

Development of a portable Cutting Extinguisher for industrial, maritime and civil use

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FIRE FIGHTING SYSTEMS

Main Advantages of Water Mist Technology

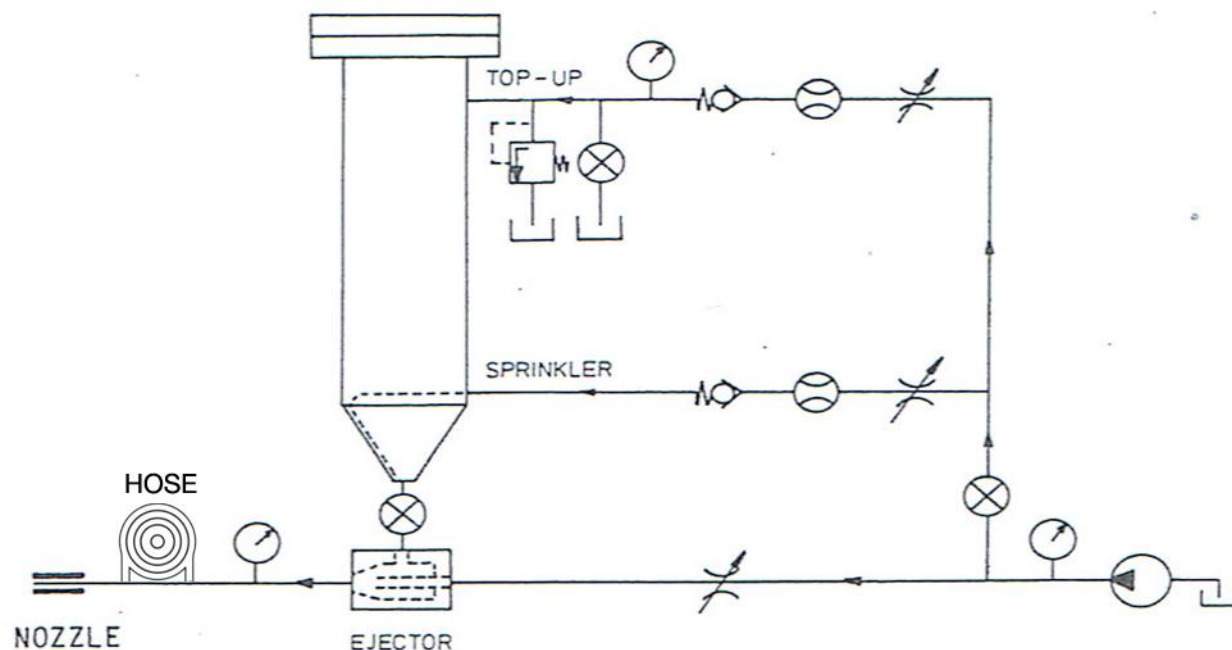
- DRASTIC COOLING EFFECT**
- OXIGEN DILUTION DUE TO PRODUCTION OF VAPOUR**
- REDUCTION OF GAS PRESSURE DUE TO COOLING**
- MINIMAL USE OF WATER**
- MINIMAL DAMAGES TO OBJECTS AND PEOPLE INVOLVED**

Requirements for a Cutting Extinguisher

- BE VERY QUICK IN PIERCING A SURFACE**
- HAVE HIGH WATER MIST PERFORMANCES**
- BE PORTABLE AND USER FRIENDLY**
- DISPLAY HIGH LEVELS OF SAFETY FOR PEOPLE**

Scheme of Working Principle of DIAJET

(EP 0 276 219 dated 10.10.86 by BHRG)



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Examples of ASWJ (Abrasive Suspended Water Jetting) cutting with hydraulic drive



Decommissioning ordnance



Opening man-hole in oil tank

Design limits of today Cutting Extinguishers

- Complex design (Vessel, Valves and system Module);
- Difficulty for the fireman to control and regulate the supply of abrasive from cutting point;
- Need to rely on Remote Control (Radio or Umbilical);
- Rubber Hose wear due to abrasive suspension flow;
- Sizes and weight unsuitable for good portability;
- Dedicated maintenance required;
- Back-thrust exceeding EC norms with 60l/min@300bar

