

Active Hydrophore System AHS-02



BRIEF PRODUCT DESCRIPTION:

Standard material

Seawater exposed parts:
Rapid Response Valves:
Cabinet:

Titanium gr. 2
Titanium gr. 2
SST AISI 316

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QA Certificate no: 2001-OSL-AQ-7140



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This unit has the high pressure cylinder bank installed in a cabinet on top of the hydrophore tank. This arrangement can be used where it is suitable to make the floor level in the high pressure cylinder cabinet match with the platform deck above the deck where the tank is installed. The main advantage with this unit is that pressure safety valves and various other instrumentation connected to the top of the tank, can be installed inside the cabinet, and is thereby easier to access than for unit AHS-01. Another advantage is that since the pressure control valves are installed above the water level in the tank, it is not necessary to have check valves on air inlet piping. This also means that it is only necessary to have one pressure safety valve on the system.

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Where to use Active Hydrophore System

The firewater system on an Offshore Oil Installation is normally built around a Firewater Ring Main (FRM), located on one of the lower decks.

Branches and risers are routed from the FRM to the individual firewater users, such as Deluge systems, Hydrants and Monitors. The firewater is fed into the FRM from large capacity Firewater Pumps (FP), located at sea level.

A Jockey Pump (i.e. a pump with low flow and high pressure capabilities) maintains FRM pressure at all times.

Following activation of a Deluge System (a high flow firewater user), the Jockey Pump cannot keep up with the demand, and the FP's are activated. The run-up time of the FP, normally 10 - 25 seconds will be longer than the opening time for the deluge valves, which will then cause the upper parts of the firewater distribution piping to be drained, due to gravitational force. This drainage will create a vacuum (aka. Column Separation) in the upper parts of the firewater piping.

When the Fire Pumps are started the firewater will rapidly re-fill the drained piping, at high flow and pressure, accelerated by the vacuum. Further, because of the vacuum no air cushion is present, and this will create a very large pressure surge in the system, also known as "water hammer". Pressures exceeding 100 Barg have been experienced. The Active Hydrophore Unit (AHS) is installed to prevent this situation to occur.

The AHS is normally installed at a low level on the platform. The size of the water tank has to be determined based on a number of factors, such as the fire pump capacity, fire pump start-up arrangement, fire pump spin-up time, number and dimensions of deluge valves involved in the largest fire scenario, the opening characteristic of the deluge valves involved, the volume of the distribution piping system for the relevant systems, etc.

The set pressure of the AHS is determined by the difference in elevation between the location of the AHS, and the highest point in the firewater system, i.e. the highest riser. Typically this difference can be around 50 meters. The set pressure of the AHS will then be around 5,5-6 Bar.

Technical Description

Main components

- The AHS skid comprises of the following main components;
- Two Rapid Response Pressure Regulating valves, (one is backup in case of maintenance)

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- Compressed Air Reservoirs (80 liter cylinders – WP 250 Barg) (2 off cylinder banks)
- Water Tank, Pressure Vessel.
- Heated and Insulated Cabinet for Cylinders and instruments
- High pressure air compressor for automatic charging of high pressure cylinders.

Operation

- During normal operation of the fire water system, the AHS is in "stand-by" mode. The Water Tank is filled to capacity, and all air in the vessel is evacuated through the Automatic Vent. Valve.
- When given Deluge systems are activated, the pressure in the fire water system drops until it reaches the set pressure of the AHS. This activates the Rapid Response Regulating Valves, which are designed to maintain the pressure in the Firewater system, with increasing flow.
- Air flows into the top of the Pressure Vessel, at the set pressure of the AHS, thereby discharging water into the FRM. The Rapid Response Pressure Regulating Valve is responding in milliseconds to change in flow as the deluge valve opens up, and will maintain the pressure steady at the set pressure level throughout the sequence.
- When the firewater pumps are spinning up, the pressure in the firewater system increases. When the pressure exceeds the set pressure, The Rapid Response Pressure Regulation valve will sense this immediately, and close. The Pressure Vessel will be recharged by the water in the FRM, and the Automatic Vent. Valve will vent out the Air, resetting the AHU.

