QMI
OILMIST.COM

QUALITY MONITORING INSTRUMENTS LTD

An Introduction to Oil Mist

KEEPING PERSONNEL AND
EQUIPMENT SAFE FOR MORE THAN **35 YEARS**

An Introduction

- Understanding Oil Mist
- A danger to man, machinery and the environment
- QMI – at the forefront of machinery fire protection
- About ‘light-scatter’
- Using light-scatter to monitor differently
- Engine crankcase detection
- Atmospheric Sensors
- Monitoring and measuring
- Key points

QUALITY MONITORING INSTRUMENTS LTD T: +44 (0) 20 7328 3121 E: qmi@oilmist.com W: www.oilmist.com A: 4 East Barnet Road, London EN4 8RW

Understanding Oil Mist

All engines generate Oil Mist.

And fuel oils, lubricants and hydraulic oils can all become flammable via their oil mist, even though they are comparatively non volatile liquids and have flash points higher than normal temperatures. When droplets of these fluids are airborne they potentially create a harmful, toxic and hazardous environment.

Measurement of these droplets falls into three categories:

Droplets smaller than 1 micron are designated as oil ***Smoke***

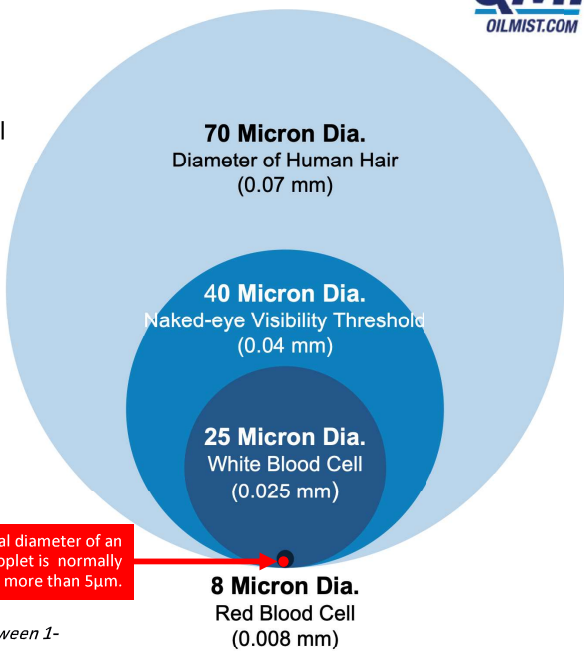
These droplets tend to appear blue in colour and are produced when oil is in contact with extremely hot surfaces – typically greater than 800°C

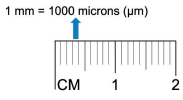
Droplets between 1-10 microns are referred to as oil ***Mist***

These appear white and are produced at surface temperatures between 200°C and 600°C

Droplets bigger than 50 microns are identified as ***Spray***

These are produced mechanically, for example from a pinhole leak in a pressure line.





The diameter of an Oil Mist droplet is measured in microns, which can be between 1-10 microns in diameter but which normally average around 5 microns.

There are 1000 microns to every millimetre and each micron is referenced to using the Greek letter "µ" as in 'µm'

QUALITY MONITORING INSTRUMENTS LTD T: +44 (0) 20 7328 3121 E: qmi@oilmist.com W: www.oilmist.com A: 4 East Barnet Road, London EN4 8RW

A danger to man, equipment and the environment

Excessive generation of oil mist potentially creates a harmful, toxic and hazardous working environment.

WHY?

Three reasons:

- The larger droplets can enter the nose and throat and be swallowed and smaller droplets can be deposited in the lungs causing irritation of the eyes, nose and throat. Oil mist can even contain metal particles with carcinogenic substances.
- In addition to injurious effects on humans, Oil Mist can be harmful to machinery, particularly sensitive electronic equipment.
- Lastly – and perhaps most importantly – an excessive build-up of Oil Mist in an enclosed space creates a combustible environment where the increasing density of an oil mist adjacent to a hot working surface could cause a fire and personal injury.

QMI has been at the forefront of engine and machinery space fire protection since the early 1980s when QMI company founder, Brian Smith, helped develop a system to protect large diesel engines from explosions due to the ignition of oil mist inside an engine crankcase.

