Water Mist Fire Protection Systems for Machinery Local Protection

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AGENDA

Definition of machinery local protection

Fire test protocols overview

Application overview

Challenges from real-life

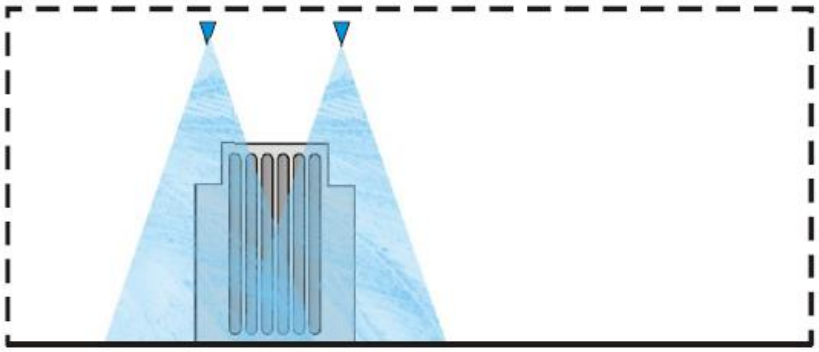
Summary & Key take aways

DEFINITION

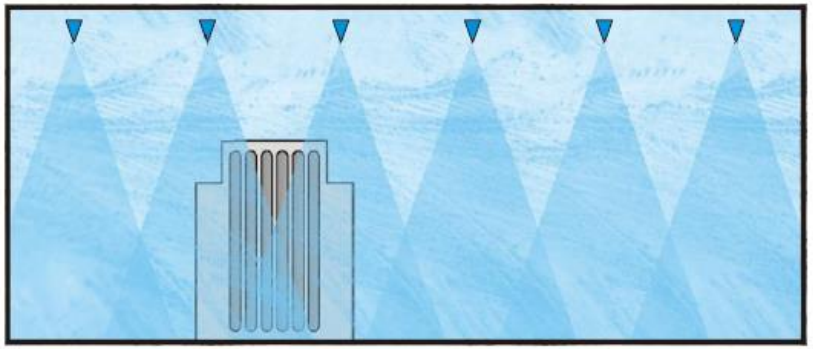
Machinery Local Protection

A machinery **local protection system** is one where a fixed supply of extinguishing media is discharge into a defined area that has either **no enclosure** surrounding it, or is only partially enclosed.

Local application systems protect equipment using **flammable liquids** in **open areas**.



Local Application



Total Flooding

Local protectionn eliminates the limitations of room sizes for total flooding systems.

FIRE TEST PROTOCOLS

FM Approval Standard Class 5560 includes a test protocol for the approval of **Local Application** systems to be used as a **primary** protection system.

Other machinery local application fire test protocols are:

IMO 1387 - only spray fires, secondary system

CNPP TD2 - based on actual machine mock up

BS 8489-4:2016 - similar to FM

FM 5560 TEST PROTOCOL

Appendix I

General Testing Requirements

The water mist system shall be capable of **extingushing** the fire scenarios in this Appendix that are required based on the type of local application being requested by the water mist manufacturer. It is the responsibility of the water mist manufacturer to inform FM Approvals of the type(s) of local application in which FM Approval is being requested.

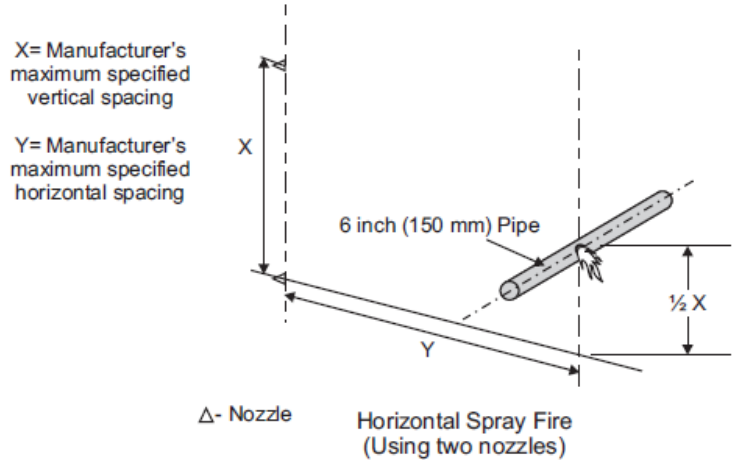
Fire Test Scenarios

(1) Square Pool Fires (4 off including min/max nozzle height)
(2) Channel Pool Fires (4 off including min/max nozzle height)
(3) Spray Fires (4 off including min/max nozzle height)
(4) Combined Pool and Spray Fires (5 off including min/max nozzle height)
(5) Obstructed Pool Fires (2 off including min/max nozzle height)
(6) Offset Pool Fires (2 off including min/max nozzle height)
(7) Combined Pool and Spray Fire
w/ External Ignition Source (2 off including min/max nozzle height)

