

Fire protection of industrial machinery

Rotating or other machinery is being operated in virtually every industrial facility. The 'machinery' can consist of wide range of equipment: from diesel engines to transformers. The size can range from a gearbox to an entire paper machine. Due to the fire hazard the machinery involves, a fixed fire protection system is essential. The high availability requirements and personnel safety emphasise the importance of fire protection.

The HI-FOG water mist systems are an ideal choice for machinery fire protection. They replace both dry chemical, foam and gaseous systems, providing improved safety for the people, property and environment. HI-FOG systems have been approved by internationally recognised bodies such as International Maritime Organisation, Factory Mutual and VdS Loss Prevention.

General

The fire risks normally involve accidental release of hydrocarbon liquids onto hot surfaces or overload in live electric apparatus.

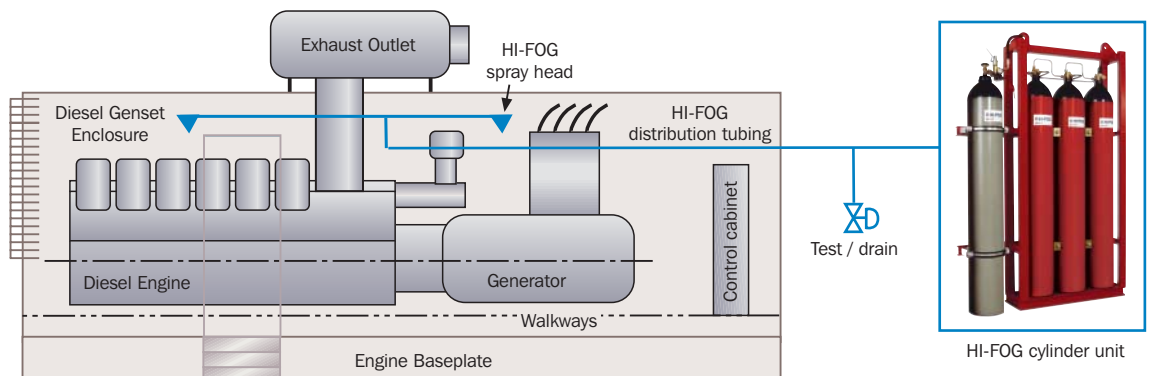
The fixed fire protection system for machinery must be able to quickly extinguish the fire or suppress it and protect the surroundings until relevant personnel have full control of the situation. The system should not be harmful to people, to the protected equipment, nor to the environment, regardless whether set off in a fire or discharged accidentally.

A diesel engine driven generator is a typical example of machinery to be protected. The biggest hazard is caused by failure of the fuel system or lubrication system. If oil comes in contact with hot engine surfaces in air atmosphere, a fire can occur. While great care is applied when designing the engine, the vibration and thermal cycling may cause failures. The hazards presented by other machinery, such

hydraulic power units, presses and rollers are similar to the one explained above.

In case of transformers, the transformer oil, combined with an electrical failure poses a hazard. In switchgear the hazard is posed by an over load, which may set insulation material in fire. It shall be noted that applying fine water mist on live electric equipment has been found safe; testing has shown that arcs or leakage currents are not developed due to the presence of fine water mist.

To put the fire out quickly is not sufficient alone. If contact between the burning material and the ignition source exists, re-ignition risk is significant. Hence, a prolonged, continuous protection with cooling of the space has to be provided. A short fire protection agent discharge or non-continuous discharge is of little value. Agent that leaks out of the space may fail to give adequate protection.



An example of machinery space fire protection

HI-FOG solution – features and benefits

The HI-FOG systems usually have a total flooding design. In very large machinery spaces, local applications systems may be applied. In any case, fine water mist with a specific application rate, droplet size distribution and high discharge momentum is used. Compartments do not need to be gas tight – indeed fire tests are done with a door open. This increases fire protection system reliability significantly and reduces facility maintenance cost.

HI-FOG systems provide:

- Own power supply and water storage (MAU or GPU)
- Proven extinguishing efficiency and operational reliability
- Proven capability to protect equipment from thermal stresses
- Tolerance to poor enclosure integrity
- Easy installation in new and existing facilities
- A safe and reliable alternative to gaseous systems
- An environmentally friendly alternative to foams, dry chemicals, halons and halon alternatives.

HI-FOG systems

A HI-FOG machinery protection system typically consists of a power and water storage unit, spray heads, interconnecting tubing and release control valves.

The MAU (Machinery Accumulator Unit) protects enclosures up to 260m³ (9,175ft³), uses stored nitrogen cylinders and non-pressurised water cylinders. Nitrogen, when released, drives the water to the HI-FOG spray heads. A 16 mm (5/8”) line from power unit to the protected

space and two to four spray heads in each enclosure with 12 mm (1/2”) piping are installed. Typical protection time is 10 or 20 minutes.

The GPU (Gas-driven Pump Unit) is approved for protecting spaces up to 500m³ (17,645ft³). It uses stored nitrogen or compressed air cylinders to drive a special pump feeding water to the distribution network. Inside enclosure, four spray heads are mounted with 12 mm (1/2”) piping. Water for 30 minutes of continuous protection is normally stored in a 1.5 m³ (52 ft³) dedicated tank at the unit. A GPU can be used to protect against multiple hazards when using selector valves. Appropriately listed local application GPU systems are also available.

Both MAU and GPU are pre-engineered, self-contained units, solving problems with power and agent supply. As the systems are used in conditions ranging from offshore platform in the arctic to sandstorm prone hot desert, they are often built in protective or heated skids. Both systems carry Factory Mutual and VdS approvals for machinery protection by total flooding.

Very large machinery may require engineered HI-FOG solutions. They are based on electric motor or diesel engine driven high-pressure pumps.

References

Marioff has supplied HI-FOG systems to protect machinery around the world. The installations include on-shore, off-shore and shipboard systems. Major oil companies and power producers apply HI-FOG in genset rooms, compressor stations, pigging stations and power plants in variety of conditions, including Alaska and Nigerian oil fields.

Approvals

Factory Mutual	Approval Report	HI-FOG system
Combustion turbines, machinery spaces, and special hazard machinery spaces in..		
..enclosures with volumes up to, and including 9,175ft ³ (260 m ³)	J. I. OD5A4.AH, February 9, 1998	MAU
..enclosures with volumes up to, and including 17,645ft ³ (500 m ³)	ID. 3000430, June 5, 2001	GPU
..enclosures with unlimited volumes	Pending	SPU & MT3
VdS Loss Prevention	Approval Report	HI-FOG system
Combustion turbines, machinery spaces, and special hazard machinery spaces in..		
..enclosures with volumes up to, and including 9,175ft ³ (260 m ³)	S 4040002, February 16, 2004	MAU
..enclosures with volumes up to, and including 17,645ft ³ (500 m ³)	S 4040003, February 16, 2004	GPU
International Maritime Organization *)	Approval Report	HI-FOG system
Machinery spaces and pump rooms – Total flooding, MSC/Circ.668/728 (ISO 6182-9 & UL 2167 Ch. 38)	Cert. No. F-17573, June 2004	GPU
	Cert. No. F-17150, January 2003	SPU & MT3
	Cert. No. F-17116, March 2003	
Machinery Spaces – Local application, MSC/Circ.913	Cert. No. F-17443, December 2003	GPU
	Cert. No. F-17445, December 2003	SPU
	Cert. No. F-17117, January 2003	

*) Approvals are issued by various bodies, such as American Bureau of Shipping, Lloyds Register of Shipping, Bureau Veritas etc. In the table above the approvals listed are issued by Det Norske Veritas.



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