



Fire protection systems

for data processing centers

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CONTENTS

1 INTRODUCTION	2
2 OBJECTIVE	3
3 LEVELS OF FIRE PROTECTION IN A DATA PROCESSING CENTER	3
4 ECONOMIC, FINANCIAL, AND TECHNICAL IMPACT OF A FIRE THAT COMPROMISES THE OPERATION OF A DATA PROCESSING CENTER	4
4.1. Monetary Loss from Interruption per Minute	4
4.2. ¿What Can Cause a Fire in a Data Center?	5
4.3. Fire Prevention Measures Implemented in Data Centers	5
5 INTEGRATION OF COMPONENTS OF AN OPTIMAL FIRE PROTECTION SYSTEM	6
5.1. 3M Novec 1230 Clean Agent	6
5.1.1. ¿How Does Novec 1230 Fluid Work?	7
5.1.2. Advantages of Novec 1230	7
5.1.3. Comparison of Fire Protection Solutions	7
5.2. SEVO Systems Suppression Systems	8
5.2.1. Force 500: Total Flooding Fire Protection System	8
5.2.2. Cube: Pre-engineered Rack-mounted Fire Suppression Systems	8
5.3. Detection and Control	9
6 CONCLUSION	9
7 BIBLIOGRAPHY	10



1 INTRODUCTION

Data Processing Centers (DPCs), referred to as assets, face risks of potential fires due to current technological requirements aimed at maintaining the availability, reliability, and continuity of sensitive and confidential data for communications. These risks necessitate detection and extinguishing systems for fire protection to minimize direct damages from fire and smoke, as well as collateral damages from water or other fluids used in firefighting.

It is essential to analyze various risk assessment methods, considering a plethora of factors to determine the risk in the event of a fire. In this specific case, the Gretener Method is the most suitable for evaluating fire risks in any building or specific environment. Through an exclusive evaluation of a Data Processing Center (DPC) equipped with a Fire Protection System (FPS), it has been concluded that the risk and probability of fire are less than 0.01%.



2 OBJECTIVE

ATo analyze and establish risk levels for a Fire Protection System (FPS) for a Data Processing Center (DPC), determining the protection strategy considering fire detection, alarm, and extinguishment.



3 LEVELS OF FIRE PROTECTION IN A DPC

Three levels of fire protection are required to safeguard data centers, workers, and equipment. The first is building-level fire protection, which shields workers and the building itself. Fire sprinklers and handheld extinguishers are the most common types of building-level fire protection.

The second required level of fire protection is room-level fire protection. Common room-level fire protection measures include pre-action systems and wet pipe sprinkler systems. Additionally, gas systems use inert and clean agent gas to extinguish fires without damaging data centers as water sprinkler systems might.

The third required level of fire protection to safeguard data centers is rack-level fire protection, which addresses specific equipment protection and damage limitation. The most common room-level fire protection measure is the implementation of pre-engineered automatic fire suppression systems. These systems quickly detect fires and suppress them before water sprinkler systems activate, potentially destroying sensitive equipment.

But, ¿what about Data Processing Centers (DPCs) that do NOT HAVE a Fire Protection System?

Unfortunately, in our country (Bolivia), there is little to no culture of properly protecting DPCs, whether they are public or private investments. This starts with a lack of awareness to perform preventive maintenance and apply solutions that ensure and increase data availability for users and IT facilities, not to mention the risk to human lives operating and managing these rooms. There is an idea of saving additional costs, but it is clear that the savings are temporary and not sustainable over time, where the real goal should be to increase the lifespan of assets in DPCs and prevent monetary losses, data losses, and human lives in the event of a fire.

Evidently, if we were to apply the Gretener Method based on what has been mentioned, the probability of a fire in a DPC in Bolivia would increase significantly, and the imminent risk of a possible fire in such a room is much higher. That is why this article aims to technically illustrate the solution that is currently a revolutionary trend worldwide due to the clean agent Novec 1230 patented by 3M and the synergy it generates with SEVO Systems' Fire Protection Systems.

4 ECONOMIC, FINANCIAL, AND TECHNICAL IMPACT OF A FIRE COMPROMISING THE OPERATION OF A DPC

4.1. Monetary Loss from Interruption per Minute

Over the past few decades, the business and industrial sectors have undergone almost radical changes. Among all the changes we have experienced as a society, none is as fundamental as the dependence on information technology systems in supporting critical business infrastructure.

The performance of data centers has become a monetizable convenience for major companies such as banking, aerospace, telecommunications, internet service providers, Oil & Gas, among many others.