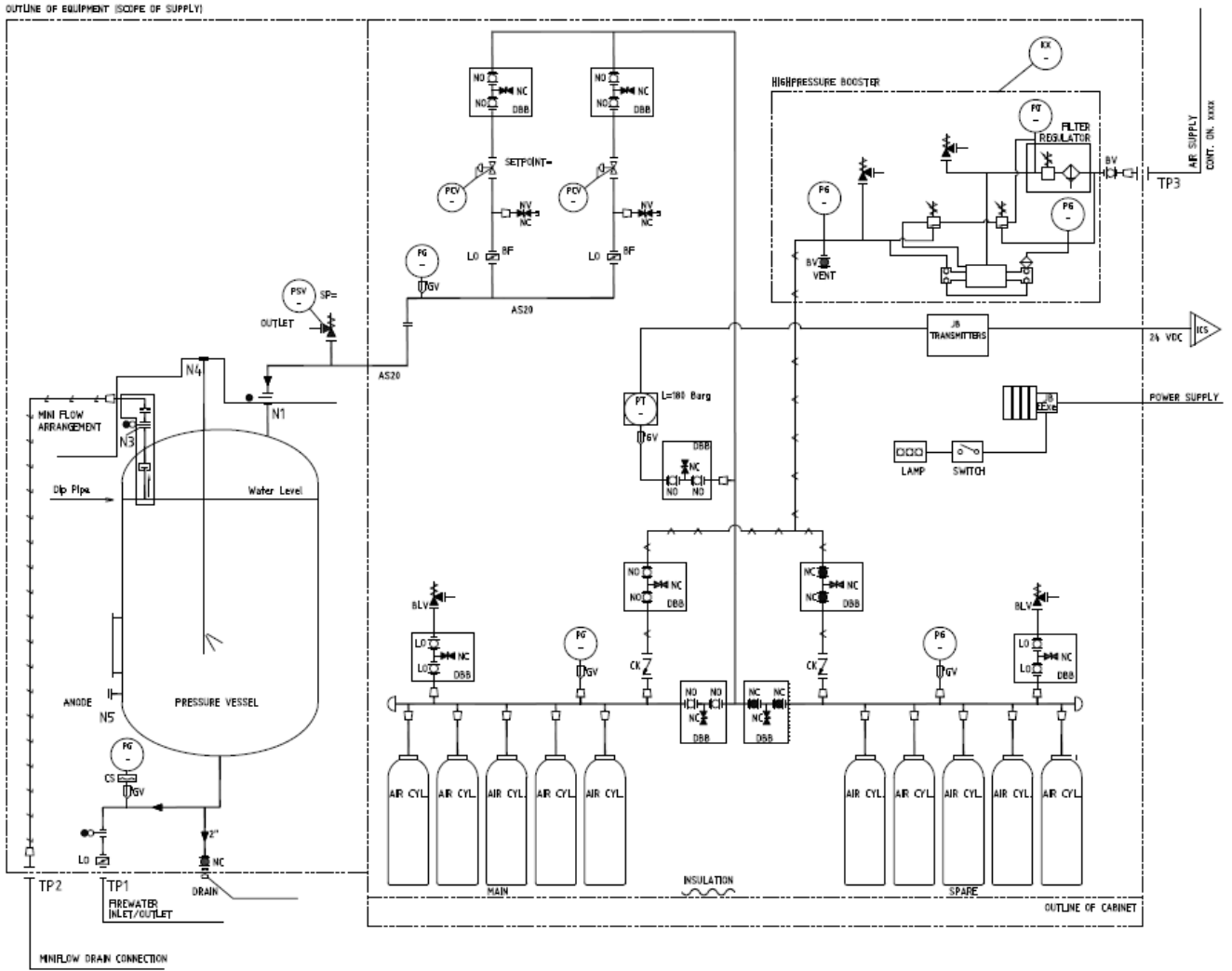
Compressed air supply

A "Haskel" Air Amplifier will automatically repressurize the Air Cylinders. Pressure is maintained at 200 Barg. The pressure is monitored in the Central Control Room via the Pressure Transmitter.

The "Haskel" Air Amplifier is powered by the Platform Instrument Air system, and automatically starts running when the reservoir pressure has dropped below the charge pressure.