Along with a colleague, Brian applied the innovative use of 'nephelometry' in measuring a build-up of dangerous and hazardous levels of oil mist in industrial applications. This was unheard of at the time but using nephelometry in this way is now globally recognised as having saved many fire and hazardous situations occurring.

Initially, QMI systems using this 'light-scatter' technique have been used in the Marine sector where they are installed in Engine Rooms, Hydraulic Areas and Pump Rooms. Additionally, now they are also installed in land-based applications in the Aviation, Transportation and Power-Generation sectors.

Brian Smith authored many papers over the years about Oil Mist that are still relevant today.

About ‘light scatter’

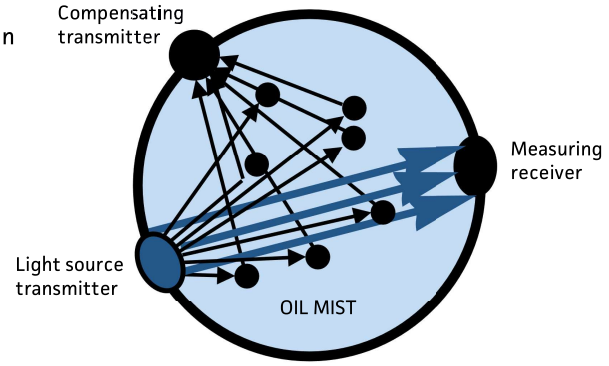
Nephelometry *(from the Greek nephelo: cloud)* is an analytical chemistry technique used to measure the amount of turbidity - or cloudiness - in a solution caused by the presence of suspended insoluble particles.

In industry it is commonly referred to as ‘light-scatter’ – and it is the principle under which QMI systems monitor – and measure – Oil Mist in a variety of industrial applications.

What is light-scatter?

The detailed design of a QMI Oil Mist detector is based on the optical effects of an oil droplet on a beam of transmitted light. The effect observed is twofold.
Some of the light is transmitted unaffected (and can be observed by a detector) and some is intercepted by the droplets. Of the light intercepted, the droplets absorb some but most is scattered away from the detector.

Schematic diagram showing principle of Nephelometry



Nephelometry is highly sensitive at low light levels
Zero mist gives zero signal
Signal increases as mist level increases
(Short light path is an advantage)

QUALITY MONITORING INSTRUMENTS LTD T: +44 (0) 20 7328 3121 E: qmi@oilmist.com W: www.oilmist.com A: 4 East Barnet Road, London EN4 8RW

Using ‘light scatter’ to monitor differently

Using light scatter technology, QMI Oil Mist Detectors operate in two different ways.

1 For engine crankcase applications we achieve discrimination in favour of ‘fine’ mist droplets (over large droplets) by the use of a “labyrinth.” This is effective in trapping the large droplets of oil mist and returning them to the crankcase.

Inclusion of this labyrinth allows the Detector Head to be placed very close to the atmosphere being monitored, which greatly improves the response time.

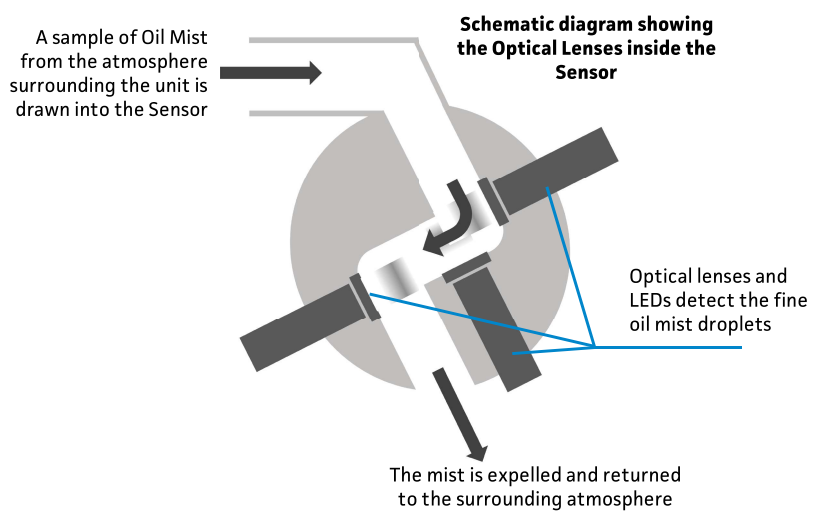
2 An Oil Mist Detector for an ‘open machinery’ space (such as the engine room itself or a hydraulic pump room or test cell) does not require a labyrinth since it is necessary to "see" all the droplets in the air - whatever their source.