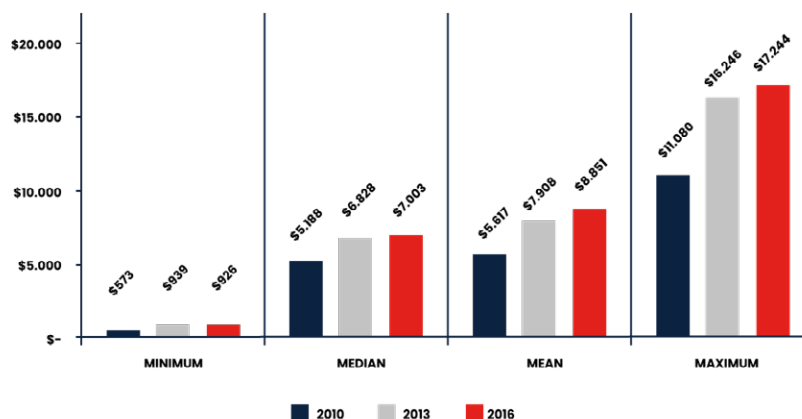


Figure 1. Cost Table per Minute of an Unplanned Interruption in a DPC Room, corresponding to the report by Ponemon Institute LLC from January 2016.

In Figure 1, it is observed that the lack of availability of a DPC, no matter how minimal, generates considerable economic losses, both for the provider and for the clients and/or businesses operating within the same center. It is worth noting that the information in Figure 1 reflects monetary losses up to the year 2016. Considering the current trend and the fact that this sector has significantly increased its requirements in recent years, it is clear that today the amount is much higher.

In this sense, it is established that a fire protection and detection system (FPS) is essential to avoid possible inoperability of the DPC.

4.2. ¿What Can Cause a Fire in a Data Center?

Fire safety is one of the main variables evaluated by DPC providers. A fire in a data center can be caused by many factors, both internal and external to the facilities. That's why DPCs carefully design their fire prevention and extinguishing systems (FPS).

The main fire risks in DPCs are:



- » Short circuits or electrical overloads.
- » Overheating of wiring or equipment.
- » Lack of surveillance or preventive maintenance of equipment in the room.
- » Installations that do not comply with the regulations established for a DPC.
- » Fires can also originate outside the data center due to external risks such as:
 - » Accidental fire in the parking lot or neighboring buildings.
 - » Lightning strikes and atmospheric discharges.
 - » Intentional, sabotage.

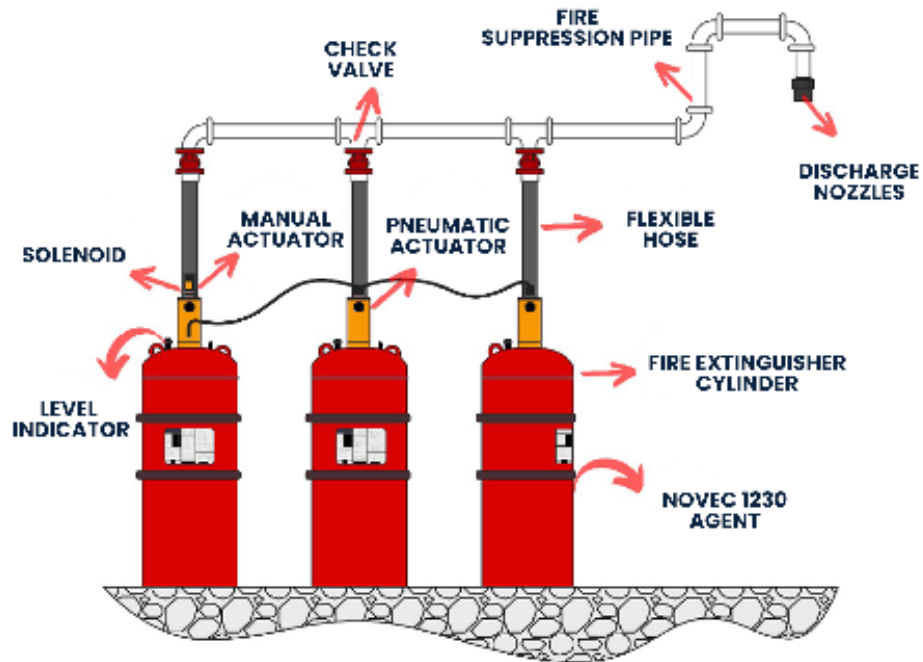
4.3. Fire Prevention Measures Implemented in Data Centers

