How does watermist fight fires and how can it be applied in real life

IWMA Seminar

15th January 2013

Dubai, UAE

By Alex Palle, CEO VID Fire-Kill, Denmark

Agenda:

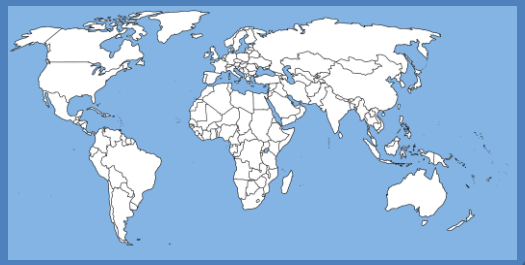
1) Introduction to VID Fire-Kill.
2) What is Watermist and how does it fight fires.
3) How can we apply Watermist in projects.
    a) Applications.
    b) Watermist System to be provided.
    c) Approval/testing of system.
    d) Product Manuals and watermist design standards.
4) Real Life Project examples.

1. VID Fire-Kill

Production and testing

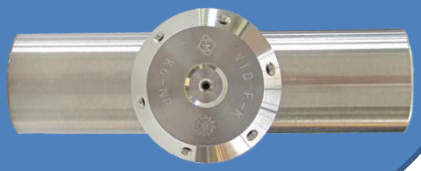
Covering all applications

Global Player and Sales



Low Pressure, low flow

Environmentally friendly



Danish Design

Tested and Approved

DNV

Lloyd's Register

ISO 9001 Management System Certification BUREAU VERITAS Certification Denmark A/S

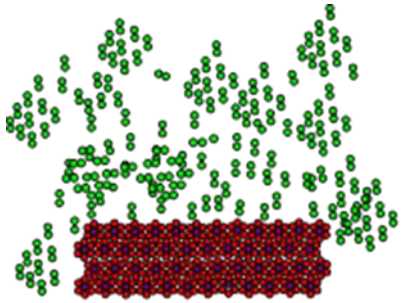
FM APPROVED

CE Ex II 3G/D nA T4

2. What is Watermist and how does it fight fires?

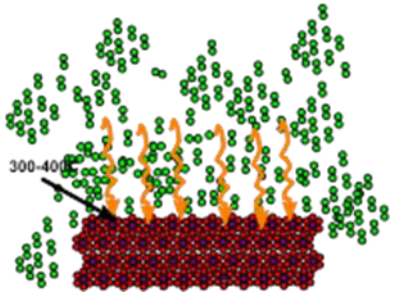
Air: 21% O_2+78,8% N_2 + ?

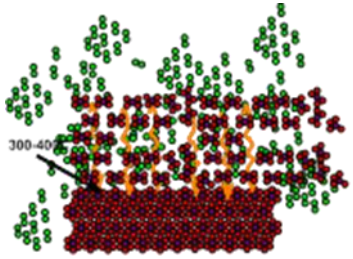
Fuels: Carbon + Hydrogen + ?



Pyrolysis process

Energy to fuel

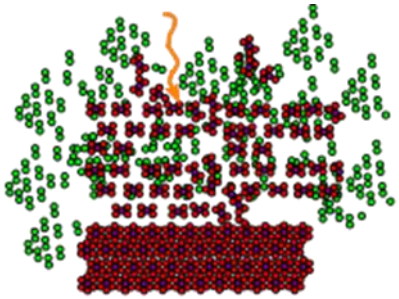




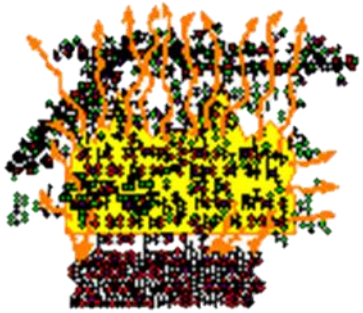
Fuel => Pyrolysis gasses

CH_4 => pyrolysis gas

Energy to Pyrolysis gas atmosphere



Fire ignition



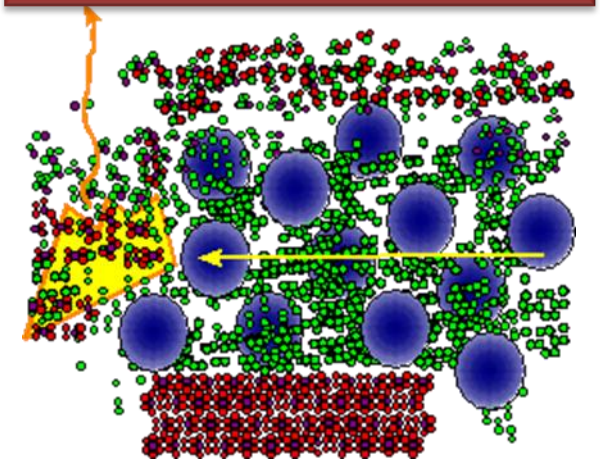
Fire example:

CH_4+2O_2

$=>2H_2O+CO_2$ + **E**

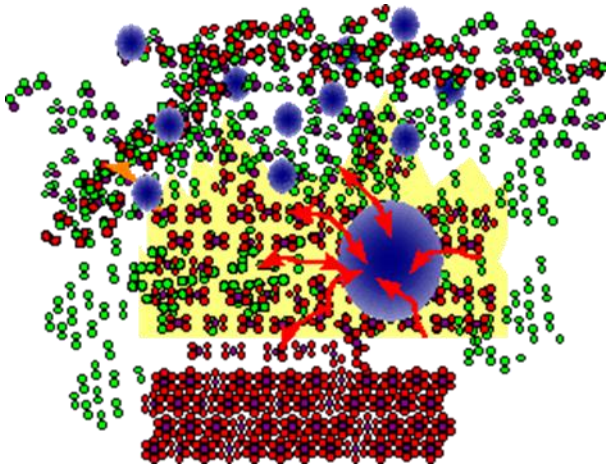
1kg O_2 => 13.000.000 joule

Focus on pyrolysis process

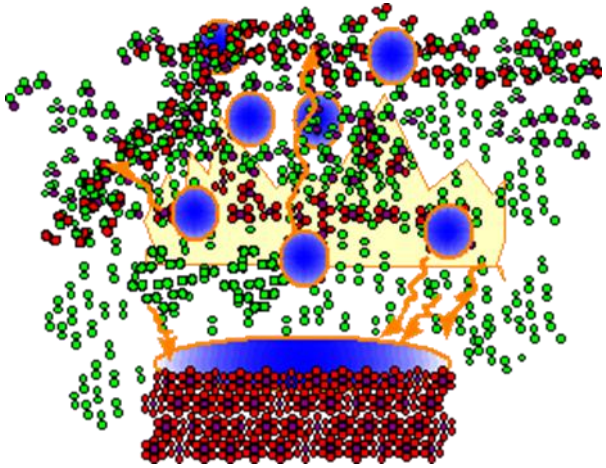


Blow away pyrolysis gasses => **blow fire out**

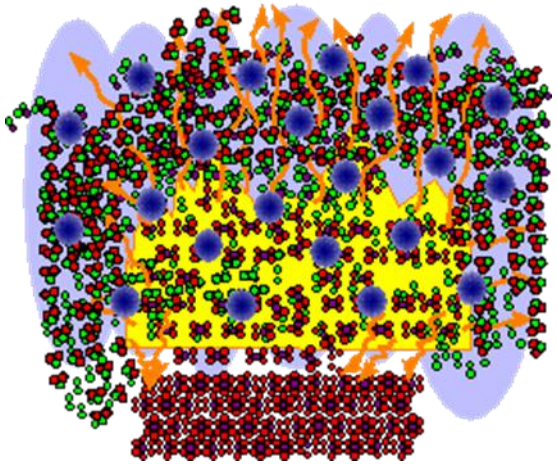
Focus on oxidation process



Cooling oxidation process => **slow down process**



Cooling fuel => **reducing the pyrolysis gas production**

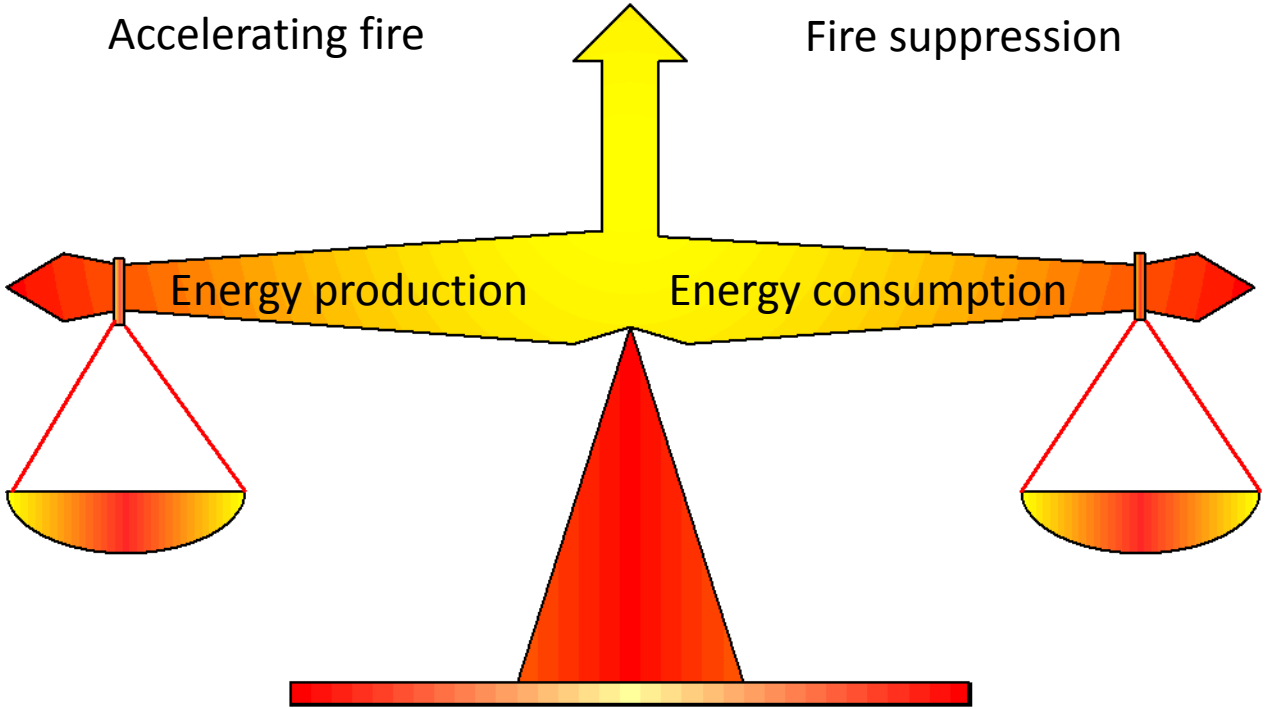


Reduce oxygen concentration => **reduce heat output**

Fire control

Accelerating fire

Fire suppression



3) How can we apply watermist in projects?

<u>The main problems:</u>

- Watermist is a new technology = Lack of knowledge => Lack of trust.
- Design, installation and maintenence criteria not found in a standard as for sprinklers (e.g. EN12845: Office area = OH1 => 72m2, 60min, 5 l/min/m2 water density).

<u>The solution is to:</u>

A) Define the application – the challenge.

B) Define the system which fit the application best.

C) Define the Approval/Documentation which can be accepted by AHJ.

D) Follow manufactorer Product Manuals, and existing watermist design standards (e.g. NFPA 750, CEN/TS14972)

3a) The Application.

Defining the applications?
Example: Object protection, Hole building, Area, etc.

