

Fully Automated Wellhead Desanding and Choke Manifold Package

Increases performance for flowback operation by automating a remotely operated package

Applications

The fully automated wellhead desanding and choke manifold package is used to minimize downhole time. It increases operational efficiency to reduce risk during flowback operations of coiled tubing cleanouts. The package also helps provide stable flow conditions and supports efficient coiled tubing fracturing operations. It minimizes the need for personnel to be close to the equipment, improving safety, and increases visibility across the equipment setup.

Benefits

- Minimizes HSE risk by avoiding unnecessary solids flushing and personnel exposure to high-risk operation
- Provides full visibility in human machine interface (HMI) with data integration across the equipment setup (Fig. 1)
- Includes an online solids measurement system with a logic flush sequence (Fig. 2)
- Raises operational efficiency and service quality by introducing full condition control (Fig. 4)
- Includes programmable logic controller (PLC) control system in full package

Principles of operation

This package is designed for remote operation and includes a programmed automation sequence to divert the flow through the PLC and the HMI displays. The desander comes equipped with dual-vessel pods, a dual-pod cyclonic desander unit (DCSRU) in a horizontal arrangement, each including cyclone and accumulator sections for maximum storage capacity. The unit offers standby pod double isolation during operation and enables solids removal without interrupting the flow. The desander is fitted with a weight system to measure the solids content in the accumulation. This system triggers the PLC for the flush sequence based on load cell data or time sequence. This saves time by avoiding unnecessary flushing that enables real-time monitoring of load cell data (Fig. 2 and Fig. 3).

Electrically actuated valves direct flow to a single pod at a time with solids weight recorded by the integral load cell. The full signal from the load cell triggers an automated sequence on the PLC system that diverts the flow to the standby vessel. It isolates, vents, and flushes the full vessel.

A remote-operated choke manifold is included in the package to control flowback pressure during coiled tubing cleanout operations. The choke manifold includes four electrically (or hydraulically) actuated valves, four manual gate valves, and two electrically (or hydraulically) actuated chokes. The unit is fitted with a PLC to maintain constant conditions during coiled tubing fluctuating operation by adjusting the choke size and automatically uses an upstream or downstream pressure transmitter. It can also be maintained by flow rate using any metering device. The control system makes it possible to divert a flow from one side to the other in a few seconds by operating valves automatically using the PLC.

The diverter manifold is a skid-mounted dual-pneumatic valve-diverter manifold remotely actuated. It diverts flow to a storage tank if there are 100% water returns from the well. It also diverts flow to the production line if hydrocarbons are detected in the flow measuring device installed downstream from the choke manifold. The control links to the basic sediment water (BS&W) reading from the flow measuring device. An accurate measurement can be obtained from flowmeter equipped with Vx* multiphase well testing technology.

For flushing the desander, two skips with a weight system and pump for each, a control box, pneumatic diverting valves between skips, and a water storage tank can be used. The control box directs slurry to the skips from the desander, diverting flow to the next skip when the active skip is full.

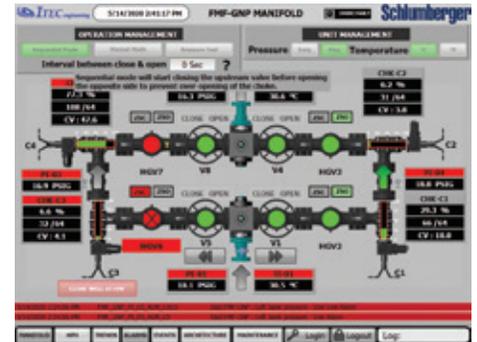


Figure 1. HMI display status.



Figure 2. Online measurement system.

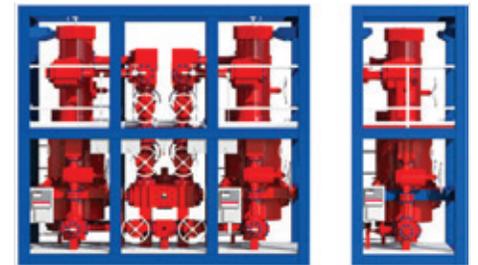


Figure 3. DCSRU 3D model.

