Incident Title	**Deethaniser Reboiler Catastrophic Failure**	
Incident Type	Fire	
Date	25th September 1998	
Country	Australia	
Location	Longford, VIC	
Fatalities	**Injuries**	**Cost**
2	8	US$ 987 m (2021) – Ref. 4

Incident Description

Credit: Fairfaxmedia/The Age

A gas processing plant was taken off-line following a major upset. A few hours later, the rich oil deethaniser reboiler had become intensely cold and failed catastrophically when warm lean oil was re-introduced during restart. The failure released more than 10 tonnes (22,000 lb) of hydrocarbon vapour to atmosphere. The vapour cloud drifted 170 m (560 ft) to a set of fired heaters and ignited. The flame front from the resulting deflagration burned through the vapour cloud without causing an explosion. When it reached the ruptured exchanger, a fierce jet fire developed beneath an elevated piperack junction and flame impingement caused 3 more leaks. The resulting fire burned for more than 2 days. Two employees were killed and eight more were injured. Supplies of natural gas to domestic and industrial users throughout the State of Victoria were halted for more than 2 weeks, causing substantial losses to industry and massive inconvenience to people in their homes.

Incident Analysis

Basic cause was brittle fracture of the deethaniser reboiler channel end due to intense low temperature (-42 °C vs 100 °C in normal operation).

Critical factors included: 1) Loss of warm lean oil flow for an extended duration. 2) Absence of remote-operated emergency block valves (EBVs) to isolate interconnecting plant, 3) Senior engineering staff had been relocated to the head office in Melbourne several years earlier.

Root causes included: 1) Inadequate hazard identification (low temperature hazard due to loss of lean oil), 2) Incomplete operating procedures (due to inadequate hazard identification), 3) Inadequate operator training (abnormal operations and upsets), 4) Inadequate alarm management (too many alarms, poorly prioritised), 5) Failure to conduct a management of change (MoC) review (organisational change relocating senior staff to head office), 6) Safety management system not fully implemented (inadequate supervision of operations and personal safety prioritised over process safety).

Lessons Learned

1) Cold metal embrittlement of carbon/low alloy steels is a low probability, high consequence hazard that is sometimes overlooked, 2) Risk assessment can only be conducted against known hazards, so it is imperative that comprehensive process hazard analysis (PHA) studies (including Hazop) are conducted on hazardous plant, 3) Organisations should ensure their workforces always remain mindful of the possibility of disaster ("chronic unease") and report all incidents and their root causes, 4) Remote-operated emergency block valves (EBVs) can be deployed to control large accidental releases of flammable materials, 5) The State of Victoria introduced the Occupational Health and Safety (Major Hazard Facilities) Regulations 2000 which legislated a requirement for a Safety Case at all major hazard facilities.

More Information

1) "Report of the Royal Commission into the Accident at Esso Longford", June 1999.
2) "Lessons from Longford", Andrew Hopkins, CCH Australia Ltd., 2000, ISBN 1-86468-422-4.
3) "Have Australia's Major Hazard Facilities learnt from the Longford Disaster?" James Nicol, Institution of Engineers Australia (IEAust), 2001, ISBN 0-85825-738-6.
4) "100 Largest Losses in the Hydrocarbon Industry", Marsh Property Risk Consulting Practice, 27th Edition (2022).

Industry Sector	Process Type	Incident Type
Oil & Gas	Gas Processing Plant	Fire
Equipment Category	**Equipment Class**	**Equipment Type**
Mechanical	Heat Exchanger	Shell & Tube

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