What type areas are often found in such?
Example: Large open volumes, concealed spaces, rooms.

Fuel types?
Example: Class A fuels, Class B fuels, Class F fuels, etc.

Environment?
Example: Open well ventilated areas, Cold areas, hot areas, enclosed areas.

Other things to encounter?
Examples: water damage, aesthetic looks, detection of fire, etc.

3b) Watermist system to be Provided.

Standard watermist system:

- Existing system.
- Common knowledge on usage and performance.
- Approved.

Is best when:

- Limitations in approval fits application.
- Limitations to technical performance fits application.
- Project time is scarce.

Special watermist system:

- Not available yet – to be developed.
- To be tested/approved.

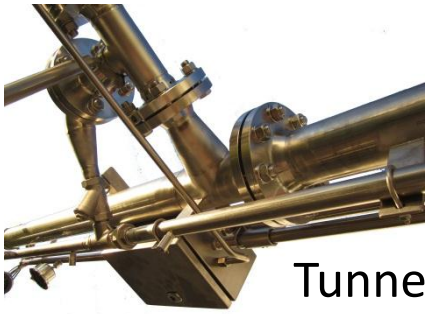
Is best when:

- Something special is needed because of application.
- When there is time to do R&D, testing etc.

3b) Watermist system to be Provided.

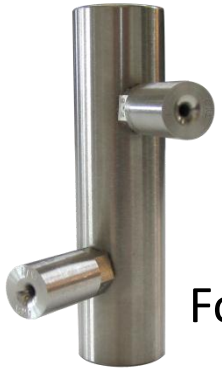
Standard watermist system:

Special watermist system:



Tunnel system

For horizontal long throw
Without wetting walls



For long concealed spaces

3b) Watermist system to be Provided.

Combining the appliction specifics with product solutions gives us:

Decision matrix example

	Sprinkler	Internal Gas Systems	Watermist standard products	Watermist special products
Large Volume size	GOOD	BAD	BAD	GOOD
High height	GOOD	BAD	BAD	GOOD
Fuel protection	GOOD	GOOD	GOOD	GOOD
Fire spread risk to other rooms	GOOD	BAD	GOOD	GOOD
Limitations due to artifacts/water damage	BAD	GOOD	GOOD	GOOD
Water limitation	BAD	GOOD	GOOD	GOOD
System space requirements/Visability	BAD	BAD	GOOD	GOOD
Project time limitations	GOOD	GOOD	GOOD	BAD
Approval needed	GOOD	GOOD	GOOD	BAD

The ”best” solution

3c) Approval/Testing of System.

<u>Standard watermist system</u>

Example of available approvals standards:

- FM5560: US light Hazard (EU OH1), machinery rooms/tubines,
- UL2167: Residential areas, LH, OH1.
- VDS: Hotels, Offices, car parks, cable tunnels,
- LPS1283: Hotel, offices.
- CEN/TS14972 annex A: Offices, atriums, cable tunnels, fat fryers.

Advantages:

- Has been tested and approved to work in fires.
- Easy accepted.

Disadvantages:

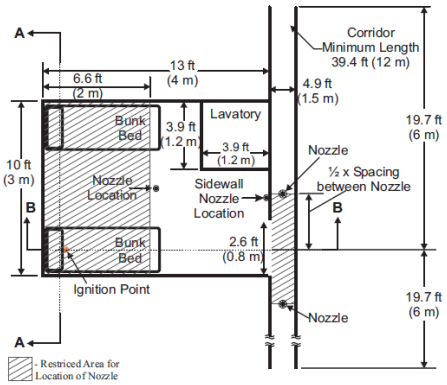
- Limitations to dimensions.
- Limitations to application type.
- Limitation to technical performance.
- Limitation to water spray damage.

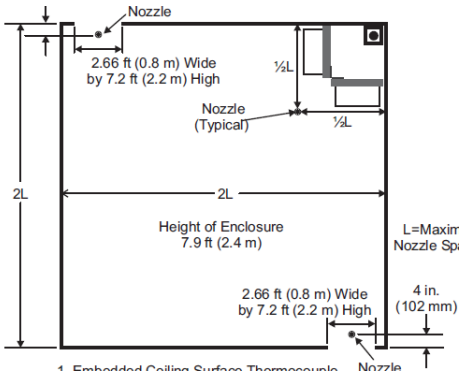
3c) Approval/Testing of System.

Standard watermist system

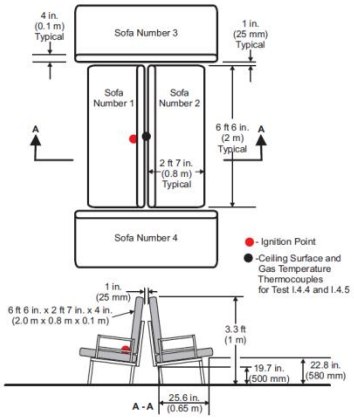
Example of test method FM5560 Light Hazard:

- Apartments
- Atriums
- Churches
- Concealed spaces
- Gymnasiums
- Hospitals and hospital laboratories
- Hotel rooms
- Institutions
- Kitchens
- Libraries
- Meeting rooms in convention centers and hotels
- Metalworking shops with nonhydraulic cutting operations
- Mineral processing such as: glass, cement, ore treating, gypsum processing, etc.
- Museums
- Nursing or convalescent homes
- Offices
- Restaurant seating areas
- Schools and universities classrooms
- Unused attics





LIMITS:
-5m ceiling height.
-Pendent automatic nozzle
-Sidewall only for small compartments.



3c) Approval/Testing of System.

