having extinguished known electrical fires in Australia, South Africa and Saudi Arabia, to where such systems have been exported. As all the R-DLP system storage cylinders contain equal amounts of extinguishant, additional non-connected optional reserve cylinders can be fitted in any installation. The availability of reserve cylinders avoids any fire risk being left unprotected, owing to a delay in having a cylinder refilled; in the event of a system discharge.

R-DLP System Certification:

SGS United Kingdom Ltd. inspected samples of the R-DLP system installations and its component certificates, after which it authorised its CE marking, having established its compliance with the Pressure Equipment Directive, 97/23/EC.

Exova: issued document number 351245, a twenty-one-page report, on the positive effectiveness of the R-DLP system; when tested on internationally recognised test fires for clean agent gaseous fire suppression systems in accordance with:

- NFPA 2001: 2015: Annex A - A.5.4.2.2 "Fire extinguishment tests for (non-cellulosic) Class A Surface Fires" - AS ISO 14520.1: 2009: Annex C 6.3. and I.S. EN 15004-1: 2008: Annex C 6.3.
- And the Class B (flammable liquid) fuel sources as defined in: NFPA 2001: 2015: Annex A - A.5.4.2.2 paragraph 5. - AS ISO 145.1: 2009: Annex C 5.1.2.1 and 5.1.2.2. - I.S. EN 15004-1:2008: Annex C 5.1.2.1 and 5.1.2.2.

BRE Global Limited: Tested the Rottguard DLP system to the LPS1666 Standard.

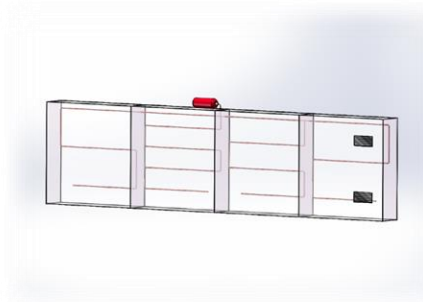


Fig. 8 – One R-DLP extinguishant storage cylinder can protect four enclosures, one of which is vented, within limits. The positioning of the cylinder is crucial in such a system.

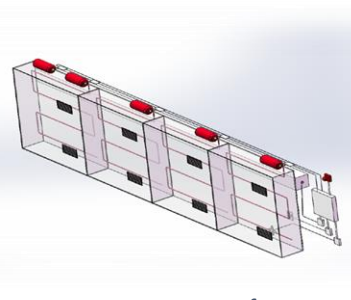


Fig. 9 – R-DLP system protects four vented enclosures, complete with a reserve cylinder.

While the LPS1666 standard makes provision for the protection of up to four enclosures, with one common extinguishant storage cylinder, it specifies the maximum:

- Volume of such enclosures.
- Lengths of fire suppression tubing.
- Number and size of enclosure openings.



This article was written by Gerard Linehan, MD of Rottguard Fire Systems Ltd., seen here during the making of a training video for a customer on a high-pressure CO2 system. His career began with the Electricity Supply Board, followed by some years in the electrical maintenance department of a chemical factory. Since then Gerard has attained 35 years' experience in the fire protection industry, having trained in the UK, America and Israel.

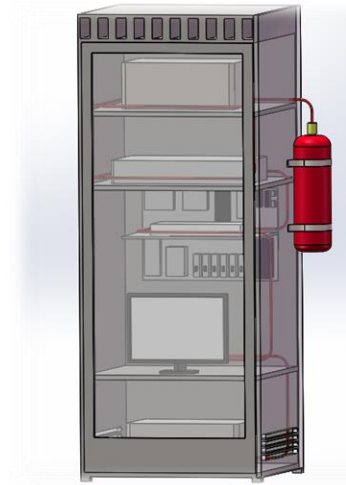


Fig. 10 – R-DLP systems are commonly used to protect electrical enclosures, server cabinets, fume cupboards and CNC machines.

Project: Apple Computer Ltd - HH4-E
Drg.Title: MDB6 Main D. B. & P. F. Correction Panel - Rottguard DLP Fire Suppression System.

■ Rottguard DLP (direct low pressure) acting HFC-227ea fire suppression system storage cylinder.
— 6mm Pressurized fire detection and suppressant tube (represented in various colours).
— 3 x 0.75mm panel flex. ■ 4700 ohm fire detection I/O EOL resistor.
— 1/8" detection tube T-Fitting ■ Fire Detection & Alarm Control Panel
— 1/8" Stop end tube fitting. ■ Fire Detection & Alarm System I/O Unit.

Rottguard Fire Systems' expertise and knowledge in the field of fire suppression is second to none, and their DLP (Direct acting Low Pressure) fire suppression systems captured the attention of the attendees and exhibitors at this years Firex International Exhibition at the ExCel in London.

Rottguard DLP systems comply with the Pressure Equipment Directive 97/23/EC and are CE marked. They have been tested to LPS1666 and on class A and B test fires, as per NFPA 2001:2015, ISO 14520.1: 2009 and EN 15004-1: 2008 standards.

To find out more about the Rottguard fire suppression systems or to discuss your premises needs, give the team at Rottguard Fire Systems Ltd a call or email today.

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