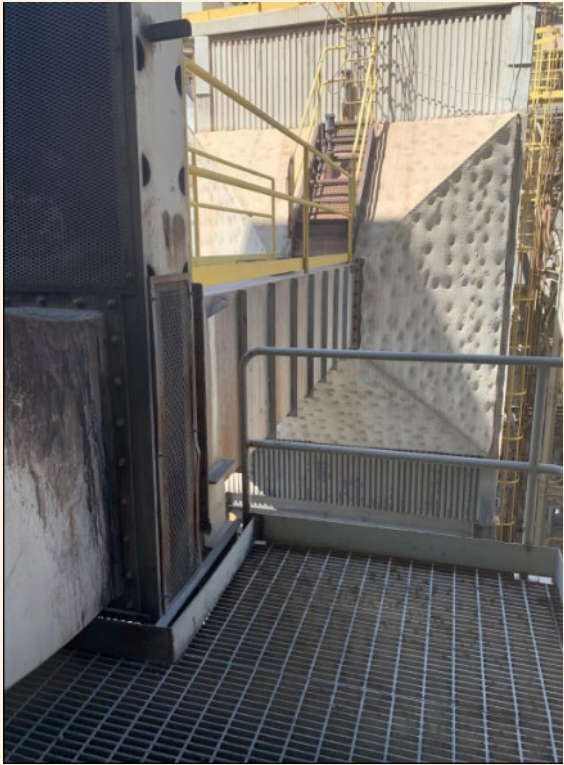





Potential Fatal Event: Sulfur Dioxide Gas Inhalation

Incident Details	
Operation	Sierrita
Date / Time	March 21, 2023 / 9:30 a.m.
Type	Injury
Summary	Control room operator was switching scrubbers and directed field operator to close crossover gate/valve for the wrong roaster. This caused Sulfur Dioxide (SO2) gas to vent through to the roaster building in which the control room operator was located. The employee exited from the area using the stairs to the bottom floors but had already inhaled SO2 gas.
Fatal Risk	Exposure to Hazardous Substance - Acute
Risk Category	Actionable
Pre / Post Rating	Significant (3) Likely (3)
Absent / Insufficient Controls	<ul style="list-style-type: none"> No SO2 Monitoring No Respiratory Protection
Applicable Policies / Procedures	<ul style="list-style-type: none"> SOP and Training Hazardous Gas Policy
Employee Condition	Employee had chest pain, required follow-up evaluation.
Contact	Cara Forbregd, Manager-Health and Safety

Photos / Links	
	
<i>Outside view of roaster building</i>	<i>Inside view of roaster building</i>



Potential Fatal Event Learnings: Exposure to Sulfur Dioxide Gas

Causal Factors

- Field operator was instructed to close wrong gate/valve.
- Field operator ran from outside terrace into roaster building, where SO2 gas concentration was highest.

Action Items	Hierarchy of Controls
Install interlocks in conjunction with automation.	CA-1 Engineering
Create and implement emergency drills for evacuation situations from roaster building.	CA-2 Administrative
Implement and communicate new PPE requirements for roaster building (tango, escape respirator).	CA-3 Administrative
Add PAPR requirement and communicate to all crews.	CA-4 Administrative
Install fixed monitoring system for SO2 in roaster building with alarming system	CA-5 Engineering

Failed Safeguards / Additional Learnings

- Install emergency backup generator for roaster and off-gas system.
- Revise roaster area sampling plan to include area and personal SO2 sampling during regular operation and when cleaning/switching scrubbers.
- Evaluate the use of tablets/tools in the field so employees can access SOPs and verify information provided by the control room operator.
- Install signage with SO2 information at the roaster.
- Review alternative technology to reduce scrubber cleaning.
- Identify other areas of exposure and generate appropriate controls.

Fatal Risk Management Insufficient Controls

- Atmospheric Monitoring – INSUFFICIENT**
- Is personal air monitoring equipment in use, functioning properly and within the designated breathing zone, where required?
- Emergency Response – INSUFFICIENT**
- Do I understand the evacuation procedures if an alarm (both personal and/or stationary) is triggered?
 - Can I recognize an upset condition that may warrant evacuation if no alarms are present?
- Engineering Controls – INSUFFICIENT**
- Are proper process controls (pH, temperature, cell voltage, ventilation, etc.) systems (including backups) functioning properly to prevent unintended release of hazardous substances?
- PPE – INSUFFICIENT**
- Is proper PPE for the task/area being used or quickly available (e.g., escape respirators)?
- Storage and Distribution – SUFFICIENT**
- Handling Requirements – SUFFICIENT**
- Work Practices – SUFFICIENT**
- Barriers and Segregation – SUFFICIENT**