Standard watermist system

Example of final proof – a certificate

FM APPROVED

Certificate of Compliance

This certificate is issued for the following:

System Designation:	Model OH-OS Fine Water Spray System
System Type:	Water Mist System for the Protection of Light Hazard Occupancies
Design, Installation, Operation, and Maintenance Manual:	Design, Installation and Service Manual For Factory Mutual Approved VID Fire-Kill OH-OS Systems, Doc. No. 120815-01-02, 23-Aug-2012

Prepared for:

VID FIRE-KILL
SVALBARDVEJ 13
DK-5700 SVENDBORG
DENMARK

Manufactured at:

VID FIRE-KILL
SVALBARDVEJ 13
DK-5700 SVENDBORG
DENMARK

FM Approvals Class: 5560

Approval Identification: 3041497 Approval Granted: October 1, 2012

Said Approval is subject to satisfactory field performance, continuing Surveillance Audits, and strict conformity to the constructions as shown in the Approval Guide, an online resource of FM Approvals.

For more than 160 years FM Approvals has partnered with business and industry to reduce property losses.

Richard B. Dunne
Group Manager – Fire Protection
FM Approvals
1151 Boston-Providence Turnpike
Norwood, MA 02062

FM Approvals

Member of the FM Global Group

3c) Approval/Testing of System.

<u>Special watermist system:</u>

Example of available approvals standards:

- CEN/TS 14972 Appendix B.
- Fire test demonstrations.

Advantages:

- Can test special products.
- Can provide specific required data for the exact project.

Disadvantages:

- Limitations to ”strenght” of approval.
- Cost and time requiring to do.

3c) Approval/Testing of System.

<u>Special watermist system</u>

Example of test method
CEN/TS14972

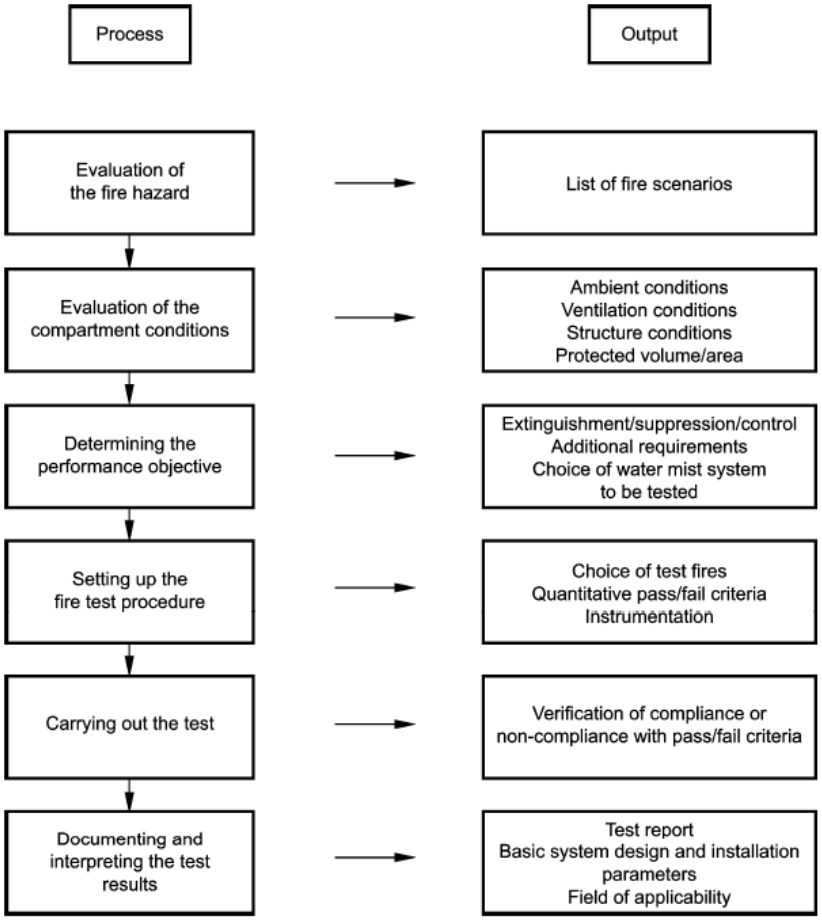
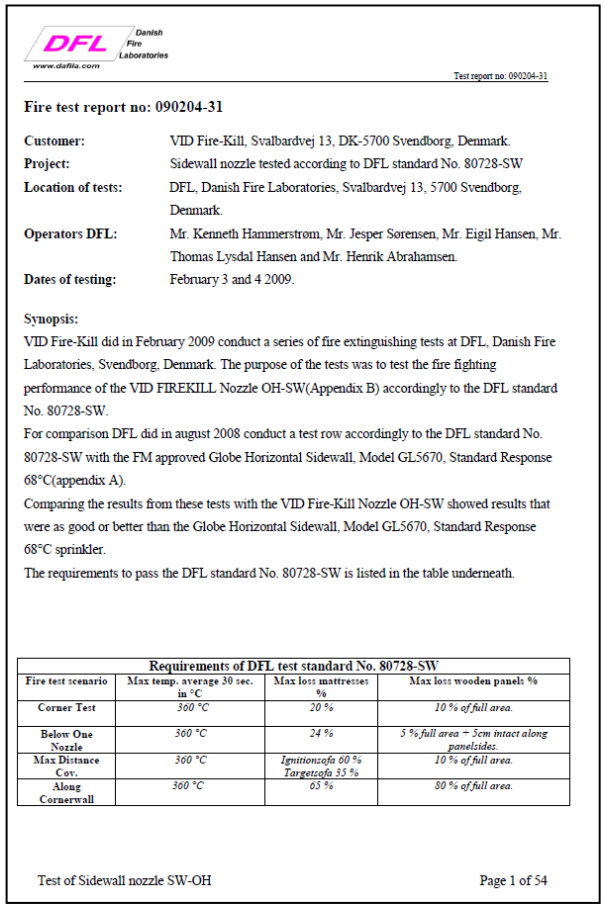


Figure B.1 — Process of developing a fire test procedure

3c) Approval/Testing of System.

Standard watermist system

Example of final proof – a test report and witness letter.