Safety limits of today Cutting Extinguishers

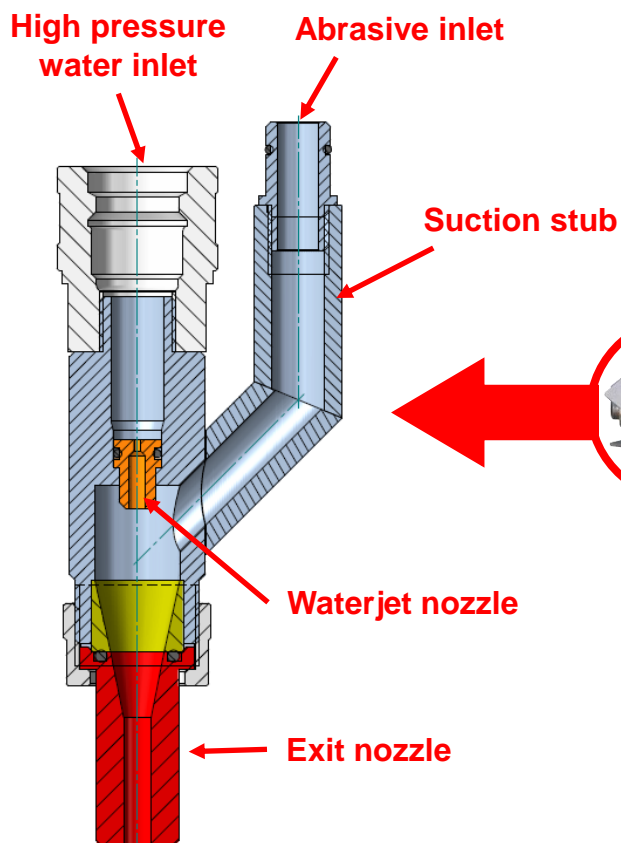
- Water-Abrasive Suspension flowing close to fireman body;
- Stop&Go piercing difficult or impossible with clogged hoses;
- Need to dump abrasive out of hose before Water Misting;
- Use of single nozzle not permitting real Water Mist pattern;
- Remote Control by Radio subject to RFI or no-link;
- Service checks required to exclude presence of grit during WJ

Waterjet in air: Cutting nozzle vs Water mist nozzle



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Section of an AEWJ (Abrasive Entrained Water Jetting) Cutting Head



WJ.FE 300 LANCE



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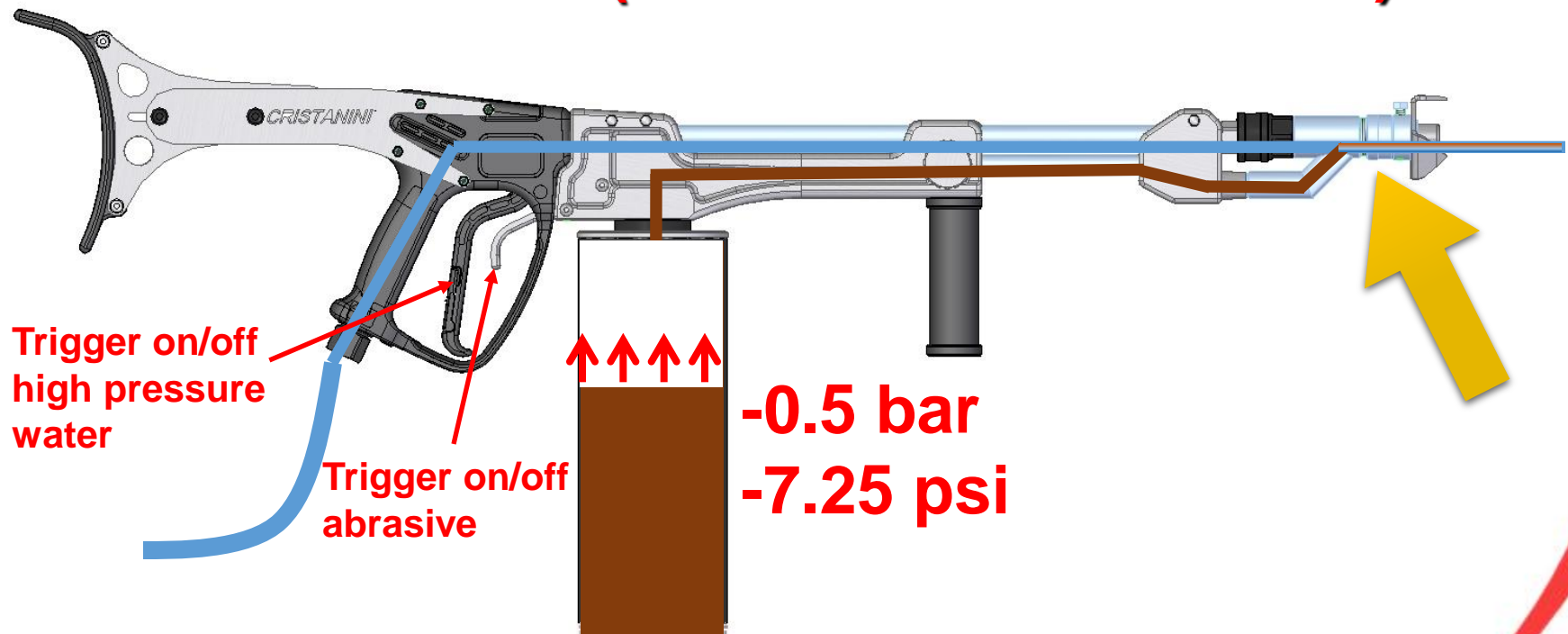
Design Targets of new Cutting Extinguisher