A total of 23 full scale fire tests
Approval criteria: Extinguishment

FIRE TESTING

Spray Fires



Fuel package diesel or heptane
Maximum nozzle distance from spray
Pressure at nozzle
k-factor
Type of pump unit

Extinguishment should be registered by thermocouples located above the pool and in front of the spray fires. Registration by means of thermal imaging equipment is strongly recommended.

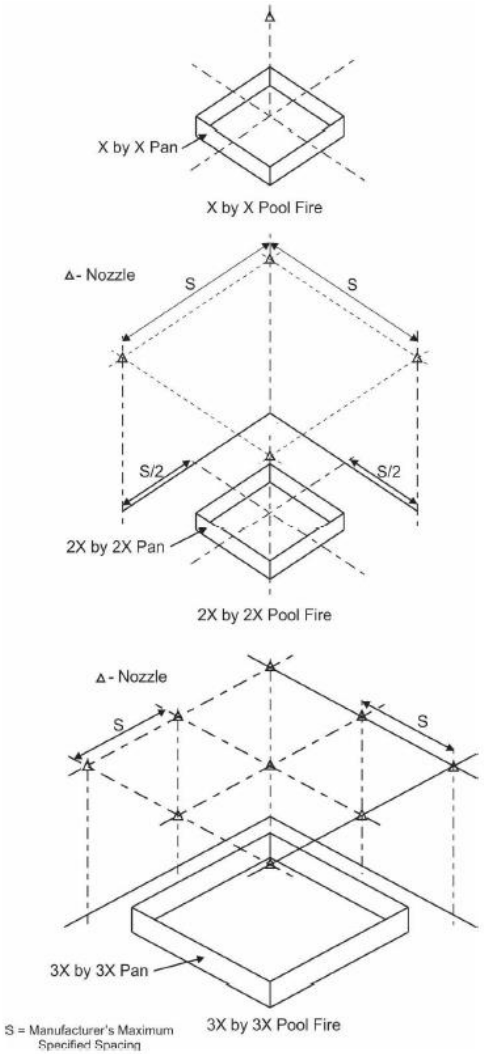
FIRE TESTING

Pool Fires

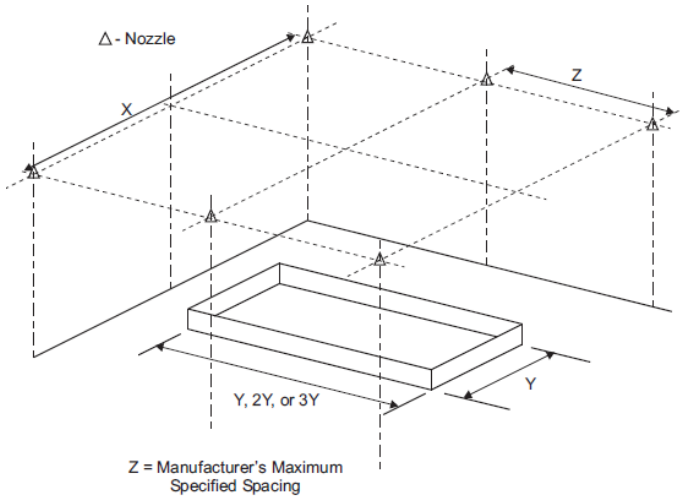
Square Pool Fire

Fuel package diesel or heptane
Maximum nozzle height
Pressure at nozzle
k-factor
Type of pump unit

Square Pool



Channel Pool



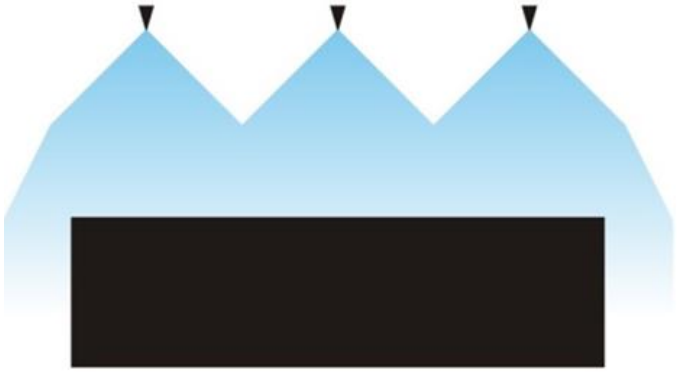
Extinguishment should be registered by thermocouples located above the pool and in front of the spray fires. Registration by means of thermal imaging equipment is strongly recommended.