DFL Danish Fire Laboratories
www.dafila.com

Test report no: 090204-31

Fire test report no: 090204-31

Customer: VID Fire-Kill, Svalbardvej 13, DK-5700 Svendborg, Denmark.
Project: Sidewall nozzle tested according to DFL standard No. 80728-SW
Location of tests: DFL, Danish Fire Laboratories, Svalbardvej 13, 5700 Svendborg, Denmark.
Operators DFL: Mr. Kenneth Hammerstrøm, Mr. Jesper Sørensen, Mr. Eigil Hansen, Mr. Thomas Lysdal Hansen and Mr. Henrik Abrahamsen.
Dates of testing: February 3 and 4 2009.

Synopsis:

VID Fire-Kill did in February 2009 conduct a series of fire extinguishing tests at DFL, Danish Fire Laboratories, Svendborg, Denmark. The purpose of the tests was to test the fire fighting performance of the VID FIREKILL Nozzle OH-SW(Appendix B) accordingly to the DFL standard No. 80728-SW.

For comparison DFL did in august 2008 conduct a test row accordingly to the DFL standard No. 80728-SW with the FM approved Globe Horizontal Sidewall, Model GL5670, Standard Response 68°C(appendix A).

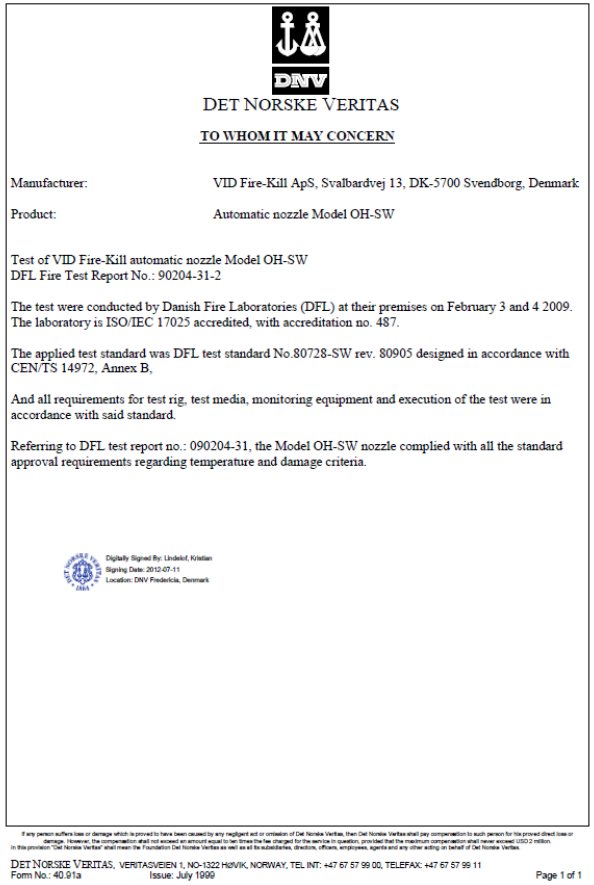
Comparing the results from these tests with the VID Fire-Kill Nozzle OH-SW showed results that were as good or better than the Globe Horizontal Sidewall, Model GL5670, Standard Response 68°C sprinkler.

The requirements to pass the DFL standard No. 80728-SW is listed in the table underneath.

Requirements of DFL test standard No. 80728-SW

Fire test scenario	Max temp. average 30 sec. in °C	Max loss mattresses %	Max loss wooden panels %
Corner Test	*360 °C*	*20 %*	*10 % of full area.*
Below One Nozzle	*360 °C*	*24 %*	*5 % full area + 5cm intact along panelsides.*
Max Distance Cov.	*360 °C*	*Ignitionsofa 60 % Targetsofa 35 %*	*10 % of full area.*
Along Cornerwall	*360 °C*	*65 %*	*80 % of full area.*

Test of Sidewall nozzle SW-OH Page 1 of 54



DNV

DET NORSKE VERITAS

TO WHOM IT MAY CONCERN

Manufacturer: VID Fire-Kill ApS, Svalbardvej 13, DK-5700 Svendborg, Denmark

Product: Automatic nozzle Model OH-SW

Test of VID Fire-Kill automatic nozzle Model OH-SW
DFL Fire Test Report No.: 90204-31-2

The test were conducted by Danish Fire Laboratories (DFL) at their premises on February 3 and 4 2009. The laboratory is ISO/IEC 17025 accredited, with accreditation no. 487.

The applied test standard was DFL test standard No.80728-SW rev. 80905 designed in accordance with CEN/TS 14972, Annex B,

And all requirements for test rig, test media, monitoring equipment and execution of the test were in accordance with said standard.

Referring to DFL test report no.: 090204-31, the Model OH-SW nozzle complied with all the standard approval requirements regarding temperature and damage criteria.

Digitally Signed By: Lindelof, Kristian
Signing Date: 2012-07-11
Location: DNV Frederickia, Denmark

If any person suffers loss or damage which is proved to have been caused by any negligent act or omission of Det Norske Veritas, then Det Norske Veritas shall pay compensation to such person for his proved direct loss or damage. However, the compensation shall not exceed an amount equal to ten times the fee charged for the service in question, provided that the maximum compensation shall never exceed USD 2 million.
In this provision "Det Norske Veritas" shall mean the Foundation Det Norske Veritas as well as all its subsidiaries, directors, officers, employees, agents and any other acting on behalf of Det Norske Veritas.

3d) Product Manuals and watermist design standards

The Product Manual.

All design parameters and any other system constraints crucial to the operation shall be specified in the manufacturer's Design and Installation manual.

The available general watermist design manuals.

All general minimum requirements for design, installation, maintenance and service can be found in these standards.