Large data centers provide a level of security and redundancy that is difficult to replicate on a smaller scale. Data centers where cloud service providers implement numerous fire safety mechanisms go far beyond fire extinguishers and hydrants. Here are some of the measures implemented in these data centers for fire prevention:

- » Early fire detection (VESDA), which detects a fire outbreak prematurely.
- » Smoke detectors on ceilings and under the technical floor.
- » Fire extinguishing systems using gas or misting water, and auxiliary elements such as FHCs (Fire Hydrant Cabinets) and extinguishers.
- » Fire sectors using RF90 walls (Doors with 90-minute fire resistance).
- » On-site security personnel 24x7.
- » Video surveillance and CCTV with image retention.
- » Biometric and/or proximity card readers.
- » Motion and door opening detectors.
- » Restricted access only to authorized personnel.
- » Building management and alarm monitoring through BMS (Building Management System).
- » Redundant air conditioning with relative humidity control and temperature monitoring.
- » Security protocols and certifications .

5 INTEGRATION OF COMPONENTS OF AN OPTIMAL FIRE PROTECTION SYSTEM

Among the components for fire detection systems, the following are included:



5.1. Clean Agent Novec 1230 by 3M

3M™ Novec™ 1230 Fire Protection Fluid is a clean fire extinguishing agent developed as a replacement for halon and as an alternative to hydrofluorocarbons (HFCs). It belongs to the family of chemicals called halocarbons, a group that includes HFCs and fluoroacetones. Novec 1230 fluid is a fluoroacetone, whereas chemical clean agents like FM-200™ and ECARO-25® are HFCs (HFC-227ea, HFC-125). Novec 1230 fluid has a global warming potential (GWP) of less than 1, whereas these HFCs have a GWP of over 3000. Novec 1230 fluid offers the highest safety margin for its use among clean agents, including inert gas.

5.1.1. ¿How Does Novec 1230 Fluid Work?

Novec 1230 fluid extinguishes the fire before it starts by rapidly removing heat. In a typical total flooding system, the fluid is stored as a liquid in cylinders pressurized with nitrogen. Automatic detection sensors activate when the fire is in an incipient phase, extinguishing it in a matter of seconds.

Novec 1230 fluid evaporates 50 times faster than water. In fact, you could soak a book in a bath of Novec 1230 fluid, and within just a minute, you could continue reading from where you left off.

5.1.2. Advantages of Novec 1230

When choosing a fire protection system, your choices can determine whether a person, a valuable asset, or the entire business will survive a fire. If your system uses Novec 1230 fluid, you can confidently offer your customer a solution that:

- » Extinguishes a fire in seconds, even before it starts and long before water-based systems or inert gas release systems.
- » Helps protect valuable assets, such as electronic systems, irreplaceable paper documents, objects, and files. Since Novec 1230 fluid is a fire extinguishing solution that does not use water, it leaves no residue and does not conduct electricity.
- » Offers the highest margin of safety for human occupancy compared to any other clean agent solution.
- » Is not subject to HFC withdrawal under the European F-Gas Regulation or any other international regulatory body, including the Montreal Protocol.
- » Includes a global environmental warranty, the 3M™ Blue Sky™ Warranty, designed to provide the customer with peace of mind.

- » Is stored as a liquid and discharged as a gas, requiring approximately 80% less space compared to inert gas systems.
- » Is suitable for fire hazards of Class A, B, and C.

5.1.3. Comparison of Fire Protection Solutions

Novec 1230 fluid offers unprecedented value and is perfect if you want to:

- » Replace a halon fire protection system.
- » Find an environmentally friendly alternative at a price comparable to FM-200™ or other HFCs.
- » Choose a clean agent with a high safety margin for occupied spaces.

See how it compares to other fire extinguishing systems in terms of performance, safety, sustainability, and design flexibility.

	NOVEC 1230	FE-25 (HFC-125)	FM-200 (HFC-227)	Inert Gas	Water Mist	Sprinkler	Aerosol	CO2
Performance								
Designed for fire extinguishment	✓	✓	✓	✓			✓	✓
Leaves no residue	✓	✓	✓	✓				✓
Non-conductive of electricity	✓	✓	✓	✓			✓	✓
Minimal cleanup	✓	✓	✓	✓				✓
Sustainability								
Global Warming Potential <1	✓			✓	N/A	N/A	✓	
Short Atmospheric Lifetime	✓			✓	N/A	N/A	✓	✓
Safe								
Safety Margin >50% above design concentration (for Class A and C hazards)	✓				N/A	N/A		LETAL
Design Flexibility								
Ventilation Pressure Required by the Doorfan Test	✓	✓	✓		✓	✓	✓	
Requires Sealed Room	✓	✓	✓	✓				✓
Minimum Required Space	✓	✓	✓				✓	