The control box is also fitted with sand and water level monitoring devices.

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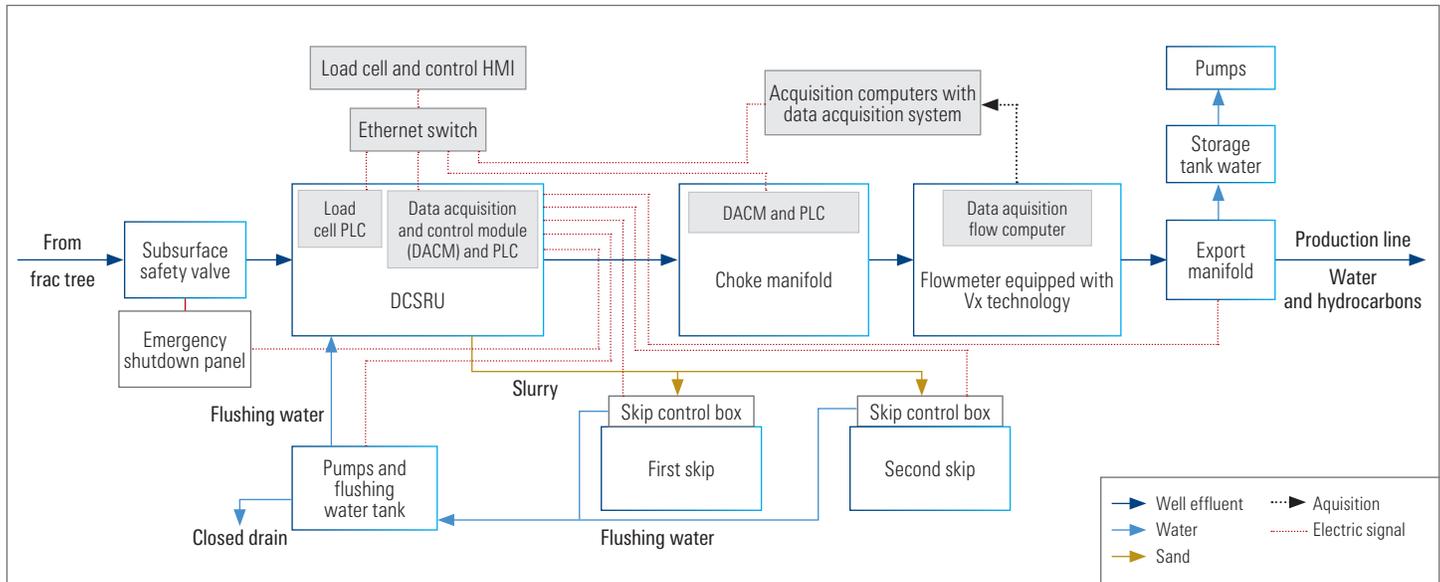


Figure 4. Schematic of the PLC system.

Control system

The control system integrates two separate DACM and a PLC module in one HMI display.

The first DACM system installed on the choke manifold skid controls the choke manifold. Its functions include

- acquiring pressure and temperature transmitter data
- opening and closing actuated valves (manual valve used as backup)
- setting choke size
- setting upstream pressure for coiled tubing cleanout operations.

The other DACM controls the desander and solids handling system. Its functions include

- acquiring pressure and temperature transmitter data
- monitoring imported load cell data
- triggering the flushing sequence based on load cell data or time sequence and directing flow by operating and monitoring valves
- handling solids with a system that diverts flow between the storage tank and production line based on the BS&W reading
- monitoring skips solids and water level through level transmitters by diverting flow between skips based on solids level measured in skips.

The HMI system has the option to either enable or disable the connected operational equipment.

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