



# WHITE PAPER

## DRY DELUGE TESTING

Reducing costs whilst improving safety  
and enhancing operational efficiency

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## 1.0 REGULAR TESTING METHOD

Normally deluge systems, water spray systems, open watermist systems, foam systems and compressed-air-foam systems require yearly mandatory function testing. Since these open extinguishing systems are the primary means of protection in the case of a fire, function testing is a mandatory requirement for personnel, equipment and environmental reasons. They are typically annually tested with brackish or sea water. During these wet function tests unforeseen complications within the system pipework, as well as risks to personnel during the complete process.

- Spray of sea water over an entire platform is a hazard for the expensive and critical processing equipment and many platform activities will be disrupted while testing,
- Wet testing causes growth of MIC (Microbiologically Influenced Corrosion), corrosion built up and salt crystallization to the flow pipes and nozzles,
- Excessive firewater discharge will overflow the sump / drain tanks,
- Freezing of firewater can be quite dangerous to operators in Arctic conditions,
- Risk of unplanned business loss and plant shutdown due to water ingress,
- Exacerbation of any existing corrosion within carbon steel systems.

Understandably traditional wet deluge testing is a very time consuming process and therefore a costly maintenance routine due to preparations and operation.

### New Development

The patented SIRON Dry Deluge Test eliminates many of the regular problems. It uses a pressurised water based vapour instead of sea water. Any flow problem in pipes and nozzles will be detected quickly and can be carried out in an uncomplicated and cost reducing way within the HSE / Norsok / NFPA guidelines. Whilst not a complete replacement for wet deluge testing, the use of SIRON Dry Deluge Testing can potentially extend the periods between wet testing to 5 years or more.

### Case Study

The 110v/240v vapour generation unit heats up an integral element to heat the test fluid which then produces a water based vapour. A 2" hose is connected immediately downstream of the deluge valve via a check valve on the deluge system that is to be tested. Once at temperature the unit fan is initiated allowing the water based vapour to migrate downstream of the deluge system ultimately exiting the deluge nozzles. Whilst migrating downstream any corrosion or particulate within the system is quickly identified by erroneous spray patterns coming from the nozzles. Any anomalies found are investigated by using a portable borescope camera. Damaged nozzles can be quickly identified also due to erroneous spray patterns of the water vapour during the test. Damaged nozzles are one of the most common failure modes on any fire protection system and can affect the density application rates or in worse cases can affect the overall hydraulic balance of the deluge system.



## 1.0 REGULAR TESTING METHOD

### Key Benefits of Dry Deluge Testing

- No marine growth, new corrosion or salt crystallization will form in deluge pipework and nozzles after testing with pressurized vapour,
- The complete system is live throughout the process and the equipment does not impede the flow path of firewater to protected areas,
- Damaged, blocked and partially blocked nozzles are quickly identified as well as ruptures or damage to pipework,
- No complicated electronics are used and the DDT equipment has a small footprint,
- Dry Deluge Testing does not rely on the system being clean or having up-to-date hydraulic calculations and isometric drawings,
- Testing deluge systems dry brings a more scientific approach to all previously available inspection based dry testing routines,
- Dry Deluge Testing has been extensively field proven on and offshore and is regularly used in Dutch, Danish and UK offshore sectors and also UK nuclear power plants.

### Dry Deluge Testing reduces costs because

- It is efficient and has no disruption to normal platform activities,
- Preparation time for Dry Deluge Testing is considerably shorter,
- Smaller teams required means less bed space is required resulting in cost saving to client,
- Typical time for single Dry Deluge Test and borescope inspection is less than one work shift,
- Complete platforms can be tested in days rather than weeks.

### Dry Deluge Testing is safer because

- No water ingress protection is required to be installed over sensitive instrumentation or electrical equipment,
- Pipe wall failures are easier to identify,
- Deluge pipework remains dry mitigating corrosion,
- Residual firewater from previous wet tests is displaced from the distribution pipe work,
- No freezing of firewater in water traps throughout the deluge system or on platform decks,
- Reduction in corrosion to surrounding plant and protected areas and general infrastructure.