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System logic drawing



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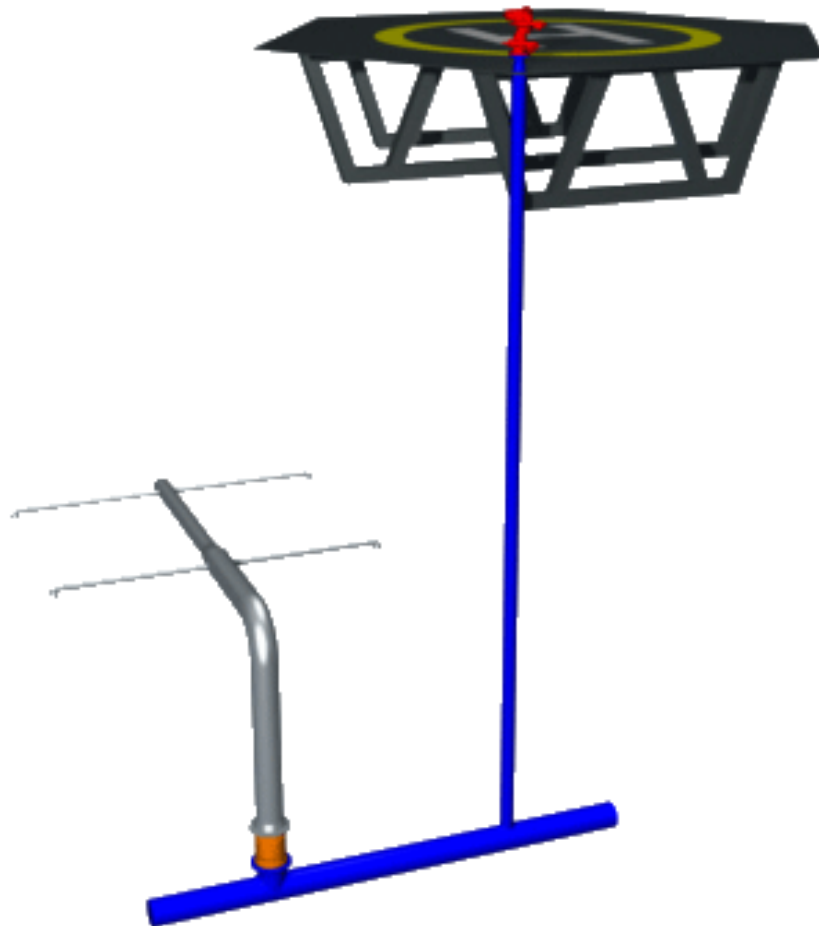


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Schematics, Firewater System without Active Hydrophore

Standby:

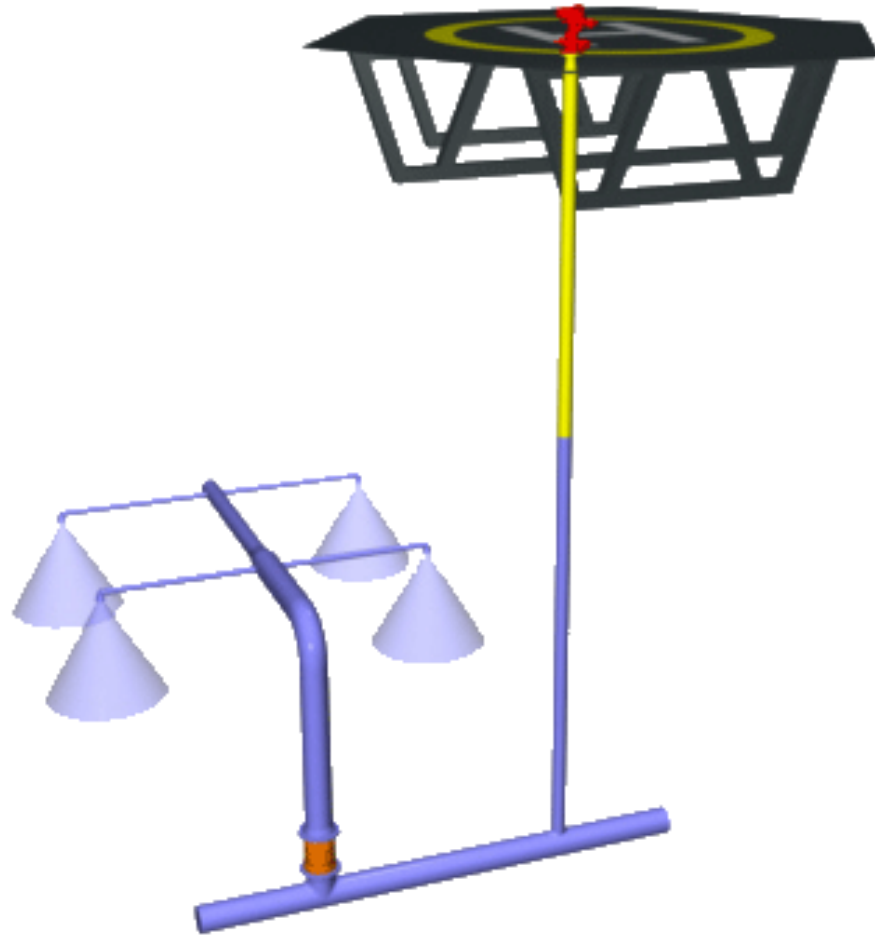
Firewater piping is pressurized by the Jockey Pump.



