



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

## Drilling Rig Fire Due to High AOFP, High Pressure Formation Encountered

Non-Injury Incident

### SAFETY ALERT

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Enform is the upstream oil and gas industry's advocate and leading resource for the continuous improvement of safety performance. Our mission is to help companies achieve their safety goals by providing practices, assessment, training, support, metrics and communication. Our vision is no work-related incidents or injuries in the Canadian upstream oil and gas industry.

#### 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: June 6, 2011  
Incidence Type: Non-Injury Event  
Country and Region: Alberta, Canada

For more information on this event, please contact: [safety@enform.ca](mailto:safety@enform.ca)

#### Description:

While drilling an exploratory gas well in Northern Alberta with 1400kg/m<sup>3</sup> fluid density, the mud motor stalled. A highly over pressured fracture was penetrated and a gas influx entered the wellbore. The well was shut in and conventional well control procedures were implemented. Maximum Allowable Casing Pressure (MACP) was exceeded and the Low Choke Method of well control was utilized. Within one hour of the kick, the high gas rate through the degasser had emptied the mud tank and circulation with the mud pump was no longer possible. At this time the well had been opened direct to flare, in an effort not to exceed MACP and maximum allowable surface equipment pressures. Vented gas became present around well center, indicating a potential casing seat failure and / or surface BOP equipment failure. All engines and electrical generation equipment were shut down. All non-essential personnel were evacuated from location, due to an increasing presence of non-ignited gas around well center and high manifold pressures. Essential personnel remained on location; however were also evacuated, due to increasing pressures and non-ignited gas at surface. Approximately 4 ½ hours after the kick was initially taken, the flowing gas ignited at well center causing the destruction of most surface equipment on site. There were no injuries to personnel during the course of the incident. There was no appreciable damage to the environment. There were no residents or other surface developments located within the Emergency Planning Zone.

#### What Caused It:

##### Unexpected Formation Capabilities

- The progression from kick to blowout occurred, as a result of an unexpectedly high gas rate and surface pressures.

##### Contributing Factors:

- Cleaning, inspection and engineering analysis, by a third party engineering firm, revealed a leak path in the casing bowl blind flange ring gasket, which was the cause of the vented gas at well center.
- Extensive erosion was noted on the ID of the casing bowl and the internal face of the blind flange.

##### Corrective/Preventive Actions:

Implement the following protocol and procedures on all wells, with potential to penetrate high rate (AOFP > 1000e3m<sup>3</sup>/d), high pressure (pressure gradient > 16.0kPa/m) gas reservoirs and / or wells with no analogous reservoir information (as per ERCB [Directive 056](#); New Pool Wildcat, Lahee classification) within a search radius of 30km (six times the radius recommended by ERCB [Directive 008](#))

- Install a minimum Class V BOP system.
- Set intermediate casing, if the FIT (Formation Integrity Test) at midpoint to targeted well depth is less than 18.0kPa/m equivalent gradient.
- Utilize well test equipment, while drilling to flow a minimum of 1980e3m<sup>3</sup>/d gas.

By industry, for industry