## 2.0 APPLICATION

Since the introduction in 2010 Dry Deluge Testing has been conducted on deluge systems throughout North Western Europe. Examples are:

### OFFSHORE GAS PLATFORMS



### OFFSHORE OIL PLATFORMS



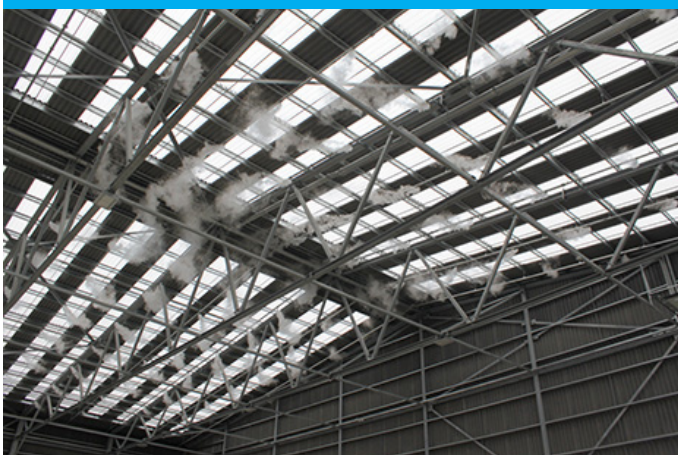
### NUCLEAR POWER PLANTS



### CHEMICAL PLANTS



### ATRIA OF OFFICE, UTILITY AND PUBLIC BUILDINGS



### FPSO





### 3.0 SCOPE

Dry Deluge Testing is a very simple, cost effective operation. Two operators can do the complete test in a few days. Exact timing will depend on the scale of the deluge system, but typically a single deluge system can be tested in less than one shift regardless of the size.

All equipment needed, can be shipped on a pallet and has a small footprint. If testing is combined with maintenance of the deluge system or expansion of the existing system, a 10ft. container will be shipped to the site.

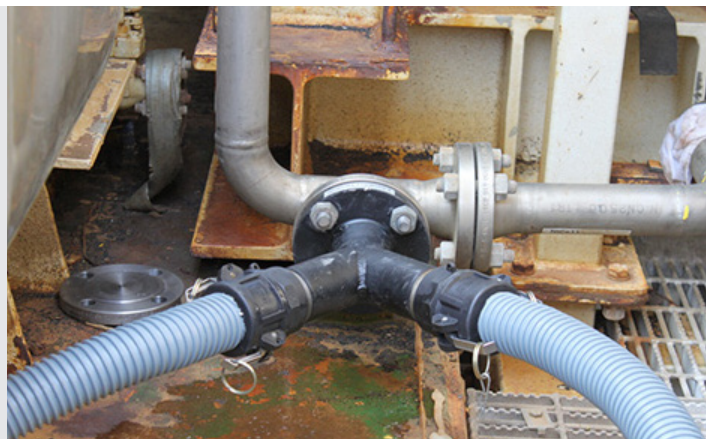
In this container is a mobile workshop with equipment and spare parts. The only other client input required on site is a 110V, 240V or 380V power outlet.



The actual Dry Deluge Testing machine is a black ABS flight case of 70 x 50 x 40 cm with a weight of approximately 70 kg.



Additional equipment are the hoses used, a flange, the vapor liquid and in some cases a toolbox.



## 4.0 PATENT

Ever since the initial inventing and optimization Dry Deluge Testing SIRON sought for a means to protect this innovative procedure both as intellectual property as well as the methodology and operation. Patenting of Dry Deluge Testing proved to be the most effective protective measure for the intellectual property and as such SIRON now hold a Global Patent for the technology.

## 5.0 GUIDELINES



The patent SIRON Dry Deluge Testing holds, is conforming to the HSE Section 10.2.1.4 and allows other maintenance intervals to be set dependant on the results of visual inspection and operational tests. (Health and Safety Laboratory RR1046 Research Report)



Dry Deluge Testing is also in line with the NORSOK Standards; if intervals for full-scale testing of facilities in seawater-resistant materials give two independent successful results, the interval can be increased to a maximum of six years. (Norwegian Oil and Gas recommended guidelines #075 for water based firefighting systems)



Dry Deluge Testing is also according to the following NFPA Standards.

