Quality
Monitoring
Instruments Ltd.

5 Hampstead West
224 Iverson Road
London
NW6 2HL

Tel: +44 (0)20 7328 3121
Fax: +44 (0)20 7328 5888
Email: qmi@oilmist.com
Web: www.oilmist.com

OIL MIST DETECTION
IN THE ATMOSPHERE OF THE ENGINE ROOM

You may be aware MCA and IMO, together with other Societies, are very concerned about the number of fires that start in machine room spaces. Places most at risk are engine and purifier rooms. However, other areas have their own problems and these include bowthruster rooms, steering gear and hydraulic pumps. Figures produced suggest that up to 65% of machine room fires are the result of oil mist.

WHAT IS OIL MIST?

There are two ways oil mist can be formed. One is when oil mist is generated through minute leaks in oil lines which, under pressure, give off a very fine atomised spray. The other source of oil mist is when oil hits a hot surface and boils.

Danger occurs when high pressure type leaks of oil mist are formed with a particle size of between 3 - 10 microns that builds up to a hazardous concentration of mist in the atmosphere. At levels of saturation conditions are truly hazardous, and if no action is taken a fire can start. The ignition temperature for this type of oil mist can be extremely low depending on the fuel that is being atomised.

Other ways oil mist can be generated is when drops of oil hit a hot spot or surface and boils. When oil mist is produced by boiling the particle size is then about 3-10 microns. This mist is visible and is known as blue smoke. The larger and hotter the hot area is the quicker oil mist is produced. At this stage a temperature as low as 150°C can cause ignition.

HOW OIL MIST FIRES START.

Many Engineers believe that when oil hits a hot spot it immediately ignites, this is not quite correct. The processes already described needs to occur before a fire of any consequence can start.

Protection of Compressors and Pumps

The atmospheric detector heads include their own fan, this ensures correct airflow and tamper-proof operation avoiding the need to use pressure or air flow regulators.

Concentrations of oil mist may be localised, but normally it diffuses into the surrounding area. If this concentration of mist spreads throughout the machine room space, a flash fire can occur over a large area.

In some instances it has been known that oil mist can remain in layers if there is a strong air stream or no air turbulence. The mist then becomes a sandwich filling lying between two layers of uncontaminated air. Under these circumstances, if ignition occurs there is a quick flash fire that may leave the area above and below the fire completely undamaged.

Oil mist in areas where hot spots do not occur such as bow thrusters, purifier rooms or steering gear can still have problems; for example, there can be an ultimate loss of power. Oils in this area are expensive as major disruption can occur, therefore leaks should be located as soon as possible. Deposits from mist cause unnecessary mess that takes time to clean up.

An oil mist detection system should be considered for use along side a smoke detection system. If reliance is placed solely on a smoke detector as a form of protection against fires taking hold, a situation can arise where it may be too late to avoid damage and even loss of life.

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General pipework monitoring

SOURCES OF MIST:

leaking injectors
fractured flexible hoses
loose or incorrectly fitted pipe fittings
broken welds
poor maintenance of machinery

SOME CAUSES OF IGNITION:

exhaust pipes
turbochargers
non-flameproof motor
electrical contacts
static electricity
faulty wiring

HOW TO PREVENT OIL MIST FIRES

The ideal is to make sure no leaks occur in the first instance. This would be simple in a perfect world, but mistakes do happen.

The practical answer is to install an oil mist detection system that will detect oil mist as it is being diffused into the atmosphere which will alarm long before it saturates the atmosphere to a danger level. It should be noted that steam and smoke have approximately the same particle size, so an oil mist detector should be able to detect these parameters if the right system is used - which is a bonus.

ATMOSPHERIC OIL MIST DETECTORS

How do they work? As I represent QMI I can only talk about this product. The QMI system incorporates up to 12 detectors using one monitor. The detectors are placed around the vessel in vulnerable areas where oil mist leaks are more likely to occur. The detectors are placed in the air stream that can normally be found by using a smoke generator. The route the oil mist usually takes is towards the turbocharger or the exit ventilation duct. Our detectors have a built-in fan and continuously draw in and monitor the surrounding atmosphere. This is because oil mist diffuses into the environment and does not generally stay in one place.

The detector communicates to the monitor through 6-core cable. The monitor can be stationed away from the danger area. The cable carries the signal and power to and from each detector and fan. The sensing system is the same as in the QMI Multiplex crankcase detector that uses light scatter as its detection source. The monitor has alarm and activating functions with on/off switching. There is a self-diagnostic fault finding system so the monitor will not give false alarms if there is a problem with the monitor or detectors.

CONCLUSION

Always remember the old adage *"There is no smoke without fire*". Now it is possible to try to protect against a fire there being no need to wait for smoke to give a warning. In other words, you can help stop a fire before it starts.

For an in depth view on oil mist we have a paper available prepared by Dr Malcolm Holness, PhD, C Chem, FRSC, M Inst Pet. late of M O D who specialised in investigating fires for the Royal Navy.

Brian J Smith
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5 Hampstead West 224 Iverson Road LONDON NW6 2HL U K
Tel: 020-7328 3121 (Intl. +44 207) Fax: 020-7328 5888