3d) Product Manuals and watermist design standards

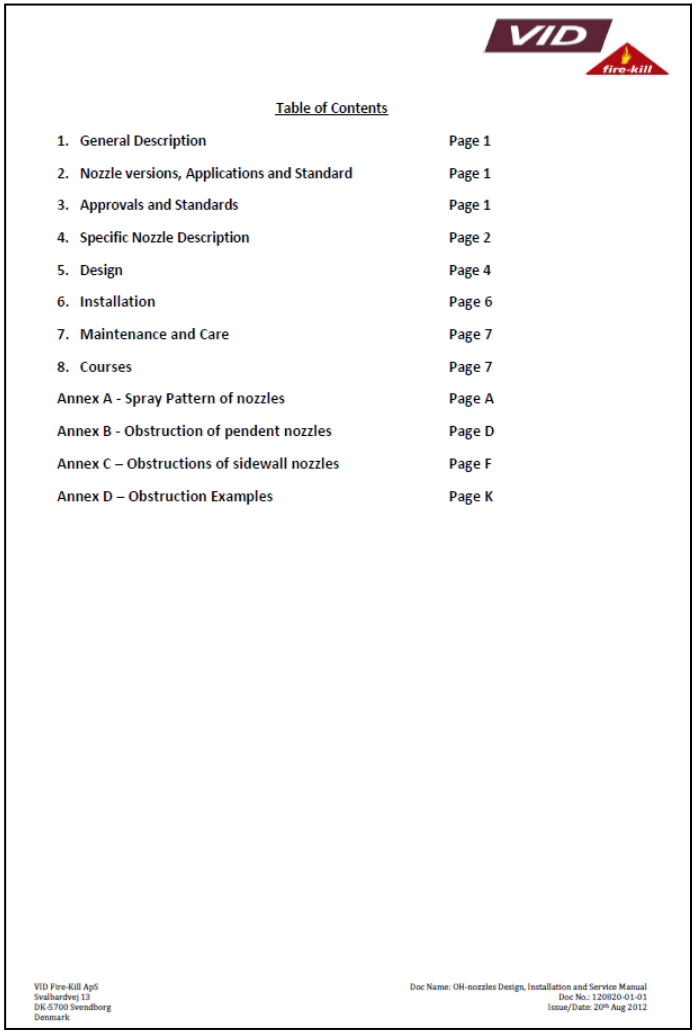


Table of Contents

VID Fire-Kill ApS
Svalbardvej 13
DK-5700 Svendborg
Denmark

WATER MIST SYSTEM PASSPORT

System Identification:				Manufacturer	
	name of the system (e.g.Light Hazard GPU system)				
1		**space geometry**	parameter	value	note
	1.01	space characteristcs	Limited / unlimited	unlimited	
		ceiling height	mt.	3 to 5	
		allowed openings	m^2	N. A.	
2		**Hazard**			
	2.01	Light Hazard	Hazard Classification	NFPA 13	
		Light Hazard	Hazard Classification	FMApprovals	with limitation as per 4-2
		Limitation/exclusion	Generally not applicable		
3		**system type**			
	3.01	operating pressure	High/medium/low	High	
	3.02	sprinkler / deluge	water mist sprinkler system		
	3.03	Compartment prot.	Total flooding/local appl.	N.A.	
	3.04	Pipe	Single/doulbe	Single	
	3.05	Fluid	Single/twin	Twin	
4		**Testing / approvals**			
	4.01	Test Laboratory	VTT Finland		
	4.02	Test Report(s)	VTT Report ...		
	4.03	Approval(s)	Factory Mutual, VdS, BRE		
5		**Design specifications**			
	5.01	nozzle type	open/closed	closed	automatic - various T °C
	5.02	spacing	square meter per nozzle	16	
	5.03	min. pressure	bar	70	
	5.04	operating nozzles	no. of operating nozzles	9	
	5.05	Duration	minutes	30	
6		**Main components**			
	6.01	Water reservoir	water reservoir or city main - 120 lpm max		
	6.02	pump unit	GPU pneumatic		
	6.03	Pump Unit power abs.	N. A.		
	6.04	Control Valves	SBA riser check with flow alarm		
	6.05	Pipe and fittings	Steinless steel / cutting ring joints		
	6.06	Nozzle 1	Vertical automatic		
	6.07	Nozzle 2	Horizontal automatic		limited appl. (Manuf. Manual)
1		Dec. 22nd 2004	Issue after approval		
issue		*issuing date*	*description*		*note*

3d) Product Manuals and watermist design standards

Example:
NFPA750:2010

Contents

4) Project Examples.

Wooden Church, Norway:

- Large and high open space with low fuel loads (sofas, benches) placed at floor. Fire spread risk high due to all wood.
- Heated and unheated areas with natural ventilation.
- Ceiling painting not to be destroyed by installation or water spray
- Authority was fire brigade.

System choosen: SPECIAL WATERMIST SYSTEM.

School, UK:

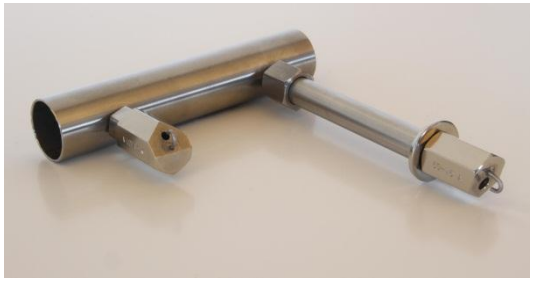
- Ceiling heights up to 5m with relative low fuel loads (furniture) placed at floor. Fire spread low due to new building.
- Heated areas with natural ventilation.