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Deluge System activated:

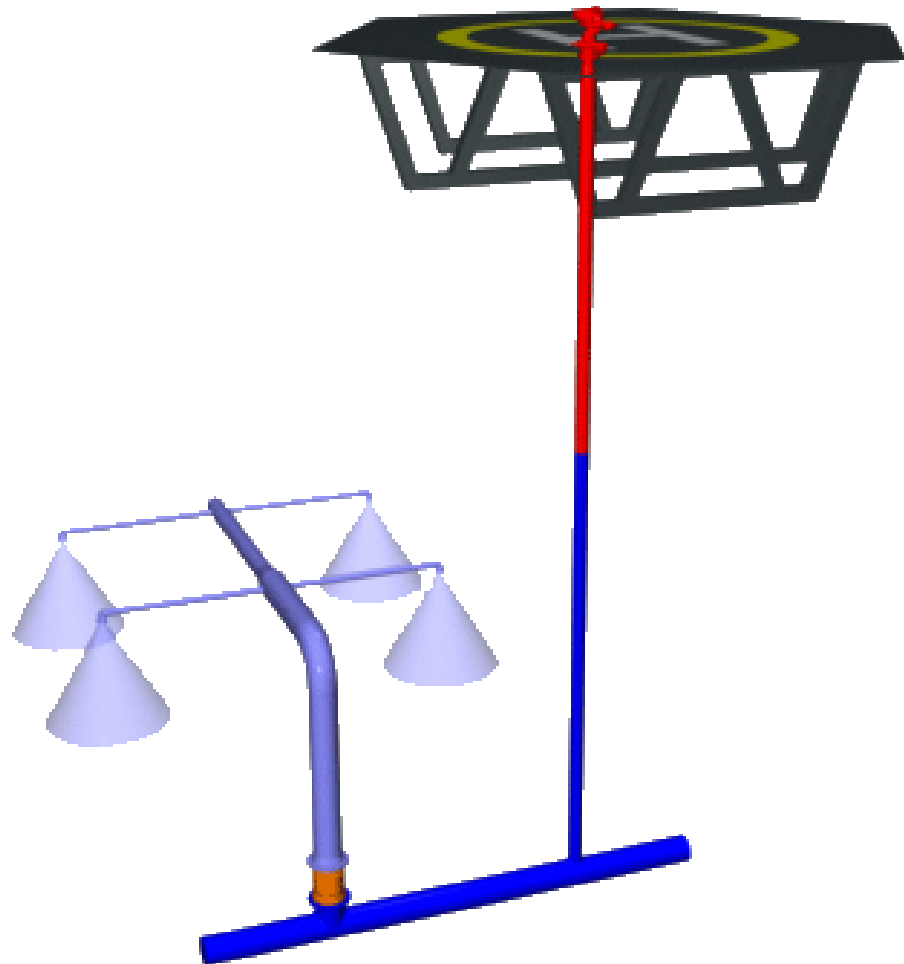
Deluge valve is opened, water flows to the Nozzles, but main Fire Pump is not yet running at capacity. Water is drained from upper part of riser, vacuum is created (yellow).



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Fire Pumps running:

Fire Pumps are running, and water is rapidly filling the riser, at high speed and pressure. Water hammer occurs (red).



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Schematics, Firewater System with Active Hydrophore Unit

Standby:

Firewater piping is pressurized by the Jockey Pump. AHU System is in stand-by mode.



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Deluge System activated:

Deluge valve is opened, water flows to the Nozzles, but main Fire Pump is not yet running at capacity.

AHU is activated, discharging water into the piping, maintaining a positive pressure at the top of the risers.



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Fire Pumps running:

Fire Pumps are running at full capacity and water is filling the riser and AHU. Water hammer is prevented.

