Protecting Machinery & Power Generation Equipment
Industrial applications such as machinery spaces, gas turbine enclosures and special hazard machinery spaces are areas where effective fire protection is required. The protected equipment typically involve the use of flammable liquids in connection with hot surfaces or electricity, creating a substantial risk for people, property and business continuity.

Historically, such hazards have been protected against fire with gaseous agents such as carbon dioxide and halons. More recently, alternatives such as halocarbon agents and inert gases have been proposed for the protection of industrial applications.

Well-engineered, high-pressure water mist fire protection systems provide superior extinguishing properties, cooling to prevent re-ignition and further damage, and radiant heat absorption to prevent fire spreading. They are safe for people and the protected equipment in case of fire or accidental discharge, containing only natural elements – water and air – that will never be banned.
HI-FOG solutions range from simple, self-contained pressure cylinder systems protecting small enclosures, to powerful pump systems for protecting the largest of machinery spaces.

Because HI-FOG systems utilize high pressure and velocity, the average water droplet size in the ‘mist’ can be very small and the combined surface cooling area becomes very large. As well as ensuring highly efficient extinguishing, the space is quickly cooled, surrounding equipment is protected from the heat, and chance of re-ignition is minimized. Additionally the discharge is totally safe for people, equipment and the environment. Which makes HI-FOG the system of choice for protecting flammable liquid fire risks!

HI-FOG minimizes downtime
When the fire has been extinguished, the machinery can be back in operation in no time, ensuring business continuity. The time for repair, clean-up and system reactivation will be minimal compared with traditional fire protection systems.

HI-FOG saves lives
HI-FOG uses potable water as extinguishing media. It is therefore harmless to people and can be activated prior to evacuation of personnel. The fire is attacked and restricted, while still in its infancy. Smoke development is significantly reduced and personnel can then safely be evacuated.

No chemical additives
Unlike some systems, HI-FOG uses plain water, sometimes with the addition of nitrogen gas. There are no chemical additives, which could be harmful to people or equipment, as well as being costly to clean and recharge.

Testing ensures safety
Extensive HI-FOG fire tests have been witnessed by major classification societies and approval bodies. The HI-FOG system can be tested at any time – a short duration water mist discharge will ensure that everything is fully operational if a fire occurs. HI-FOG GPU and MAU systems bear the respected Factory Mutual type approvals.
I-FOG Total Flooding systems are becoming the ‘first choice’ fire protection solution for all machinery spaces. This includes turbine and generator enclosures, transformer and compressor rooms, engine test cells, indeed any enclosed space with risk of liquid fuel fire.

For small areas a MAU (Machinery Space Accumulator Unit) is normally suitable, whereas for larger spaces and multiple space protection, the GPU (Gas-driven Pump Unit) is more appropriate. Systems are self-contained and do not require electric power.

For very large spaces where complete protection is required, HI-FOG MT3 total flooding systems can be supplied. In this case the electrically driven SPU pump unit is used with additional nitrogen cylinders.

**Machinery space protection**

Full scale fire test programs have shown that HI-FOG Machinery Space systems can extinguish spray and pool fires caused by ruptured fuel or lube oil lines. The system provides dramatic space cooling which lowers risk of re-ignition and radiant heat blocking, which means that equipment near the fire is protected from damage. Systems are normally deluge type, activated manually or by a suitable listed detection system, so all HI-FOG spray heads operate simultaneously in the space.

**Gas Turbine protection**

Marioff has developed HI-FOG systems specifically for protecting against potential oil fires in gas turbine enclosures. The FM approved systems have few nozzles and a single tubing network, making installation easy and keeping costs low.

HI-FOG systems have passed the FM and other distortion tests with a ‘continuous discharge’ technique using small quantities of water, initially at a rate, droplet size and density adequate for flame suppression, and subsequently at a rate to prevent re-ignition. This means efficient fire extinguishing with no possibility of turbine casing distortion. Enclosure integrity is not crucial as fire testing has been successful even with doors to test enclosure partially open. And the self-contained MAU power unit requires no external power or water supply.
Offshore Oil & Gas protection

Marioff has supplied one of many HI-FOG systems to the world's largest energy companies to protect gas turbines, gas compressors, emergency generators and other machinery spaces on offshore oil & gas platforms around the world. These are typically small machinery spaces where HI-FOG total flooding MAU or GPU systems are specified.