- Develop a new hand lance to avoid need for an abrasive hopper;
- Develop one set of two nozzles: one for Cutting and one for Water Mist;
- Avoid requirement for Remote Control of abrasive suspension;
- Reduce size and weight for better portability and easier installation;
- Offer friendly - approach in use and in maintenance;
- High efficiency in standard and stop & go utilization;
- Display low back-thrust for comfortable use.

Safety Targets of new Cutting Extinguisher

- No abrasive flowing in the hose;
- Immediate stop of abrasive by releasing the trigger after cutting
- Use Water Mist nozzle to avoid harming people within 6m
- No danger of stopping the piercing job due to hose clogged by grit
- No need to dump grit from hose before starting Water Misting

The innovative dual barrel hand lance (Patent VI2014 A000150)



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The innovative Set: the Water Mist nozzle



Quick coupling



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The innovative Set: the Cutting nozzle

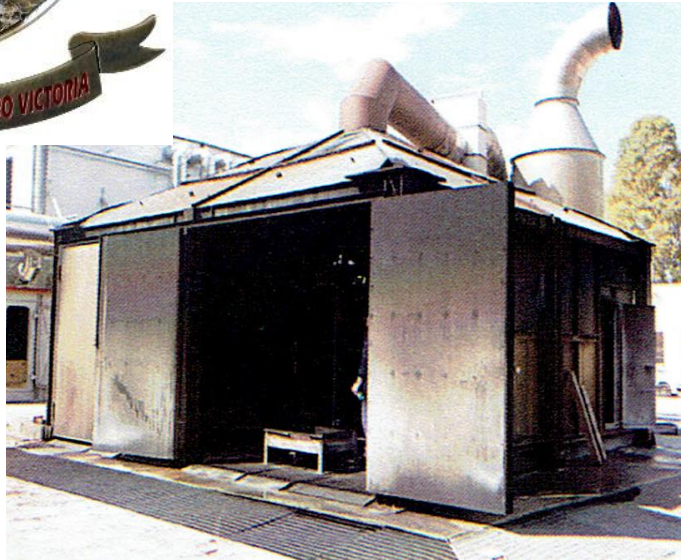
Quick coupling



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Tests at Italian Navy Training Center



Fire room (about $V=256$ c.m.)

