

High Pressure Shutdown Switch Fails Equipment Failure

SAFETY ALERT

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Details

Release Date: October 4, 2012
Incidence Type: Equipment Failure
Country and Region: Alberta, Canada

For more information on this event, please contact: safety@enform.ca

Description of Incident:

In the early morning hours a remote separator at a wellsite went into emergency shutdown (ESD). The shut-down of the separator created back-pressure on the system, which subsequently activated a hydraulic ESD on the pipeline.

- The high pressure shut-down switch on the well was tied into the pump-off-controller; however the program logic controlling the shutdown of the pump-jack appeared to have been erased, thereby eliminating the ability to automatically shut down the motor (driving the pump-jack) on high pressure.
- The pump-jack continued to run and build up pressure within the tubing/wellhead, until the 1500 psi rated rod blow out preventer failed. The BOP released a small amount of oil and gas into the air and onto the surrounding lease area.
- The release of product from the well was noticed by a worker from one of the adjacent companies, who was driving by. The worker reported the incident, by calling the Company 24 Hour Emergency number.

The failed BOP was sent to a materials lab to undergo a failure analysis. The findings were that the BOP unit had been over pressured and subsequently catastrophically failed.

What Caused It:

- The High Pressure Shutdown Switch was wired through the pump off controller and then to the pump-jack motor.
- When the logic programming was inadvertently/unknowingly erased in the controller, the shutdown signal sent by the Presco switch (when its high pressure shut down point was reached) failed to reach the motor
- The pumpjack was allowed to continue to operate, building up a very high internal pressure, thereby causing the ratigan to overpressure and fail.

Contributing Factors:

- The Presco switch designed to ESD the pumpjack motor on high pressure, was wired through the pump off controller system, rather than being wired directly to the motor.
- Logic programming in the pump off controller had been modified/erased, thereby preventing the ESD signal to shut down the motor.
- Operators did not perform a functional ESD test on the Presco switch, following a rod packing failure the previous week.
- A functional ESD test may have identified a problem with the logic controller, and (if addressed) would likely have prevented the subsequent failure of the ratigan.(Fig. 1)

By industry, for industry

Corrective/Preventive Actions:

Investigation identified the following preventive recommendations:

- Check all wells with Pump Off Controllers (POC's) that use Program Logic Controllers (PLC's), to activate shutdowns, ensuring that Presco switches are operational.
- Consider installing solenoids on Presco switches in order to bypass the PLC and directly shut down the motor on the pumpjack.
- Install appropriate security level clearance in POC's, to reduce or eliminate the chance of accidental programming removal.
- Implement a procedure for rod packing changes that includes verification of the functionality of the Presco switch, to ESD the motor, over and above the regular maintenance program for Presco checks.



Figure 1: Ratigan Hole