One of hundreds HI-FOG systems installed on several North sea platforms. Systems were fully hazardous area rated and supplied in stainless steel enclosures to meet the highest offshore standards.

HI-FOG systems protect key areas on the giant 300,000 ton Floating Production, Storage and Off-loading (FPSO) vessel being built for Shell’s Bonga oil and gas production project, offshore West Africa.

**HI-FOG protected areas on Bonga FPSO**
- 7 decks of accommodation & service areas
- oil purifier rooms
- fire pump compartments
- hydraulic power pack compartments
- incinerator & transformer rooms
- generator room
- emergency and essential diesel generator rooms
- top sides power module
Local Application systems

In the past it has been almost impossible to effectively protect against flammable liquid fire risks in a very large space. Local gaseous systems can be dangerous to personnel, have limited discharge time and provide no cooling to prevent re-ignition. Conventional spray systems can be ineffective and cause extensive damage to property and equipment with large volumes of water.

Marioff is now able to offer a range of HI-FOG solutions, based on extensive fire test experience, which provide appropriate local protection for oil fire risks without high volume water use. Fire protection is enhanced, personnel safety is assured and equipment damage is minimized.

The system can be designed to give extended time protection, alternatively a short duration protection if local fire brigade can arrive within a guaranteed time. The local protection can be enhanced by a background mist system in the whole space which provides cooling and radiation blocking to protect other equipment in the space.

Example 1

A HI-FOG Local Application system was installed to protect the 14MW Solar Turbine drive set and Dresser Rand compressor in Transco’s 2350m³ (83,000 ft³) gas compressor room at Churchover, UK. Marioff has supplied a system which protects the high risk zones with local application discharge, and the rest of the space with cooling/radiant protection mist density. The system’s GPU (Gas driven Pump Unit) sits in a weatherproof and heated enclosure where the dedicated water storage unit and supply piping is trace heated and monitored.

Example 2

A very different fire risk is protected by a self-contained HI-FOG Local Application system at Metso Paper’s Technology Centre, Järvenpää in Finland. Here the GPU system protects the oil heated soft rolls, thermo rolls as well as rotating couplings, as well as two adjacent machinery rooms associated with R&D paper finishing machinery. The HI-FOG system has dual manual activation and guarantees 20-minute fire suppression over the three protected areas.
Over 5000 full scale fire tests have helped Marioff receive more approvals than any other water mist system manufacturer.

For machinery space fire risk, Marioff can provide either pre-engineered or engineered HI-FOG solutions which take into account the client’s requirements and are appropriate for the particular space.

<table>
<thead>
<tr>
<th>Total protection</th>
<th>MAU</th>
<th>GPU</th>
<th>SPU</th>
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<tbody>
<tr>
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= Pre-engineered systems  = Engineered systems

**MAU**

*Machinery Space Accumulator Unit*

Suitable for total protection of small enclosed spaces from flammable liquid hazards and special hazards.

**Key Features & Benefits:**
- nitrogen or air powered
- non-pressurized water cylinders
- easy installation & maintenance
- easy integration to detection systems
- manual, pneumatic or electric release

**GPU**

*Gas-driven Pump Unit*

Specify a GPU system where normal water supply or electric power may not be available or where water discharge must be minimised.

**Key Features & Benefits:**
- nitrogen or air driven pump
- no external power needed
- manual, pneumatic or electric release

**SPU**

*Sprinkler Pump Unit*

The HI-FOG MT3* system uses this pump with additional nitrogen cylinders for protection of large machinery spaces. A version is available with diesel motor.

**Key Features & Benefits:**
- modular motor/pump assembly
- water tank or water supply
- continuous operation providing extended protection time

* type approved by major Classification Societies