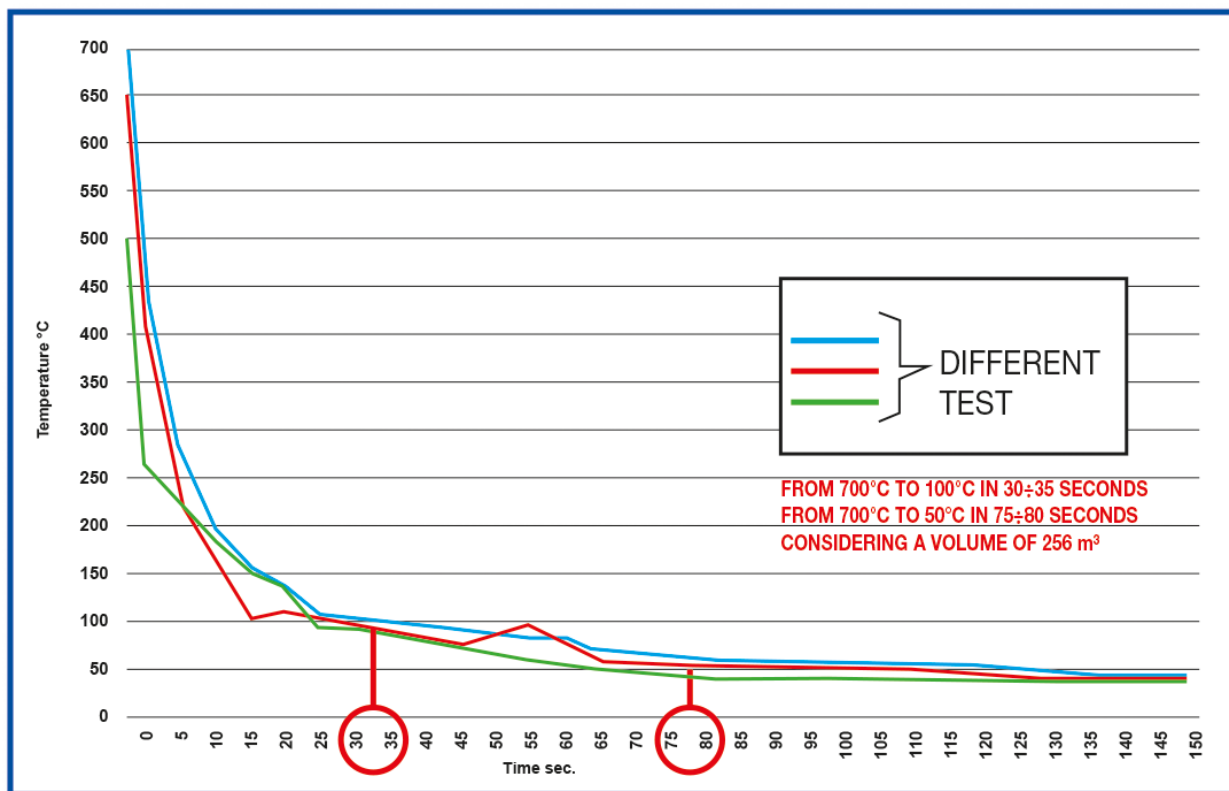


Fire load ignited (Type A & B)

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Tests at Italian Navy Training Center

COOLING GRAPH



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Tests at Italian Navy Training Center



Safety with Water Mist nozzle @ 30 cm (11,81 in)



FPA tests: Equipment used



WJ.FE 300 LANCE

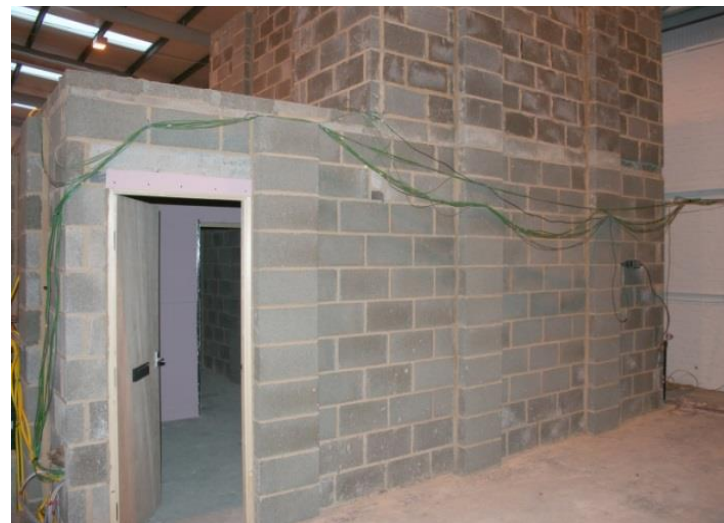
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FPA Test Rig : External set up and Fuel load



