


Sulfur unit.com
MORE PRODUCTION - LESS RISK

aquilex

Continuous Evolution of Technology Delivers Safety and Performance Improvements

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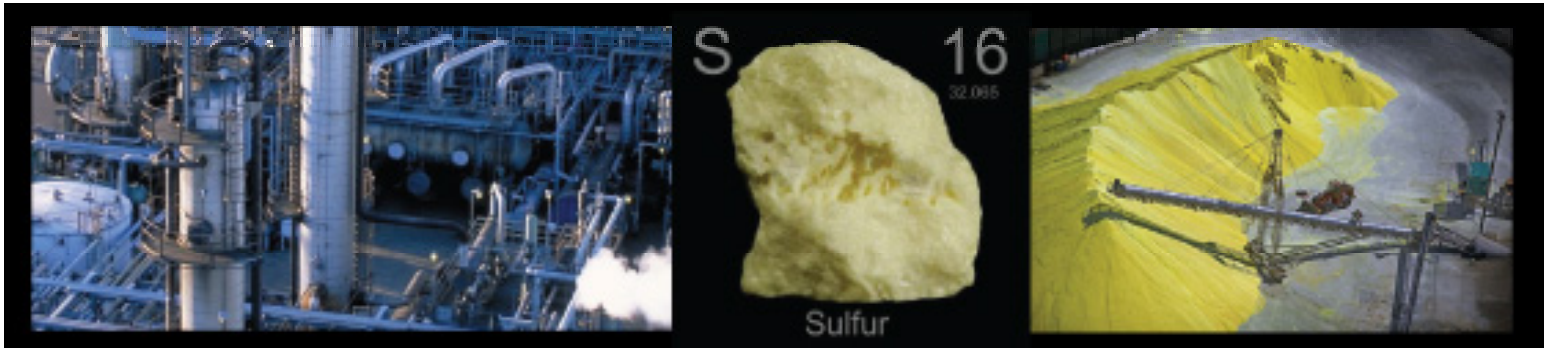
Sulfur Unit operation inherently has risk associated with it; high temperatures, high pressures and deadly gases. The introduction of technology to mitigate personnel, equipment and environmental risk while working in these units has proven to deliver value beyond immediate exposure.

Objective: Present non-traditional approaches to SRU processes that improve Safety, Schedule and Quality Results initiating the development of Best Practices.



Overview

- Decontamination of SRU Process Equipment
  - Traditional Methods and Risks
  - Steam Fogging
- Cleaning of SRU Process Equipment
  - Manual Cleaning Operations
  - Automated Cleaning Tools

Decontamination of SRU Process Equipment

Primary Safety Concerns

- Removal of H_2S Vapor Prior to Turnaround Maintenance
- Encountering Pockets of Trapped H_2S During Maintenance Activities
- Release of H_2S From Sludge Deposits During Cleaning Activities
- LEL & Hydrocarbon Concerns in Gas Processing Systems
  - Amine System
  - Scrubbers

Traditional Methods Of Preparing SRU for Maintenance Activities

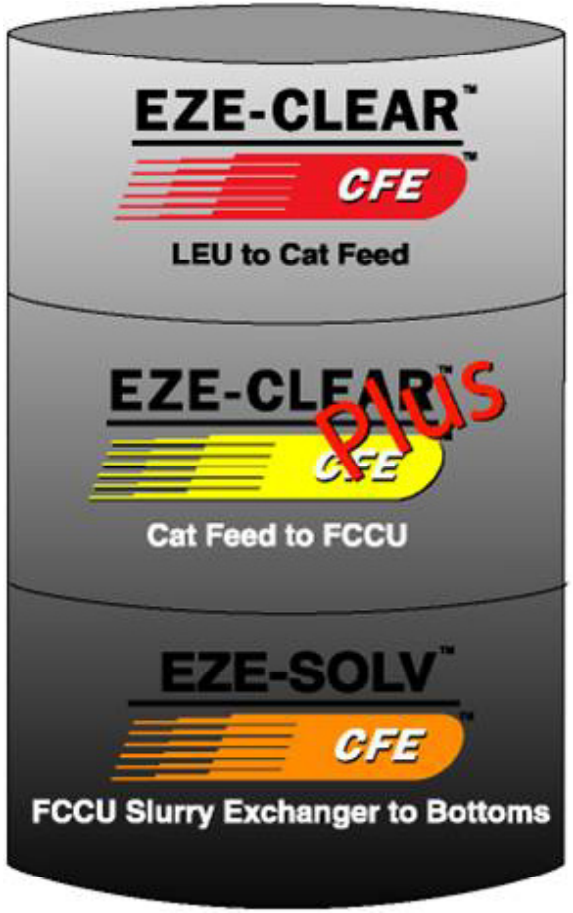
- Liquid Flushing Followed by Extended Steam-out
  - Schedule Impact: 2 – 3 Day Duration Estimated
  - Waste Volume: Excessive Amount
  - Risks: Historically requires further De-con work
- Liquid Circulation of Processing Equipment
  - Schedule Impact: 1-2 Day Duration Estimate
  - Waste Volume: Higher than Liquid Flushing
  - Risks: Limited Provided Circulation Contacts All Process Equipment