5.2. SEVO Systems Fire Suppression Systems

SEVO Systems products revolutionize the way fire suppression systems with clean agents are designed, installed, and maintained. They leverage the unique chemical properties of a fluid to store it as a liquid but deliver it as a gas. SEVO Systems' exclusive mission is to develop and market equipment and systems optimized for the unique properties of 3M™ Novec™ 1230 fire protection fluid for use in fire protection, differentiating SEVO from all other Original Equipment Manufacturers (OEMs).



Designed and pre-engineered total flooding systems have been tested and approved by UL, ULC, and FM Global, as well as other major international agencies and maritime approval bodies.

Total flooding systems are available at a storage pressure of 360 or 500 psi. SEVO is the only company developing fire suppression systems with clean agents using Novec 1230 Fluid at 500 psi using conventional welded cylinders. This higher storage pressure allows for a "true retrofit" of existing halon systems by utilizing existing piping networks in over 90% of cases. In new construction, higher pressure allows for longer pipe runs and smaller pipe diameters, saving overall costs.

5.2.1. Force 500: Total Flooding Fire Protection System

The SEVO™ 1230 FORCE500™ clean agent fire extinguishing system is a revolutionary new technology for clean agent systems that utilizes

3M™ Novec™ 1230 fire protection fluid and its unique ability to be pressurized to 500 psi (34.5 bar). It allows for longer pipe runs and smaller pipe diameters, in addition to the cost-saving benefits of using a cleaner agent in smaller and/or fewer cylinders per project. Along with these new engineering capabilities, it includes standard monitoring components such as



an integrated pressure switch, a pressure gauge, and a gauge guard. The low vapor pressure of Novec 1230 Fluid allows for the use of low-pressure welded cylinders and Schedule 40 piping. With these revolutionary features, the FORCE500 stands out from conventional 360 psi (25 bar) systems.

5.2.2. Cube: Pre-engineered Fire Suppression Systems for Rack Mounting



The Cube™ rack-mount fire suppression system is a standalone fire detection and suppression unit designed to protect a 19" rack-mounted server cabinet. Mounted on the top shelf of the server cabinet, Cube systems provide 24-hour smoke monitoring using twin optical smoke detectors operated by a control unit with a power supply and backup battery. Upon confirmed detection, the release panel activates the electric actuator to discharge 3M™ Novec™ 1230 fire protection fluid for quick extinguishment.

- » Plug & Play rack-mount system
- » Clean agent extinguishing system
- » Detection and control

5.3. Detection and Control

The RP-2002 is a six-zone FACP (Fire Alarm Control Panel) for single and dual hazard agent release applications. The RP-2002 provides reliable fire detection, signaling, and protection for commercial, industrial, and institutional buildings requiring agent-based release. The RP-2002 is compatible with the System Sensor i3 detector. Additionally, the control panel is compatible with conventional input devices such as two-wire smoke detectors, four-wire smoke detectors, control stations, water flow devices, tamper switches, and other normally open contact devices. Also included on the main circuit board are three programmable Form C relays and special application 24 VDC power outputs that can be resettable and non-resettable. The RP-2002 supervises all wiring, AC voltage, battery charger, and battery level.



- » Control Panels
- » Wall-Mount Horn/Strobe
- » Photoelectric Smoke Detector
- » LCD Series Annunciator
- » Dual Action Agent Release Station
- » Xtralis VESDA Air Sampling Detection

6 CONCLUSION

In conclusion, it is clear that Fire Protection Systems (FPS) must address three issues: detection, alarm, and extinguishment, as they play a crucial role in protecting against a fire event in an IT room. The long-term outcome is to achieve the following:

- » Ensure early detection to prevent fires.
- » Ensure complete extinguishment in the event of a fire in the room.
- » Ensure the lifespan of the equipment being protected in the data center.
- » Ensure service continuity regarding the availability of stored information for users.
- » Ensure that equipment does not suffer damage in the event of extinguishing discharge, thanks to the clean agent NOVEC 1230, resulting in monetary loss.
- » Ensure that the FPS fire protection system has no harmful impact on operators or the environment.



HIGH-QUALITY SOLUTIONS, SUPERIOR PERFORMANCE, AND DURABILITY FOR THE MOST DEMANDING APPLICATIONS

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