



Shell Canada Limited
Hydrogen Sulphide (H₂S) Release
September 12, 2006

EUB Investigation Report

February 6, 2007

ALBERTA ENERGY AND UTILITIES BOARD

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Incident Overview

On Tuesday September 12, 2006, at about 10:00 a.m. Shell Canada Limited's Scotford Oil Sands Upgrader facility, located about 15 kilometres (km) northeast of Fort Saskatchewan, experienced a release of liquid and gas. The incident occurred during routine operations of one the residue hydro cracker (RHC) units. The release consisted of reactor effluent, composed of a mixture of hydrogen, 6 per cent hydrogen sulphide (H₂S), and hydrocarbons, which formed a whitish plume that travelled off site.

The upgrader site was evacuated by Shell, and the emergency response plan (ERP) was activated. The incident command centre was activated, and the Alberta Energy and Utilities Board (EUB) St. Albert Field Centre (SAFC) was notified at 10:45 a.m. An SAFC inspector was dispatched and participated in the incident response unified command. The EUB air monitoring unit was also dispatched to the scene. The incident was classified as a level-1 emergency.

Shell is part of the mutual aid agreement with Northeast Region Community Awareness and Emergency Response (NRCAER) members. Shell updated the NRCAER line with information at 10:25 a.m. with the first of four messages.

The emergency response teams were summoned, and the release was controlled by spraying it with water to cool it and prevent ignition. A slow reduction of the pressure and temperature in the unit commenced.

To ensure public safety from emissions from H₂S and sulphur dioxide (SO₂), off-site air monitoring was conducted. The investigated area was defined by the wind direction during the event. As a precautionary measure, at 11:00 a.m. a shelter-in-place advisory call-out was issued to the 12 residents in the primary communication area (PCA) to the east of RR 214. Pipeline workers in the near vicinity were also notified by Shell security, and road access was controlled in this area.

At about 12:50 p.m., the pressure in the unit had been reduced and the release was effectively stopped. The upstream tight shut-off (TSO) valve was closed, and water spraying continued to reduce the temperature. At 15:45 p.m. the all-clear message was sent out to residents in the PCA and the 24-hour contact list.

Later that night when water spraying was interrupted for inspection of the area, the release briefly recurred due to the TSO valve not holding properly. The release was quickly controlled by resuming water quenching and rapidly decreasing the remaining pressure in the unit, effectively stopping the release.

On September 13 at 17:55 p.m., positive isolation of the leak was achieved with installation of temporary engineered enclosures and the unit was restarted.

There was one medical complaint reported by a worker at the site. This worker complained of eye and throat irritation. He was treated on site, was released, and returned to work the next day.

No members of the public were injured as a result of the incident.

Damage was limited to Shell's assets and the use of the unit due to the shutdown for investigation into the cause of the release and repair.

EUB Investigation and Findings

The EUB conducted an investigation focused on the cause of the incident, the risk to public safety, environmental impacts, and the conservation of the resource. The following findings resulted from the EUB investigation.

Cause

The operator decided to swing the process from one line to another in the unit. The system needed to be warmed up prior to the swing over, so the system was cracked open at about 9:50 a.m. to allow product to flow through that circuit for warm-up. About 10 minutes after the system was opened, there was a vapour release. A fitting containing a restriction orifice in a bypass line around a backup high-pressure separator level control valve line failed, causing the release. The most probable cause of the failure was the rapid heating of the fitting, combined with sealing surface damage or debris.

Public Safety/Emergency Response

This portion of the investigation was to assess the implementation of Shell's ERP, including the action undertaken to manage the incident. All required agencies were contacted: EUB, Alberta Environment, Workplace Health and Safety, Environment Canada, Capital Health Region, Strathcona Fire Department, RCMP, and local hospitals and clinics.

The EUB concluded that at no time during the response to the incident was public safety at risk.

There was prompt response from the three Shell ERT crews (refinery, upgrader, and chemicals), with good communication between the fire captains and the safety officer setting up the hot zone.

While many critical portions of Shell's ERP were implemented and managed appropriately, the EUB has concluded that specific elements of Shell's ERP were deficient. These deficiencies relate primarily to effective communication during an incident, especially with other affected stakeholders during the initial period of the incident. Specifically, there is a need to

- improve public and media notification regarding an incident's status, and
- ensure that pertinent details are communicated in a timely manner to all affected parties, both internal and external.

At 2 p.m., a contract mobile air monitoring unit was deployed monitoring air quality downwind from the site. The highest one-hour average reading for SO₂ was 1.4 parts per billion (ppb) and for H₂S was 0.4 ppb. The *Alberta Ambient Air Quality Objectives* for hourly averages are 172 ppb for SO₂ and 10 ppb for H₂S. These objectives are on the Alberta Environment Web site at <http://environment.gov.ab.ca/info/library/5726.pdf>. The EUB air monitoring unit, while ensuring complete area coverage, registered no readings in the monitored area.

Based on the readings recorded, at no time were the *Alberta Ambient Air Quality Objectives* exceeded.

Environmental Impact

The liquid released and the water sprayed during the incident control was contained on the concrete pad and catch basins under the RHC unit. The total H₂S released was about 21 cubic metres (m³) and the amount of SO₂ released from hydrocarbon on flare during the event was about 22 tonnes. Water was sprayed on the release, cooling it, thus reducing the amount of vapour generated by the release.

Resource Conservation

The amount of liquid hydrocarbon released was estimated to be about 11.3 m³.

Follow-up Actions

Shell

As a result of the incident and the EUB investigation, Shell has committed to

- 1) conduct an ERP exercise and schedule an exercise to test a new automated call-out delivery system;
- 2) communicate the findings to all affected parties, including NRCAER, neighbouring residents and businesses, municipal officials, Northeast Capital Industrial Association and county emergency responders (RCMP, Fire Department);
- 3) ensure that the 2007 information package for neighbour visits/contacts update in accordance with EUB Directive 071: Emergency Preparedness and Response Requirements for the Upstream Petroleum Industry, Section 4.3.3, is completed to ensure that all members of the public are fully informed of the process of how to shelter;
- 4) ensure that residents who have contacted Shell or the EUB have been contacted or visited and their concerns noted;
- 5) review all similar fitting connections at the upgrader with potential for this type of failure, placing temporary engineered enclosures around them, and revise procedures for warming systems prior to placing in hot service;
- 6) removal and replacement of the failed fitting during the plant turnaround in 2010;
- 7) ensure that the manufacturer of the fitting was notified and requested to contact other users of this technology to check if similar incidents have been experienced by other users and ensure that the users understand this incident;
- 8) install remote actuators on all of the valves in the unit so it will enable the control room operators to close the TSO valves remotely; this will result in the valve sealing as designed and it will therefore isolate the upstream equipment at high pressure; and
- 9) ensure that the line is not put into use until engineered repairs are complete.

Actions 1 to 4 are repeated from the September 7, 2006, incident investigation report and will not require duplication.

EUB

- 1) The EUB will meet with Shell to track the progress of the follow-up actions and update EUB management.
- 2) The EUB will continue to respond and evaluate its response to incidents with respect to emergency management for oil sands sites.