Uncontrolled Flow Back Occurs Due to Needle Valve Leak in Fracturing Assembly

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Details
Release Date: March 21, 2011
Incidence Type: Equipment Failure
Country and Region: Alberta, Canada

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

Description of Incident:

The incident occurred following a well completions activity.

- Following a well stimulation procedure (Fracturing) the well was being flowed back at a minimal rate to the onsite test unit P Tank to lower the pressure on the well bore prior to a Coiled Tubing clean out procedure.
- A leak occurred around the stem of a Needle valve located in a piece of piping (Data Collection Header) just short of the P Tank inlet.
- The leak was discovered immediately and well control measures were initiated. The two Master Valves located on the wellhead assembly above the casing bowl were shut along with the two Wing Valves located on the wellhead assembly above and to the right of the main Master Valves.
- The four valves closed could not hold the pressure and the onsite personnel were faced with an uncontrolled flow situation.
- The incident was brought under control 21 hours after it began with no injuries to any personnel and no major equipment damage.

What Caused It:

The investigation has indicated that the underlying cause of the incident was due to the following:

- A sand and water mix being flowed back under high pressure (32 MPa) following a Fracturing procedure that had encountered difficulties and had sanded off some of the surface equipment at the tail end of the procedure.
- This increased the sand content in the Frac fluid being flowed back from the well to the test unit. Thereby increasing its abrasive qualities.
- This also contributed to the amount of sand lodged in the wellhead valve assembly, thereby preventing the valve assembly from functioning properly and allowing for full control of the flow back procedure.
- This also contributed to the enlargement of the initial leak discovered at, and the subsequent destruction of the Needle Valve on the tester's Data Collection Header.

Further investigation of the incident revealed:

- The inability of the valves on the Frac Head Assembly to be fully closed is believed to have been caused by the presence of Frac sand in the seats of the valves.
- This belief is substantiated by the fact that when the valves were greased they could then be cycled the full number of turns (23.5) required for full closure.
- The original leak occurred on the Needle Valve on the Data Collection Header upstream of the tester's P tank. Unfortunately the valve in question cannot be analyzed to determine the exact cause of the leak due to the fact that the valve was destroyed by the flow of liquid containing the Frac sand during the incident.

Corrective Actions:

- Training for all staff and contract personnel responsible for of Frac Head Assembly control valves.
- Development of a testing procedure for the Frac Head Valve assembly valve operations and to have a valve servicing unit on standby capable of greasing all valves during all well stimulation operations.
- Confirm with all location personnel the importance of flow back storage (previously and during incident, site personnel ensured flow back tank farm never exceeded two of the five 400 Bbl. tanks were full at any given time)
- Discuss sand entrained in flow back and its possible effect on isolation valves.