Industry Leading Clearing Method

- Steam Fog of Process Equipment Using EZE-CLEAR CFE Controlled Breakout Detergent
  - Schedule: 12 Hours Estimated
  - Waste Volume: most vented to Unit's Flare system and Liquid waste is treatable to Plant's Waste Process System
  - Risks: None
  - Added Benefits
    - EZE-CLEAR CFE Detergent Is Injected Into Unit's Steam Header During Traditional Steam-out Phase
    - Difficult to Clear Loops Are Circulated In Conjunction With Steam Fogging Operation

SRU Equipment Applications

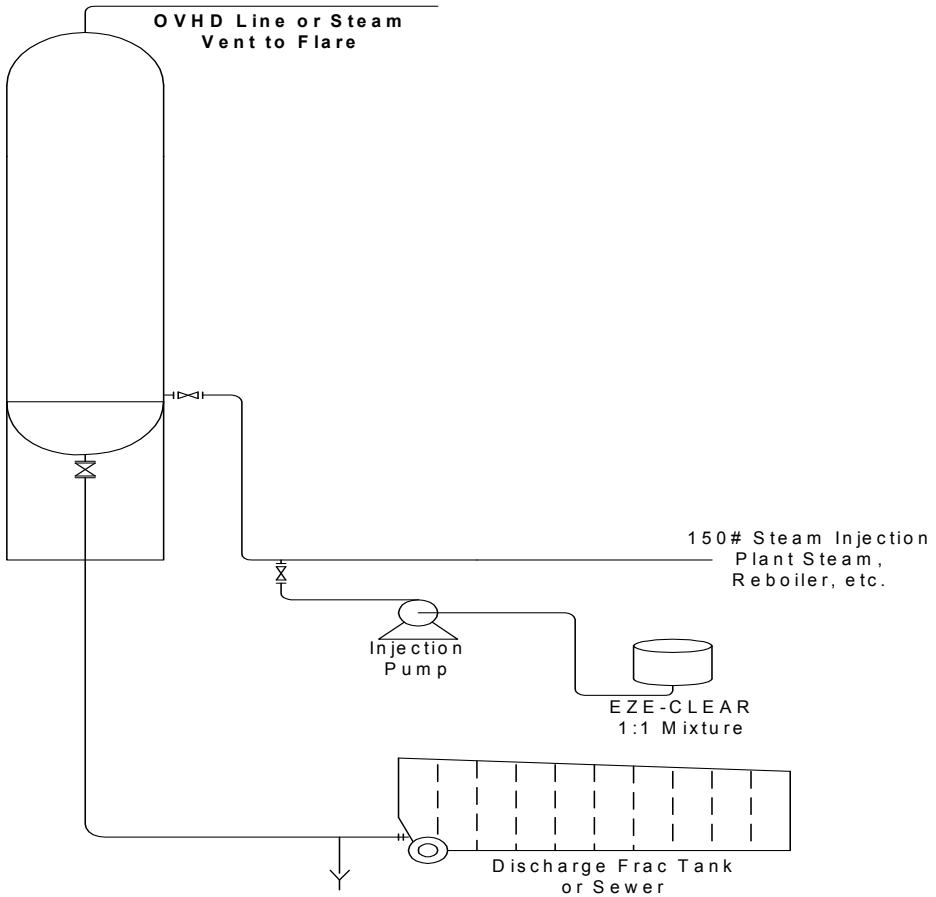
- Exchangers
- Drums
- Flare Systems
- Tanks
- Pipelines & Headers
- Gas Compressors
- Amine Contactors
- Sour Water Strippers
- ARU
  - *All Organic Liquids can be treated*