Inside set up of Kitchen with Fire Cribs



Outside set up of Test Rig

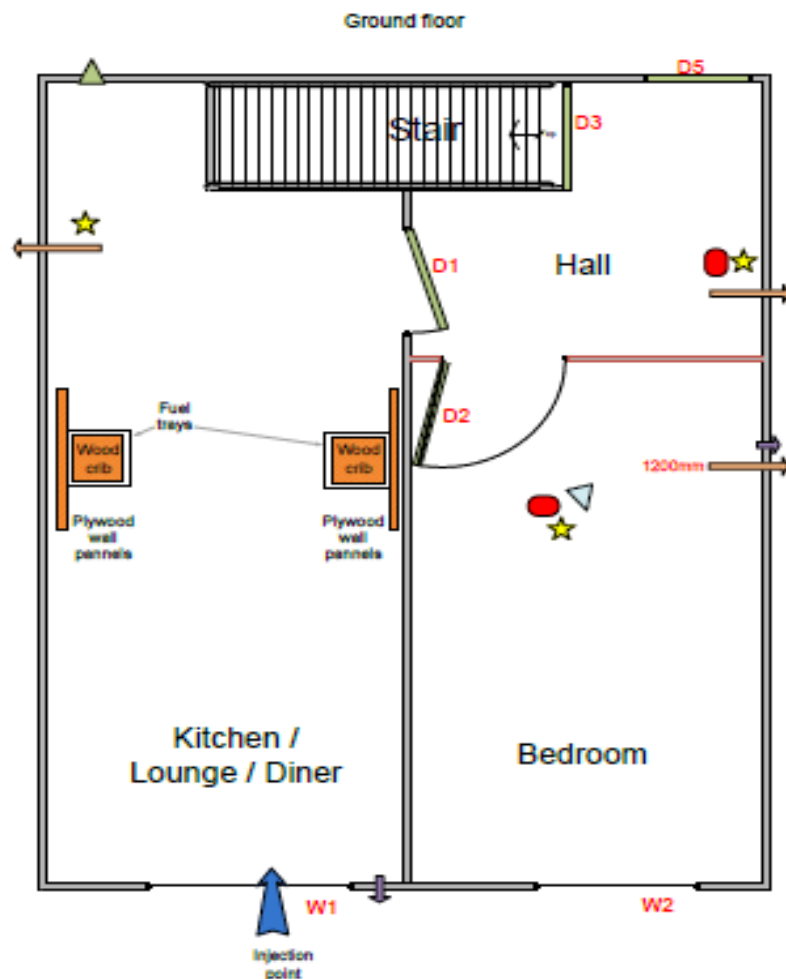


**Ignited
Fire Cribs**

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FPA Test Rig : Location of instrumentation



- ★ Thermocouples, 3 heights at each location
- Locations for room pressure measurements
- Locations for gas sampling
- Heat flux sensors, 2 heights at each location
- ▲ Thermal imaging camera location
- ▲ 'Throat' heat flux and t/c measurements

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FPA Test Rig :Fire test procedures

Time (min:sec)	Event / description
00:00	Fire Ignited
00:15	Test personnel exit rig and close the front door
03:00	Test hall smoke extraction plant set to maximum
04:00	High level vent closed
10:00	Low level vents closed
10:30	Water mist injection commences
11:30 or 12:30	Water mist injection ceases (Note 1)
>17:00	Test termination / fuel load extinguished manually
Note 1 – this time varies depending upon the intended duration of the water mist injection	



FPA Test Rig : Cutting test Set up and Procedure



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FPA Test Rig : Cutting test Results

TEST N°	MATERIAL	TIME(SEC)
1	6.2 mm steel plate	22 sec.
2	95 mm concrete block	71 sec.
3	6.0 mm aluminium plate	13 sec.
4	44 mm softwood timber	7 sec.
5	135 mm high density block	48 sec.
6	ISO container wall	11 sec.