APPLICATION OVERVIEW

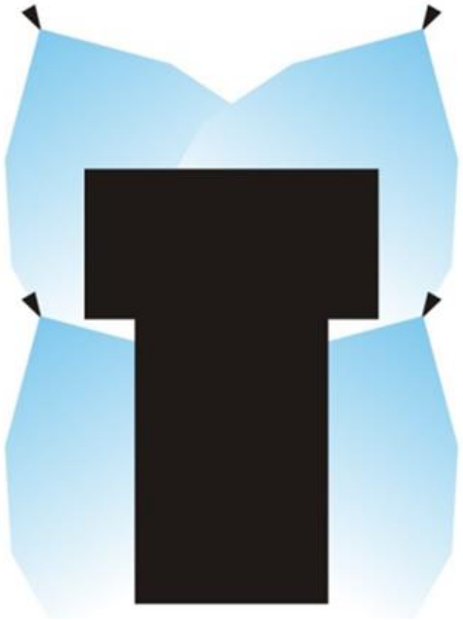
Machinery Local Application

During full scale fire testing, different system types were evaluated

Overhead protection



Surrounded protection

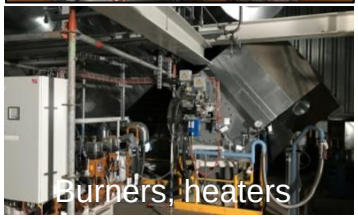


Point protection

APPLICATION OVERVIEW

Sub segments

Applications



All have
”flammable liquids”

Pressurized oil and/or fuel lines. Hydraulic and lubrication systems etc.

CHALLENGES FROM REAL LIFE

Steam Turbine

MACHINERY LOCAL PROTECTION

Manufacturers Challenge

Sample from real-life

Turbine bearing including pressurized lubrication oil

Spray fire

Pool fire

?

Water mist system

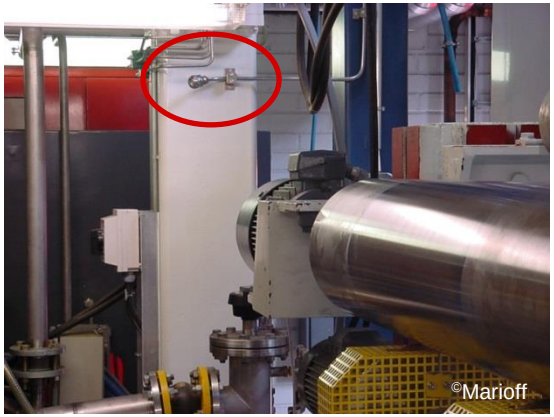
Out of the 23 full scale fire tests, who will determine which are applicable for this particular case and what would be the optimal water mist system solution?

MACHINERY LOCAL PROTECTION

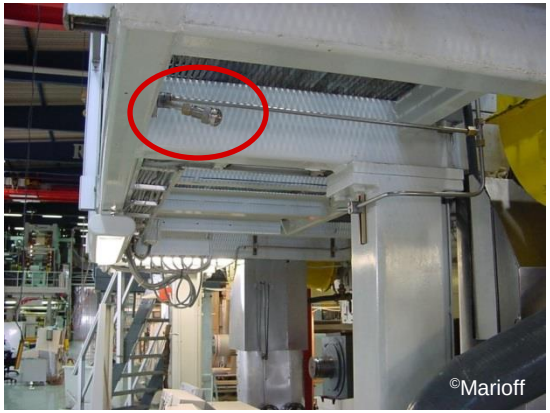
Application Samples

Surrounded protection

In real-life, installation limitations might force you to remove obstructions and/or apply optimized nozzle layout.



Point protection of an object



Point protection of an object

SUMMARY

Key Take Aways

Water mist fire suppression systems are always performance based. System design parameters are defined based on full scale fire tests.

Machinery local protection based on FM 5560 fire test protocol covers a wide range of applications having flammable liquids and no enclosure.

Challenge is to apply a certain performance based design with a real-world application. Assessment of the fire hazards and identification of heat sources are critical.

The water mist manufacturer, the end customer as well as local AHJ need to agree on machinery local protection design.

THANK YOU FOR YOUR ATTENTION

QUESTIONS?