### *NFPA 25 Paragraph 11.3.2.3*

Where discharge from the system discharge devices would create a hazardous condition or conflict with local

requirements, an approved alternate method to achieve full flow conditions shall be permitted. (Full Flow Test to be achieved through a Test Header and tests shall be conducted to ensure that the foam-water system(s) responds as designed, both automatically and manually.)

When tested wet or alternative method nozzles should always be checked on:

### *NFPA 25 Paragraph 11.3.2.6.1*

The discharge patterns from all of the open spray devices shall be observed to ensure that patterns are not impeded by;

- plugged discharge devices and to ensure that
- discharge devices are correctly positioned and that
- obstructions do not prevent discharge patterns from covering surfaces to be protected.

### *NFPA 25 Paragraph 11.3.2.6.2*

Where obstructions occur, the piping and discharge devices shall be cleaned and the system retested.



## 6.0 ATTESTED BY BUREAU VERITAS

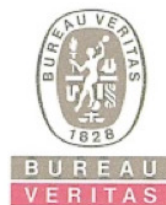
The patented SIRON Dry Deluge Test has been given an attestation by Bureau Veritas:

Cert. No. 15ABD11103 Rev. 0

In the Clearwater attestation Bureau Veritas writes:

*The SIRON 240v Vapour Generation Unit is fit for purpose and if operated as per QA 021 Rev 01 – Performance Standard for dry testing of deluge systems with the use of the SIRON 240v Vapour Generation Unit.*

*The Bureau Veritas inspection report 15ABD11049 Rev A also allows the use of the SIRON 110v Vapour Generation Unit as long as the unit is operated as per QA 021 Rev 01.*



### Siron 240v Vapour Generation Unit Witness Dry Testing of Typical Deluge System

BV Job No. 15ABD8787008

Cert. No. 15ABD11103 Rev. 0

## ATTESTATION

Issued within the scope of the Bureau Veritas General Conditions of Service

Bureau Veritas was contacted by Clearwater Fire Solutions to witness the dry testing of a typical deluge system in order to verify Siron 240v Vapour Generation Unit is fit for purpose.

**Description:** Siron 240v Vapour Generation Unit  
**Design Ref.:** CFS-VUL-001  
**Performance Criteria:** Failure Modes requires to be identified as shown below

1. Partial Deluge Blockage Nozzle
2. Full Deluge Blockage Nozzle
3. Partial Deluge Pipework Blockage
4. Full Deluge Pipework Blockage
5. Damaged Deluge Nozzle

**Exclusions:** None

**Note:** Bureau Veritas engineer has only witnessed above mentioned Siron 240v Vapour Generation Unit during the test. Inspection report 15ABD11049 Rev. A can be used as a reference document to acquire more detail on test.

**Performance standard:** QA 021 Rev. 01 - Performance Standard for dry testing of deluge system with the use of Siron 240v Vapour Generation Unit

The undersigned considers that, during the test, Siron 240v Vapour Generation Unit functioned as specified in performance standard QA 021 Rev. 01 and met the specified performance criteria detailed in this attestation.

**Date of Survey:**  
16<sup>th</sup> July 2015

**Witnessed by**  
Hemalkumar Chovatiya





## 6.0 ATTESTED BY BUREAU VERITAS

Correct use of the SIRON Vapour Generation Unit will identify the following deluge Failure Modes:

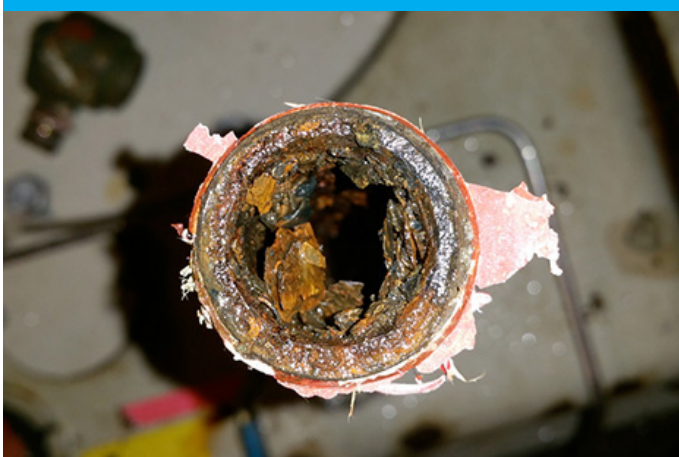
**PARTIAL DELUGE NOZZLE BLOCKAGE**



**FULL DELUGE NOZZLE BLOCKAGE**



**PARTIAL DELUGE PIPEWORK BLOCKAGE**



**FULL DELUGE PIPEWORK BLOCKAGE**



**DAMAGED DELUGE NOZZLE**





## 7.0 REFERENCES

### A CARBON STEEL PIPE PLUGGED DUE TO CORROSION.

Dry Deluge Testing keeps carbon steel piping dry to prevent corrosion.



### B DELUGE SYSTEM PLUGGED DUE TO MUSSELS.

Dry Deluge Testing will prevent marine growth in the deluge system.





## 7.0 REFERENCES

### C NOZZLES PLUGGED DUE TO SALT CRYSTALS

Dry Deluge Testing no will prevent salt crystallization in nozzles.



### D TITANIUM PIPING DELUGE SYSTEM WITH BRASS NOZZLES PLUGGED DUE TO CORROSION.

Because no sea water is used while testing dry, dissimilar metals corrosion will be prevented.

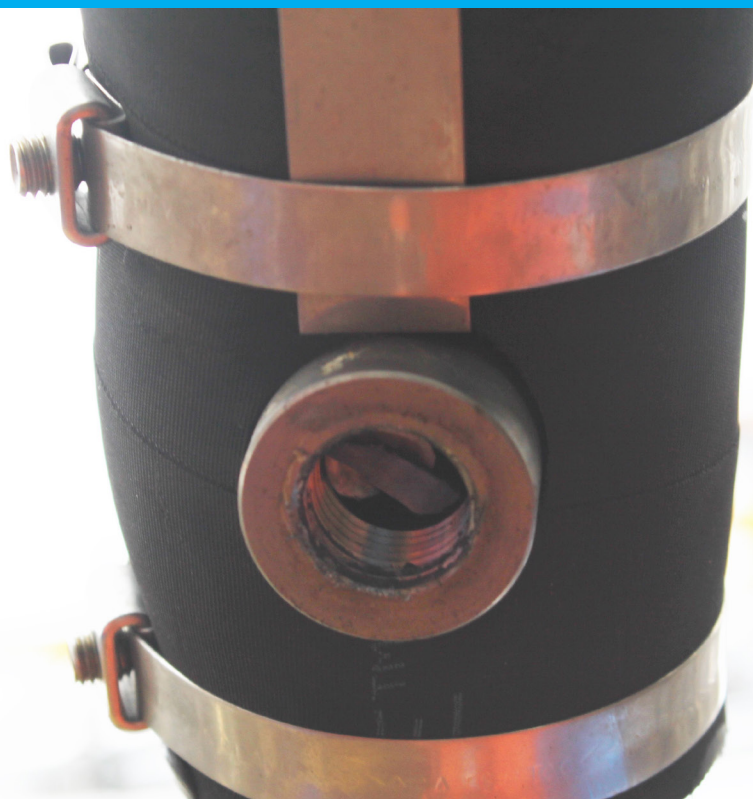




## 7.0 REFERENCES

### E ELASTOPIPE AND TITANIUM NOZZLES PLUGGED DUE TO MUSSELS

Marine growth has no chance using Dry Deluge Testing.



### F MINIMIZE WET TESTING TO PREVENT UNPLANNED SHUTDOWNS DUE TO WATER INGRESS IN THE ELECTRICAL SYSTEM

Circuit boards, switch cabinets and other electrical equipment are kept dry with Dry Deluge Testing.





**G DRY DELUGE TESTING PROTECTS PROCESSING EQUIPMENT AGAINST CORROSION**

Processing equipment benefits from the lack of being sprayed over with sea water by utilizing Dry Deluge Testing.



## 7.0 REFERENCES

### Appendixes

1. Example of a Dry Deluge Testing report