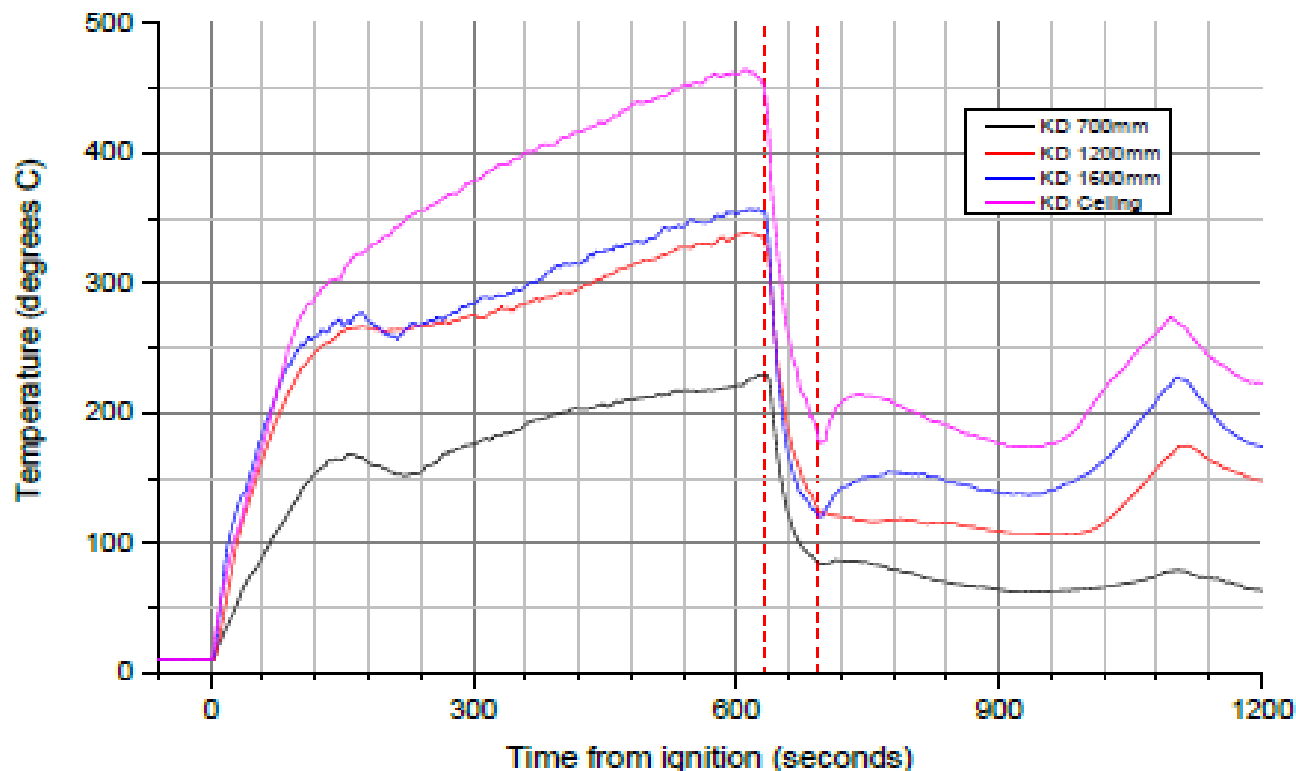


FPA Test Rig Results: Gas temperature in K-D

Gas temperatures - Kitchen/Diner

Cristanini fire test 01 :

60s injection from compartment window with cutting nozzle

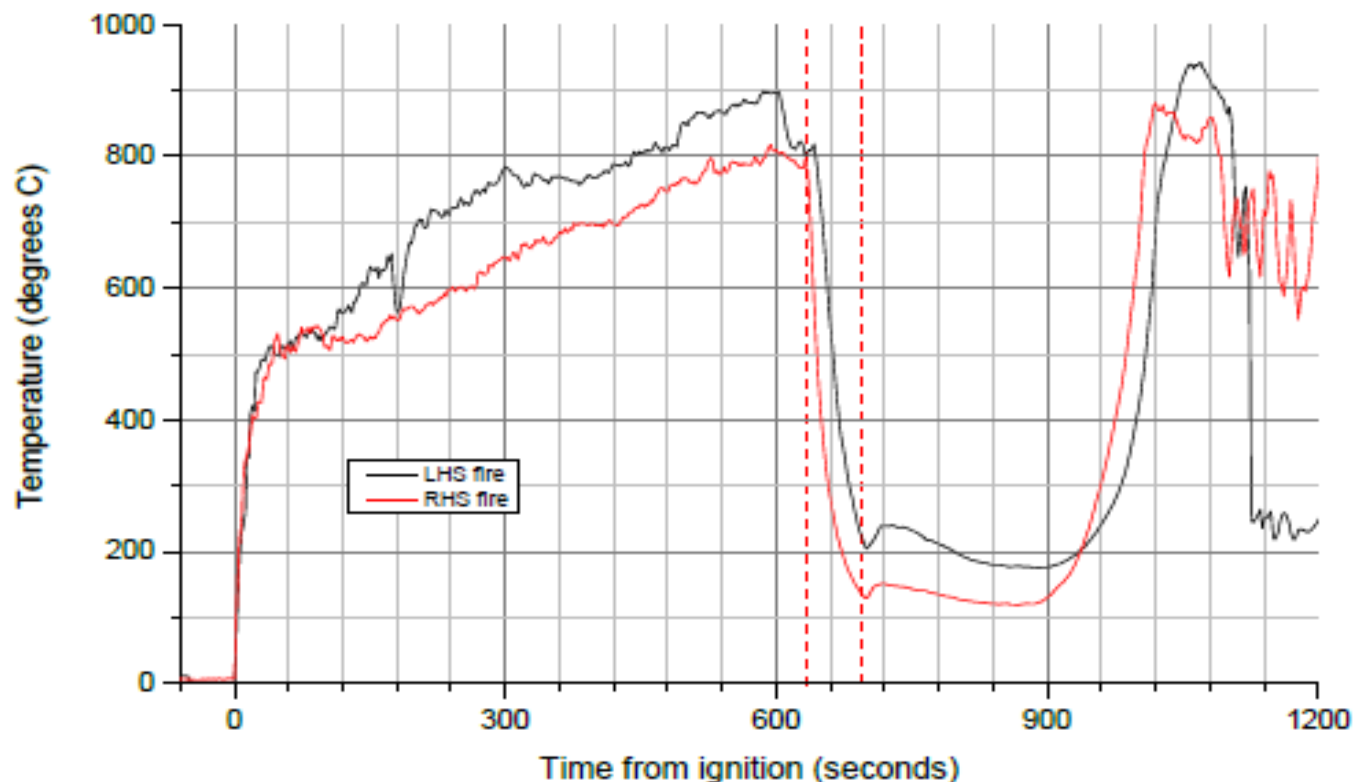


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FPA Test Rig Results: Gas temp. in Fire Crib

