EUB Alberta Energy and Utilities Board

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Safety Bulletin 2005-02

October 25, 2005

Downhole Explosion/Sour Gas Blowout

During a recent workover of a well, a downhole explosion occurred that caused a catastrophic failure of the well's production and surface casings at a depth of about 18 metres (m) from surface. The result was an uncontrolled release of produced water, sour natural gas, and a small amount of oil at surface. The well blew out of control for 30 days, from December 12, 2004, to January 10, 2005. The Alberta Energy and Utilities Board (EUB) has determined the following from an investigation into the incident:

- A mixture of air and hydrocarbons and an ignition source were required for this explosion to occur. It was determined that air was introduced into the wellbore during the previous day's well servicing operations (acidizing). When the acid job was completed, the crew pulled the tubing and acid packer cup tool out of the well. The well and equipment were secured for the night.
- On the morning of December 12, 2004, a rig crew member was opening a valve on the wellhead to take a routine wellhead pressure reading when the downhole explosion occurred. The recorded wellhead pressure was 7000 kilopascals (kPa). The ground around the wellhead lifted, creating a huge crater adjacent to the well and the service rig. Over 100 joints of tubing, which were racked in the service rig derrick, fell into the crater. Sour gas and wellbore fluids flowed to surface. The crew members escaped without injury.
- During the workover of this well, the daily well servicing reports indicated that water was pumped down the production casing at a rate of 0.2 cubic metres (m^3) per minute to maintain a fluid balance in the well. Pumping at this rate was required to prevent formation fluids from flowing to surface, but was not sufficient to prevent air from being drawn into the wellbore. Air and hydrocarbon mixtures are created when a well goes on vacuum and air is drawn into the wellbore.
- The licensee surmised that a possible source of ignition was unstable oxidized hydrocarbon products. The decomposition of these products, which can take place during sudden changes in pressure (e.g., opening a valve), can yield sufficient energy to create a source of ignition. Although the actual source of ignition may never be known definitively, it is worth noting that the explosion occurred in conjunction with service rig personnel opening a valve on the wellhead to take a pressure reading. Similar situations have occurred during other incidents of this nature.

Recommendations

In order to prevent the recurrence of a similar incident, the EUB recommends that

- licensees recognize the inherent risks associated with well servicing operations in which there is potential for air to be drawn into the wellbore;
- licensees review *IRP Volume 18:Explosive Atmospheres in Vessels, Tanks, and Piping System*, currently in draft form, available on the Web at www.psc.ca, as part of a Drilling and

Completions Committee (DACC) sponsored subcommittee. The objective of IRP-18 is to develop recommended practices that will help operators and contractors work safely in situations where air and hydrocarbon mixtures are present.

- licensees develop a safe operating practice that would purge the wellbore of air before securing a well for the night. This practice should be included in the well workover program, and the on-site supervisors, as well as the rig crew, should receive training to ensure they understand the need for its implementation.

Contact

For more information about this matter, please contact one of the following:*

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