

Incident Investigation Report

INTELEX INCIDENT TITLE: #474070, #3 Amine Unit Acid Gas H2S Exposures

LOCATION: Marathon Los Angeles Refinery, Carson Operations (LAR-C)

INCIDENT DATE: 4/20/2025 9:30 AM

INVESTIGATION INITIATED: 4/20/2025 9:11 PM

INVESTIGATION METHODOLOGY: TapRoot® Root Cause Analysis

DATE OF REPORT: 5/29/2025

INCIDENT SUMMARY:

On Sunday, April 20th, at approximately 9:30 am, acid gas from the Carson #3 Amine Unit was released from a bleeder to the atmosphere resulting in H2S exposures over 500 ppm to three Operations personnel (OP), OP-A and OP-B and the Operations Shift Supervisor (OSS). OP-A was transported to the hospital, received first aid and was released. OP-B sustained a laceration on the head as they fell down the ladder and was treated offsite, which was classified as a recordable injury. The OSS was evaluated on site with no further treatment.

The release occurred while the three OP's were on an elevated platform progressing with the #3 Amine Unit startup. They had intended to open the plot edge valve on the flare line to put it in service, but mistakenly opened the plot edge valve on the acid gas line. In the process the upstream bleeder plug valve was either bumped open or had not been fully seated allowing acid gas to leak out.

Meteorological Conditions:

Wind was coming from the south-southwest at 7 mph. Temperature 61°F.

Material Released:

Amine acid gas, hydrogen sulfide (H2S)

Injuries or Community Impacts:

OP-A and OP-B were exposed to H2S with physical symptoms.

OP-B fell and sustained a laceration to the head.

IMMEDIATE CORRECTIVE ACTIONS:

- The three OP's evacuated the platform.
- The OSS donned fresh air, returned to the platform, and closed the bleeder.
- First responders were called to assist the injured personnel.

INVESTIGATION TEAM:

The investigation was started immediately after the incident on April 20, 2025. A collection of witness statements and preliminary interviews occurred between April 20 and April 24. Below is a list of the incident investigation team members.

1. Process Safety Senior Engineer - Investigation Leader
2. USW Process Safety Representative
3. Process Specialist
4. Technical Services Process Engineer
5. Industrial Hygiene Manager
6. Area Team Manager
7. Advanced Process Safety Engineer

EVENT DESCRIPTION:

On the morning of April 20, 2025, the Carson Amine Unit was being restarted following Major Maintenance. On crew that day were three field operators (OP-A, OP-B, and OP-C) and the console operator. OP-C was not involved in the #3 Amine Unit activities and typically was assigned to the loading area.

The Plot Edge Operational Readiness Review (ORR), isolation plan reinstatements, and #3 Amine Unit start-up procedure had been initiated on April 19 and progressed through night shift. This included a unit walkdown to close and cap/plug bleeders using the isolation plan as a reference. One night shift operator had stayed over to continue to assist with reinstatements on the isolation plan and pulling the remaining blinds. The permit issued on night shift to pull blinds was extended through day shift as allowed by the standard.

At 7:00 AM the crew did a second pressure test on the system up to the overhead accumulator to verify the pressure test completed on night shift. Reportedly, the acid gas line was not part of the pressure test. There were no deficiencies observed through the pressure test. Between 8:00 AM and 8:30 AM the last two plot edge blinds were pulled on the acid gas and rich amine lines.

Through the morning, the Operations Shift Supervisor (OSS) and Day Foreman had been attending to the Wilmington SRP on-going TAR. The OSS went over to the Carson Amine Unit to assist OP-A and OP-B with putting the flare line in service because the plot edge plug valve was difficult to operate. The OSS arrived and discussed putting the flare line in service with the operators. All three ascended the ladder to access the platform and scaffold where both the flare and acid gas plot edge valves were. OP-A went to the flare valve to look over the isolation, noticing other locked valves and housekeeping issues. At the same time, the OSS and OP-B noticed the acid gas valve with a pipe wrench already positioned on the stem (there was no handwheel installed and this was also a difficult valve to operate) and mistakenly thought that was the flare valve they were supposed to open. The cable, lock, and tag installed around the valve body had slid below the valve and was not immediately visible. The OSS and OP-B fully opened the acid gas plug valve. The upstream bleeder had not been plugged and either had been partially cracked open or it was bumped open in the process of opening the acid gas valve. As a result, H₂S gas leaked from the bleeder. Both operators' personal gas monitors alarmed and pegged at 500 ppm. OP-B lost consciousness while descending a ladder and sustained a head laceration. OP-A, followed closely behind, also lost consciousness briefly after reaching the ground. OP-C and the Day Foreman were in the area and responded to assist the operators. The OSS descended from the platform and told responders to call for

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help. The OSS donned fresh air and returned to close the bleeder, which stopped the leak. He estimated the bleeder was open 10-20%. The unit start-up was put on hold and in a safe state.

OP-A and OP-B were transported to the hospital for treatment and evaluation and were released. The OSS was evaluated on-site with no further treatment.

Timeline of Events:

The following detailed timeline of events was determined through eyewitness accounts, control system data, and other evidence. Where an “~” symbol is used, the time is approximate.