Fire crib temperatures
Cristanini fire test 01 : 60s injection from compartment window with cutting nozzle

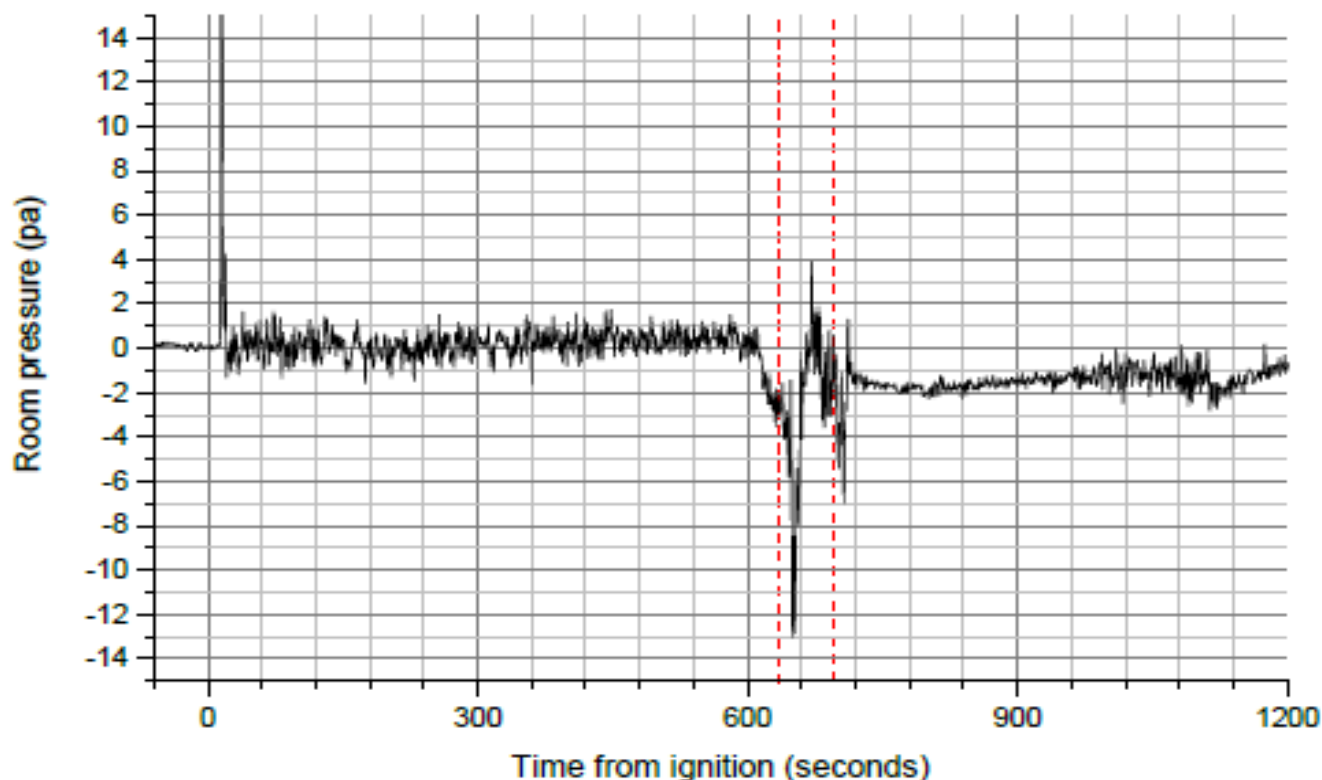


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FPA Test Rig Results: Gas Pressure in K-D room

Compartment pressure - KD
Cristanini fire test 01 : 60s injection from compartment window with cutting nozzle



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FPA Test Rig Results Final Comments

Conclusive comments on the new Cutting and Fire Extinguisher WJ.FE 300

- The system is capable of cutting through a variety of construction materials including brick, wood, aluminium, steel plates and concrete blocks;
- In all fire tests injecting water with both cutting and WM nozzles achieved rapid cooling of gases in the room;
- The combination of cooling and oxygen reduction caused by steam generation provides very effective fire suppression;

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In-House testing: Venturi vacuum set-up



Vacuum meter fitted on the lance
0,5 - 0,6 bar with thin walls
0,2 bar with thick walls