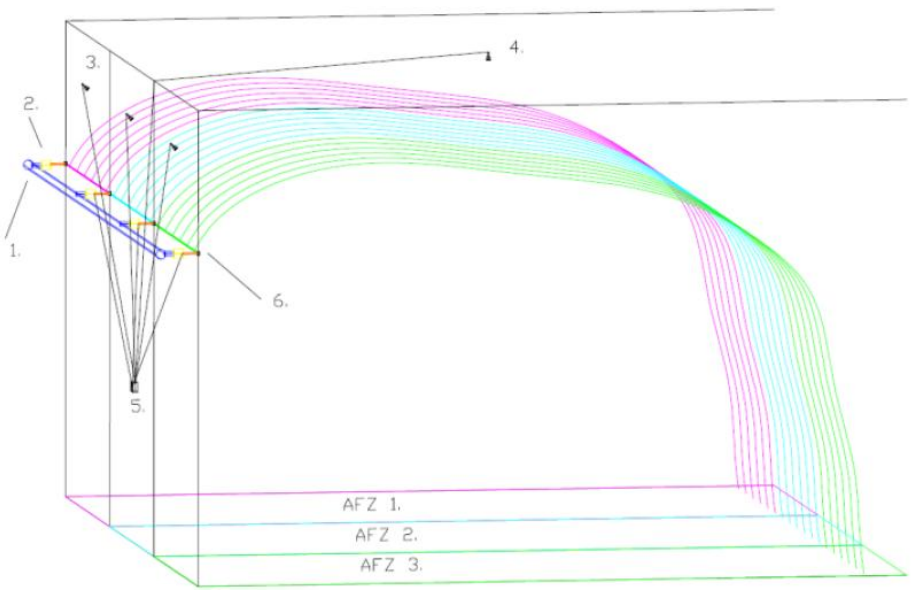
System choosen: STANDARD WATERMIST SYSTEM.

4) Project Examples.

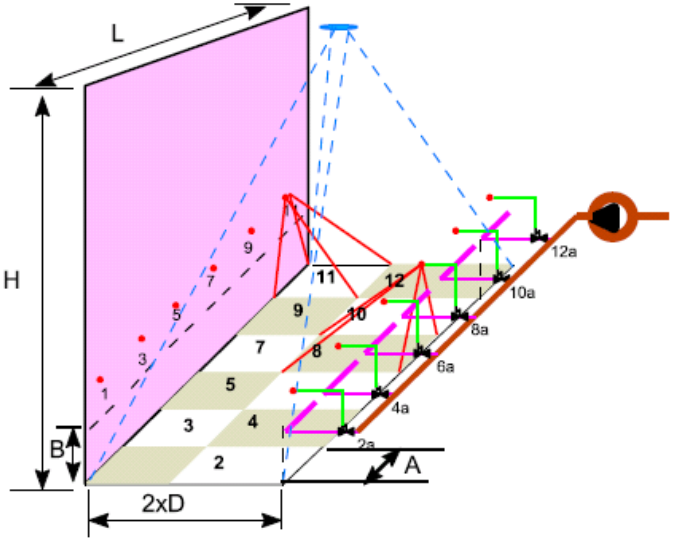
Wooden Church:

System: MODEL APS



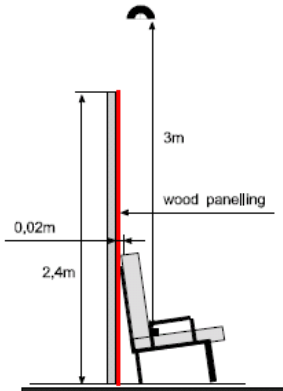


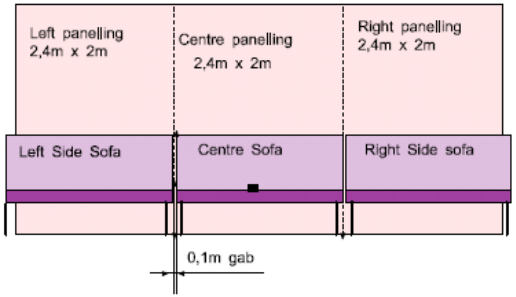
Length (L):	unlimited
Height (H):	unlimited
Width (2xD) Type A	max. 16m
Type B	max. 20m
Type C	max. 26m
Nozzle wall height (B):	3,5m – 7m

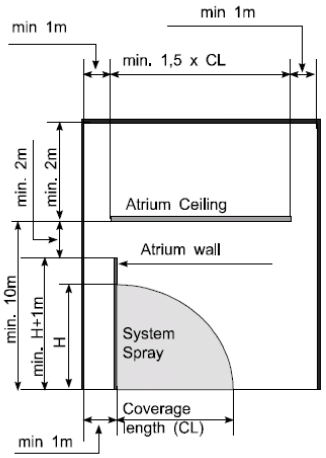


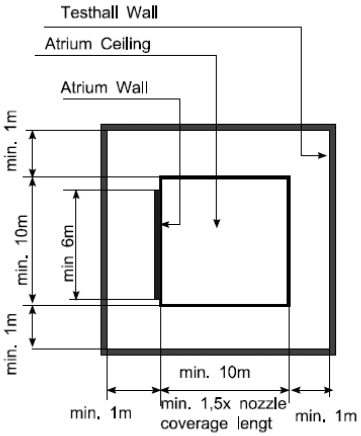
4) Project Examples.

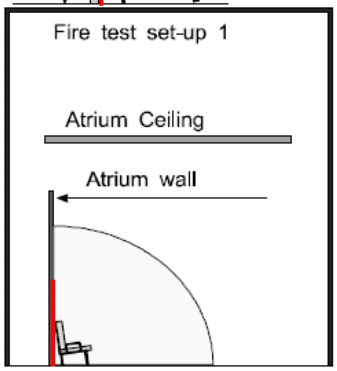
Test scenarios from test method designed in accordance to CEN/TS 14972 Annex B.

