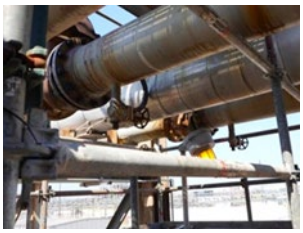
Incident Title	**Toxic Gas Release During Maintenance Activity**	
Incident Type	Toxic Gas Release	
Date	10th October 2024	
Country	USA	
Location	Deer Park, TX	
Fatalities	**Injuries**	**Cost**
2	13	US$ 12.3 m (2026) – Ref. 1

Incident Description



Credit: US Chemical Safety Board

"Lean" amine is used to treat acid gases such as hydrogen sulphide (H_2S) and carbon dioxide (CO_2) produced by multiple refinery processes. The absorbed acid gases are liberated from "rich" amine by steam stripping in 2 identical amine regeneration units (ARU6/7) operating in parallel and located on the same plot. Lean amine is returned to the refinery for re-use and liberated acid gas from ARU6/7 is routed to the sulphur recovery unit (SRU) and other downstream units via independent transfer lines in an elevated piperack. Perimeter (battery limit) isolation valves and blinds with a shared access platform enable full isolation of ARU 6/7 from other refinery units.

The SRU was undergoing a full maintenance turnaround (depressured, decontaminated and positively isolated at its battery limit). ARU6 had been shut down for opportunity maintenance (process piping depressured, purged, and isolated with blinds). ARU7 was live and operating normally.

On the day of the incident, contract boilermakers were abruptly reassigned from working on the isolated SRU to the adjacent, partially operational ARU. They inadvertently opened the acid gas blind flange on the live ARU7 line instead of the intended nearby depressured ARU6 line. Around 12.2 tonnes (27,000 lbs) of pressurised H_2S escaped and travelled downwind to the SRU.

Incident Analysis

Basic cause of the fatal H_2S-rich gas release was contract boilermakers mistakenly opening a flange on the pressurised ARU7 acid gas line instead of the depressured and isolated ARU6 acid gas line just 1.5 m (5 ft) away.

Critical factors included: 1) Acid gas lines from ARU6/7 were not labelled, 2) The ARU6 (blinds list and associated drawing did not clearly show blind locations, 3) Operators hung a visual identifier tag for subject ARU6 blind on a railing above the flange (due to poor access) but the workers did not see it, 4) The ARU6 blind removal permit covered 15 lines in various services (even though acid gas presents unique hazards and procedure required operator presence), 5) Boilermakers at ARU6 were not wearing personal H_2S gas detectors (as they were using supplied-air respirators), 6) The SRU fixed H_2S gas detectors were not in service due to turnaround-related maintenance.

Root causes included: 1) Inadequate hazard awareness (contractors moved from isolated SRU to live ARU6/7 but not briefed on possible presence of H_2S), 2) Inadequate risk assessment (H_2S exposure risk at downwind SRU not evaluated), 3) Inadequate control of work (absence of hold point to ensure presence of operator), 4) Inadequate process safety management (failure to enforce procedure requiring separate permit for high hazard work).

Lessons Learned

1) A standardised equipment identification system coupled with clear, physical marking of piping can help minimise the risk of misidentification of a workface, 2) The permit to work (PtW) system should unambiguously define hold points (if required) and responsibilities to ensure safety-critical activities are not overlooked or skipped by workers, 3) Direct communication between the responsible operator and the workers performing the job is essential (do not rely on maintenance foreman to pass on permit and job requirements).

More Information

1) "Fatal Hydrogen Sulphide Release at PEMEX Deer Park Refinery", US Chemical Safety and Hazard Investigation Board, Report No. 2024-05-I-TX (2026): https://www.csb.gov/pemex-deer-park-chemical-release-/.

Industry Sector	Process Type	Incident Type
Oil & Gas	Amine Regeneration Unit	Toxic Gas Release
Equipment Category	**Equipment Class**	**Equipment Type**
Not equipment-related	Not applicable	Not applicable