Vacuum setting knob

In-House testing: piercing tests

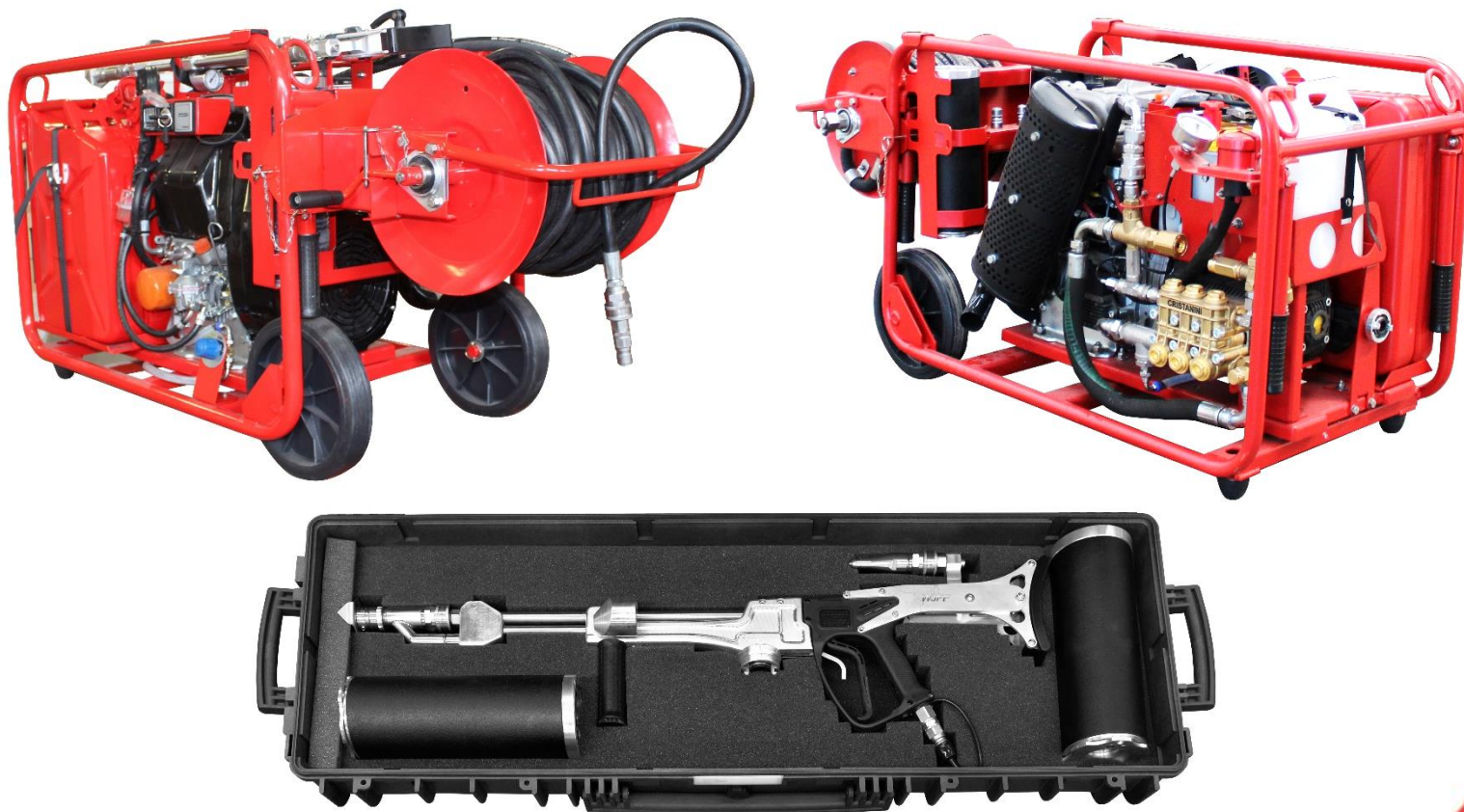


5mm steel sheet pierced in 14 secs.
10mm steel sheet pierced in 31 secs.



210mm concrete block pierced in 47 secs.

Water Jet Fire Extinguisher: WJ.FE 300



Final configuration: 22l/min@350bar , 14kW, 186kg

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WJ.FE 300 , the most innovative & safest system for first attack of fires:

- In closed or difficult to reach compartments (cabins, engine rooms...)
- In areas or plants with hazard of explosion;
- On overheated trucks & container on decks of ferries and RO-RO ships
- With static or mobile tanks filled with fuels ;
- Where use of water to suppress a fire should be drastically reduced;
- and so on!!

Development of a portable Cutting Extinguisher for industrial, maritime and civil use

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Many thanks for your attention!

QUESTIONS ?

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