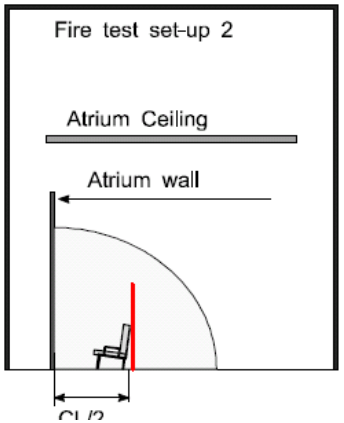


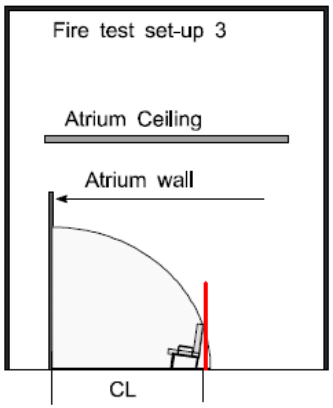












4) Project Examples.

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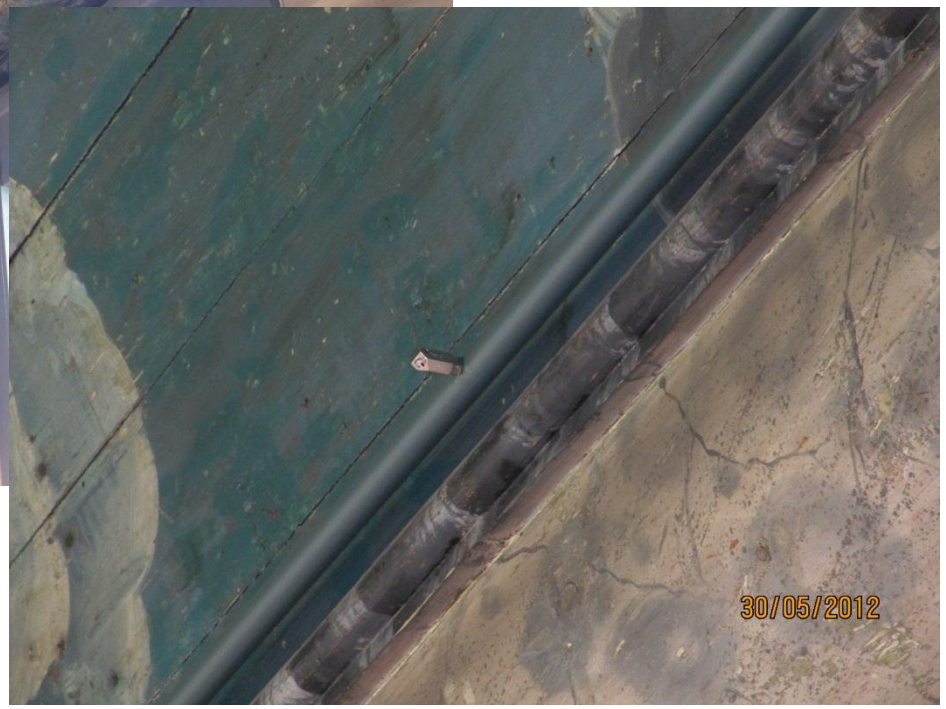

4) Project Examples.

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School:

System: MODEL OH-OS

FM APPROVED

Certificate of Compliance

This certificate is issued for the following:

System Designation:	Model OH-OS Fine Water Spray System
System Type:	Water Mist System for the Protection of Light Hazard Occupancies
Design, Installation, Operation, and Maintenance Manual:	Design, Installation and Service Manual For Factory Mutual Approved VID Fire-Kill OH-OS Systems, Doc. No. 120815-01-02, 23-Aug-2012

Prepared for:

VID FIRE-KILL
SVALBARDVEJ 13
DK-5700 SVENDBORG
DENMARK

Manufactured at:

VID FIRE-KILL
SVALBARDVEJ 13
DK-5700 SVENDBORG
DENMARK

FM Approvals Class: 5560

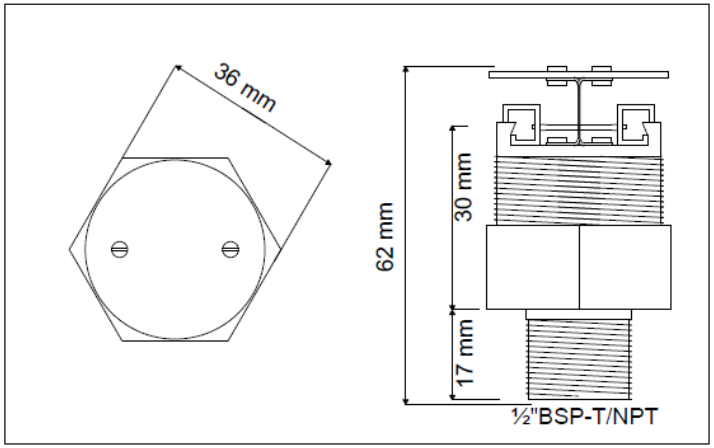
Approval Identification: 3041497 Approval Granted: October 1, 2012

Said Approval is subject to satisfactory field performance, continuing Surveillance Audits, and strict conformity to the constructions as shown in the Approval Guide, an online resource of FM Approvals.

For more than 160 years FM Approvals has partnered with business and industry to reduce property losses.

Richard B. Dunne
Group Manager – Fire Protection
FM Approvals
1151 Boston-Providence Turnpike
Norwood, MA 02062

FM Approvals
Member of the FM Global Group



General Stats	
Minimum water pressure	10 bar
Maximum working pressure	16 bar
K-factor (metric)	16.5 (l/t/√bar)
FM approved nominal release temperature	57°C
Other nominal release temperatures	68°C, 79°C, 93°C
Time Response Index (metric)	RTI < 50 Fast Response Class
Drop size	DV_{90} < 300 µm
Application	
Spacing (max)	13 m^2 (3.6m x 3.6m)
Distance to wall (max)	1.8 m
Height (max)	5 m

Videos link

4) Project Examples.

Thank you for your attention.

The full presentation including videos can be requested on sales@vidaps.dk