

Subsea Fluid Injection Skid

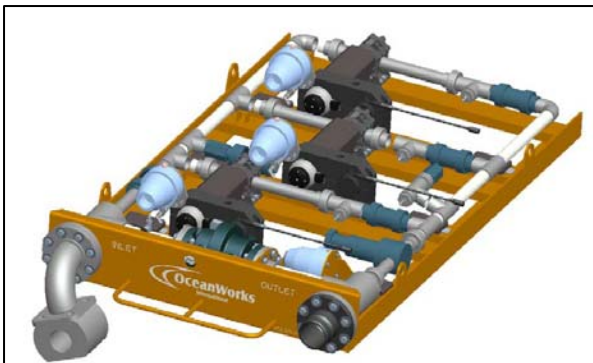
Overview

The OceanWorks Subsea Fluid Injection Skid consists of a dual bladder fluid containment system, a pumping station and monitoring, control and data logging module. The Subsea Fluid Injection Skid can be configured for operation with surface supplied power or with the OceanWorks UPS-3000 battery system for autonomous operation.

The Subsea Injection Skid is configured with two separate bladders each capable of supporting 2,500 gals of fluid. The bladder systems can be independently operated or as a single reservoir system.



The Pumping Station consists of three pumping modules connected in parallel for fault tolerance and the controls for the pumping station can be configured for autonomous, Ethernet controlled, or manual ROV control function. Pump selection is optimized based on requirements to meet the head, flow and viscosity required. The physical pump modules can also be stacked within the skid; or interchanged to allow modularity in operation.



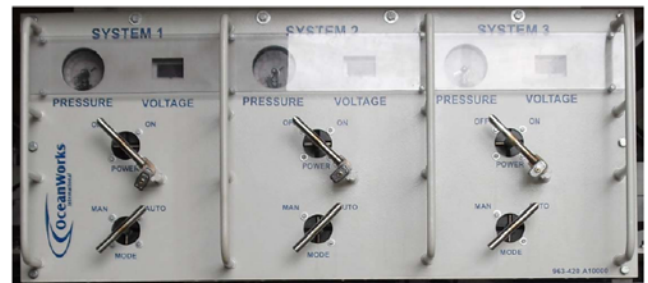
Features

The flexibility and modularity of design is the key hallmark of the OceanWorks Subsea Fluid Injection Skid. Skids can also be interconnected to allow for larger reservoir operation. The dual bladder design provides physical redundancy. This can also be configured with multiple skids in arrays for larger fluid capacity operation. All systems can support subsea refilling.

By incorporating the Subsea Fluid Injection Skid with OceanWorks UPS-3000 battery system fluid injection can be accomplished either autonomously or through ROV control eliminating the need for expensive cabled interconnects.

Monitoring of the reservoir levels, fluid pressure and flow rate as well as state of health monitoring of the pumping station is provided by the control modules. The control modules based on our world leading Ocean Observing system hardware and is backed by over 200,000 hours of subsea deployment. The monitoring system is capable of providing alarms or self directed response to out of tolerance events to ensure faults are isolated and do not propagate through the system.

The entire Subsea Fluid Injection Skid is single fault tolerate with fully redundant system design to ensure consistent and optimal operation.



Typical Applications

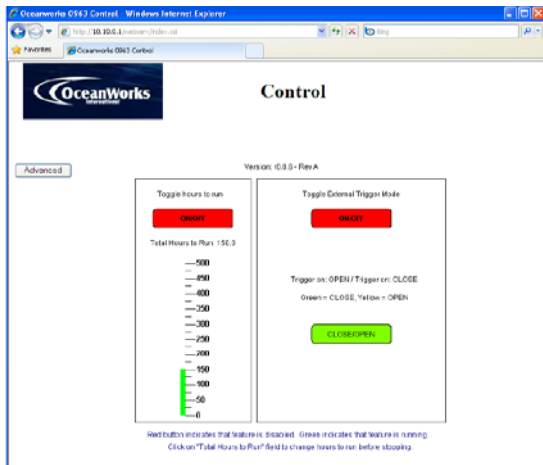
- Subsea Dispersant injection
- Remote wellhead production chemical injection
- Subsea Methanol injection

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Specifications

- **Electrical Input**
 - Input is 300VDC to 400VDC
 - Over voltage and transient protected
 - Communications options (select on build)
 - 1000BaseLX SM fiber optic Gigabit Ethernet
 - 100BaseT Copper Ethernet
 - No external comms only data logging
 - Wet-mate connector standard for external communications.
- **Flow Output Parameters**
 - Adjustable to 30 GPM standard. Custom designs to suit
- **Operation**
 - ROV selectable pumping flow, reservoir selection and ROV readable status lights for fluid level, pump status as well as flow rates and pressure.
- **Mechanical**
 - 20' x 8' x 8'6" ISO container standard options for 30 and 40 foot ISO container sizing optional
 - 10000 lbs in air weight (empty)
 - 100% titanium pressure vessel with dual o-ring seals for monitoring systems
 - Electronic systems Vibration qualified to IEC60068-2-64, Category 2
- **Reliability**
 - 25 year design life on 5 year maintenance service
 - 50,000 Hrs MTBF (MIL-HDBK-217) at 25°C
- **Environment**
 - 3000msw operating depth
 - -20°C to +50°C Transport
 - -3°C to +20°C Operational



Options

- 30' or 40' ISO container operation
- Daisy chain configuration skids
- Multiple pump station modules
- Integrated mud mats and mud mat suction release system
- Autonomous operation (no wet mate connector)

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