4/19/2025	Day Shift	Day shift operators began prepping SRU for startup.
4/19/2025	Day Shift	2 ERT-qualified operators and the OSS respond to an emergency in the North End.
4/19–20/2025	Night Shift	Night shift operators continued pulling blinds and prepping the unit.
4/20/2025	3:00 AM	Pressure test conducted on coolers, tower, and accumulator.
4/20/2025	5:00 AM	Shift relief, one operator stayed over two hours to assist with start-up.
4/20/2025	7:00 AM	Second pressure test conducted by day shift to verify tightness.
4/20/2025	~8:00 AM	Remaining blinds on acid gas and rich amine lines pulled.
4/20/2025	~8:30 AM	OSS arrived at SRU to assist with prep and startup activities.
4/20/2025	9:00 AM	Operators and OSS began prep to put flare line in service.
4/20/2025	9:20 AM	Acid gas valve mistakenly opened; H ₂ S leaked from bleeder.
4/20/2025	9:21–9:22 AM	Operators’ H ₂ S monitors alarmed; evacuation initiated.
4/20/2025	9:25 AM	OSS donned fresh air and secured the bleeder valve with a wrench.
4/20/2025	Post-incident	Two operators transported to hospital; OSS evaluated on-site.
4/20/2025	Post-incident	Unit startup halted and placed in a safe state.

Major Incident Requirements

Human Factor Analysis

A Human Factors Checklist Analysis was performed as part of the incident investigation by the investigation team. The team identified that the human factors issues that contributed to this incident were primarily related to communication or understanding of the management systems, supporting the findings from the TapRoot® Root Cause Analysis.

Process Hazard Analysis

As part of the incident investigation requirements for major incidents, the investigation team reviewed the 2021 Process Hazard Analysis (PHA) for the Carson 3, 4, 5 Amine Units.

PHA: The content of this study did not identify additional information considered relevant to the investigation. The study includes a scenario for backflow of acid gas through bleeders and exposure to

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personnel. Safeguards listed included operating procedures, use of fresh air when breaking the line, fixed H₂S monitors with local and TDC visual and audible alarms, and personal H₂S detectors.

SPA/LOPA: The content of this study did not identify additional information considered relevant to the investigation.

HCA: This study was not applicable since the incident was not related to hierarchy of controls.

DMR: This study was not applicable since the incident was not related to a damage mechanism. Therefore no updates to the DMR are required.

Agency Notification

Notification was made to California Governor's Office of Emergency Services (CalOES) and LA County Fire.

Interim Measures Implemented

The leaking bleeder was closed and the unit put in a safe state until an evaluation could be completed.

Identifying Management System Failures/ Organizational & Safety Culture Deficiencies

The incident investigation team relied on a widely used and well-regarded methodology (TapRoot®) for purposes of conducting its root cause analysis. This methodology considers potential management system failures and process safety culture deficiencies. For example, pertinent questions are assessed such as whether management was warned of the problem, whether the problem has occurred before, and whether a task was performed in a hurry or a shortcut used. In addition, the TapRoot® workflow takes into account: (1) whether standards, policies, or administrative controls needed improvement, (2) whether standards, policies, or administrative controls were not used, (3) consideration of oversight / employee relations, and (4) relevant corrective actions.

The TapRoot method details each of these management system subcategories. As an example, for purposes of analyzing the "oversight / employee relations" subcategory, the method guides consideration of the following:

1. Did management fail to hear about the issue and their involvement was needed to ensure adequate corrective actions?
2. Could the issue have been prevented by management involvement in an adequate evaluation program with timely corrective actions?
3. Did management's lack of an effective employee communications program that communicates their concerns for quality workmanship, their beliefs, safety emphasis, programmatic direction, etc., contribute to the issue?
4. Did failure of management's employee communications program to communicate their concerns for quality workmanship, their beliefs, safety emphasis, programmatic direction, etc., contribute to the issue?
5. Did management fail to create the appropriate culture or work environment (for example, excessive pressure that caused shortcuts to be taken to get the job done quickly) to prevent this type of issue?
6. Did management fail to provide proper examples and rewards (or inconsistent examples and rewards) for quality workmanship, good safety performance, and environmental stewardship in the organization?

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7. Could the issue have been detected and corrected by an audit conducted by an independent, outside auditor and should this audit have been requested by management?

INCIDENT CAUSES AND RECOMMENDED CORRECTIVE ACTIONS:

Causal Factor	Root Cause	Recommendation	Hierarchy of Controls Analysis
CF 1: The isolation plan reinstatements had not been fully signed off.	RC 1: Operations was working on completing the ORR, isolation plan reinstatements, and start-up procedure prior to the incident. Completion of the reinstatements for the flare and acid gas line isolations had not been completed prior to opening process valves.	REC 1: Identify and implement a strategy to prompt operators to close and cap or plug bleeders following maintenance work before blinds are pulled. This could include incorporating a review of start-up tasks against the start-up procedure checklist as procedures are updated to ensure applicable steps are included in the updates and reviewed through the MOC process.	Procedural
CF 2: The ORR had not been completed before opening process valves.	RC 2: At the time of the incident, items B.2 related to blind removal, F.2 related to locked valves, and F.4 related to flare lineups and flare blind removals on the ORR had not been signed, therefore the final signature for the Area Team Leader verifications was not signed off. Interviews indicate operators believed putting the flare in service was part of the ORR.	REC 2: Identify and implement improvements to the ORR checklist to include P&ID walkdowns for cycle-ending or non-cycle-ending outages (TAR, maintenance, etc.) involving plot edge isolation to ensure bleeders are closed and capped/plugged prior to opening process valves. Clarify in the ORR flare line walkdown language and expectations that ORR is 100% complete before opening process valves, including the flare valves.	Procedural
		REC 3: Evaluate 65-3001 3 Amine Unit Startup procedure and implement changes to clarify completion of the ORR prior to opening process valves. Clarify which valves are considered process valves (e.g. flare, acid gas, or other plot edge valves). Consider adding a stop point and step for the OSS to sign as verification that the isolation	Procedural

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Causal Factor	Root Cause	Recommendation	Hierarchy of Controls Analysis
		plan (where required) and ORR signatures have been completed prior to opening process valves.	