



Potential Fatal Event: Sulfur Dioxide Exposure in Roaster



Preliminary Incident Details

Operation	Sierrita
Date / Time	April 4, 2023 / 11:00 a.m.
Type	Near Miss
Summary	Two electricians were exposed to SO ₂ gas after entering the hearth of roaster to do work on a thermocouple while the scrubber was being cleaned. One electrician was wearing a Powered Air Purifying Respirator with the hood up, while the other was not wearing any respiratory protection. They reported the incident and were evaluated in the clinic the next day.
Fatal Risk	Exposure to Hazardous Substances – Acute
Risk Category	Actionable
Pre / Post Rating	Significant (3) Likely (3)
Findings / Missing Controls	<ul style="list-style-type: none">• Access Control• Personal Monitors• Respiratory Protection• Response to Alarms
Applicable Policies / Procedures	Hazardous Gas Policy
Employee Condition	No injury
Contact	Cara Forbregd, Manager-Health and Safety

Photos / Links



The building electricians entered and were exposed to sulfur dioxide gas.



Potential Fatal Event Learnings: Sulfur Dioxide Exposure in Roaster

Causal Factors

- The employees were unaware of newly implemented PPE requirements following a similar incident a few weeks prior (PFE #2023-7).

Fatal Risk Management 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**

Action Items

(All actions in progress but incomplete following PFE #2023-7)

Hierarchy of Controls

Install interlocks in conjunction with automation

Engineering

Create and implement emergency drills for evacuation situations from roaster building

Administrative

Implement and communicate new PPE requirements for roaster building (e.g., Tango gas monitor and escape respirator)

Administrative

Add Powered Air Purifying Respirator requirement and communicate to all crews

Administrative

Add alarm to SO2 monitoring system in roaster building

Engineering

Failed Safeguards / Additional Learnings

- Install emergency back-up generator for roaster and off-gas system
- Improve sampling plan for roaster area to include area and personal sampling for SO2 (during regular operation and when cleaning/switching scrubbers)
- Evaluate the use of tablets/tools so employees can access SOPs from the field to be able to verify information given to them by the control room operator
- Install signage with SO2 information inside the roaster building
- Review alternative technology to reduce scrubber cleaning
- Identify other areas of exposure and generate appropriate controls