Since the company’s inception 37 years ago Quality Monitoring Instruments have developed two different detectors which meet the requirements for oil mist monitoring in these two different situations.

Atmospheric Sensors

2

The QMI Atmospheric Sensor operates under the same principle as the Engine Detector, with Oil Mist being drawn into a measurement device where three Sensors detect the percentage of oil mist in the unit.



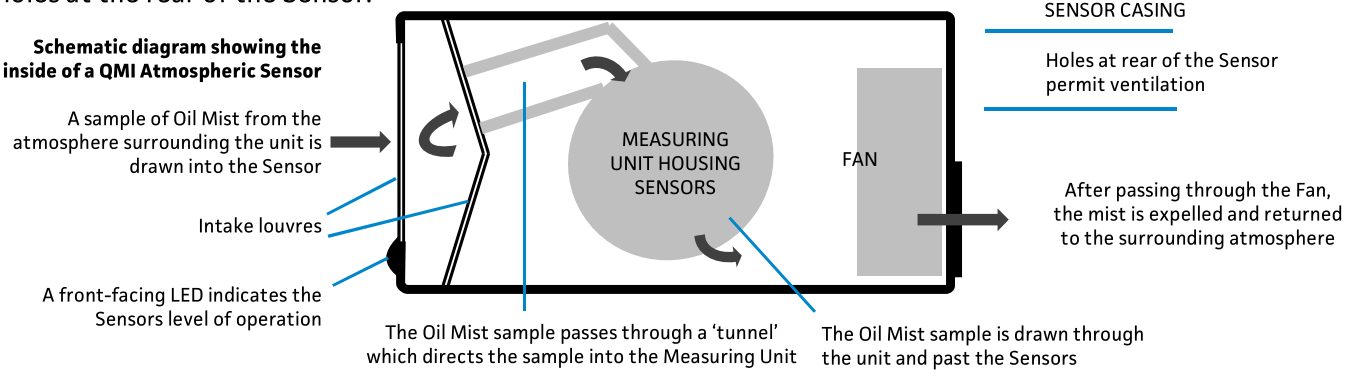
Atmospheric Sensors

2

The unique design of the QMI Atmospheric Sensor draws atmospheric particles into the unit through use of an integrated Fan which 'pulls' the oil mist through. After passing through Oil Mist intake louvres, the sample swirls through a vortex before passing through another set of louvres and enters a tunnel into the Sensor itself.

On exiting the Measuring Unit, the oil mist sample is expelled through the Fan and out through ventilation holes at the rear of the Sensor.

Schematic diagram showing the inside of a QMI Atmospheric Sensor



Atmospheric Sensors

2

Atmospheric Sensors are not confined to marine applications only. There are many land-based applications where the leak of a hazardous fluid could cause injury and harm, and for this reason many insurance companies now request the inclusion of a suitable atmospheric monitoring system in an industrial location.

Shown below are a few examples of installations and a separate document lists other examples and incidences where fires have occurred and where QMI equipment has assisted with preventing damage and injury.


Oil Purifier Room


Test Cell


Boiler MDO Supply Pumps


Boiler Burner Area

Monitoring and Measuring

As an integral part of the system, QMI Monitors have been designed to coordinate signals from the various multi-placed Detectors and Sensors.

To address industry requirements, over the intervening 37 years QMI have subsequently introduced three monitoring systems:

In 1984 QMI introduced the **MULTIPLEX™ 12-Channel Oil Mist Detector** for Marine Engines

In 1989 we launched a QMI Atmospheric Oil Mist Sensor for 12 Channels

In 2001 we introduced the **TRIPLEX™ 3-Channel** system

MULTIPLEX™ Monitor (CMU) Part No. Q01H

TRIPLEX™ Monitor (CMU) Part No. Q01T

Both the MULTIPLEX™ and TRIPLEX™ Monitors operate in the same way with the simple difference being that the MULTIPLEX™ system has the ability to monitor up to 12 Channels simultaneously while the TRIPLEX™ system can monitor up to three Channels.

Monitoring and Measuring

QMI Monitors feature sophisticated and extensive operating and display properties.