



The Safety Association for Canada's
Upstream Oil and Gas Industry

Hydraulic Operated Master Valve Failure

SAFETY ALERT

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Enform: Your Partner in Safety

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An Industry Product

This document was developed by industry for industry. Working collaboratively, Enform works with the submitting organization representative in developing these documents to improve the industry's hazard awareness. Canada's leading oil and gas industry trade associations support the use of shared information to help companies of all sizes improve performance.

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Details

Release Date: March 21, 2011
Incidence Type: Equipment Failure
Country and Region: NE British Columbia

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

Description of Incident:

- A high rate, slick water fracture stimulation stage was being pumped into a horizontal Marcellus shale well, when the hydraulically operated master valve on the frac head failed and closed pre-maturely.
- The flush stage of the frac treatment was being pumped at approximately 7,500 psi and 90 bbls/min at the time the incident occurred.
- As a consequence of pumping into a suddenly closed valve, a severe water hammer condition developed in the treating line.
- The outcome of this was that the pumpers tripped out on high pressure shut downs at 9200 psi
- The 4 inch, 10,000 psi rated treating line parted in six locations, between the wellhead and the frac manifold.
- The failures were induced by shear forces and the majority occurred at the chican bearing race areas, where the steel wall thickness is reduced slightly.
- There were no injuries, but there was extensive damage to equipment.

What Caused It:

- The failure point was determined to be tensile separation of the valve stem at the connection to the valve gate.
- The closing unit control handle had not been accidentally moved to the close position, eliminating the possibility of human error on the well site.
- The valve was removed and transported to the valve repair facility where it was examined. It was found to be in the closed position.
- The valve was successfully pressure tested. The hydraulic actuator functioned properly and was in good working order.
- The valve was dis-assembled and found to be in good condition with a proper amount of grease present. The metallurgical analysis verified the valve was manufactured with the proper steel specifications.

Corrective Actions:

Further investigation of the incident revealed:

- The cause of the valve stem failure was determined to be a machining error that went undetected during the valve refurbishment process.
- The main recommendation coming from this incident is that operators must ensure that valve refurbishment is being performed to the standards of API 6A.

By industry, for industry