Steam Fogging Process

- *Define a distinct steam flow path for optimum contact*
- *Turn steam into a detergent cleaning solution!*
- *Apply detergent at optimum cleaning conditions!*
- ***Steam Fogging using EZE-CLEAR CFE is the fastest and most economical way to degas/de-oil process equipment!***

Generic Steam Fogging Diagram



Steam Fogging Benefits

- Rapid degassing of process equipment
  - Removes benzene, H_2S & other VOC's
  - Excellent de-oiling capabilities
  - Jobs completed in 6 - 12 hours
- Cost effective degassing of process equipment
  - Reduced equipment requirements
  - Reduced manpower requirements
  - Reduced waste disposal cost

Safety Benefits

- Reduces personnel exposure
  - No special PPE required
- Low toxicity
  - Less toxic than most common hand soaps
- No HAP's
  - Contains no EPA- Listed hazardous air pollutants
- Non-hazardous
  - Easy to transport and store – no limits

SRU Unit - Chalmette

- **SRU** scope of many Steam Fog applications
- **EZE-CLEAR CFE** used at 1% in an extensive Steam Fog in the amine scrubber unit
  - EZE-CLEAR CFE fed to the tower reboiler
  - Steam Fogged the tower, and
  - overhead condensers
  - several banks of fin-fan coolers
  - accumulator drum –
- **All cleared and clean!**
- EZE-CLEAR CFE used to Steam Fog Contacting Towers
- Circulation to clear and clean Fractionation

Sour Water Stripper – Lake Charles

- CFE Steam Fog of Tower & Piping
- Job Results
  - LEL - 0
  - Removed all oil from system (100 gallons)
  - Clear For Entry time reduced by 50%
  - Saved $7,075 on job vs. conventional method
  - Only 1 Frac Tank needed vs 3+ Frac Tanks

DEA Regenerator Tower - Joliet

- Clearing cost reduced >$1500
- Improved cleaning results
- Removed 53 cu. Ft. of sludge from tower

Cost effective

- Reduced cleaning cost
- Lower product cost
- Reduced disposal cost
- Minimized temporary storage requirements

Recycle Gas Amine Scrubber – Pt. Arthur

- Tower trays and packing (2 sections) plugged with waxy deposits
  - Tower inoperable
  - Tower had been down for 1 ½ weeks due to high H_2S and hydrocarbon vapors (LEL)
- CFE Steam Fog
  - Clear/clean of all deposits & contaminants in **6 hours**
  - Eliminated down-time cost – thousands of dollars
  - Reduced clearing cost

Steam Fogging Benefit Summary

- Reduced Decontamination Time
- Cost Effective Total Solution
  - Performance
  - Versatility
  - Less Expensive to Use
  - Fast Acting
- Personnel and Environmentally Safe
- Low/No Foaming
- Reduced Waste Generation and Easier to Dispose
- Supported by Experienced and Capable Team

High Pressure Cleaning of SRU Process Equipment

Traditional Process Equipment Cleaning

- Manual Hydroblasting Techniques
  - Flex Lancing
  - Stiff Lancing
  - Manual Line Moling
  - Vessel Entry to Perform Manual Shotgunning
- Labor Intensive
- Greater Safety Risks to Employees
- Inconsistent Results
  - Cleaning effectiveness below optimal performance
  - Often Requires Rework

Primary Safety Concerns

- Water Pressure and Flow Rates
- Repetitive Work Leading to Reduced Level of Awareness
- High Turnover Tate of Craft Personnel
- Challenging Geometries to Perform Work
  - Horizontal
  - Vertical
  - Space constraints in working area

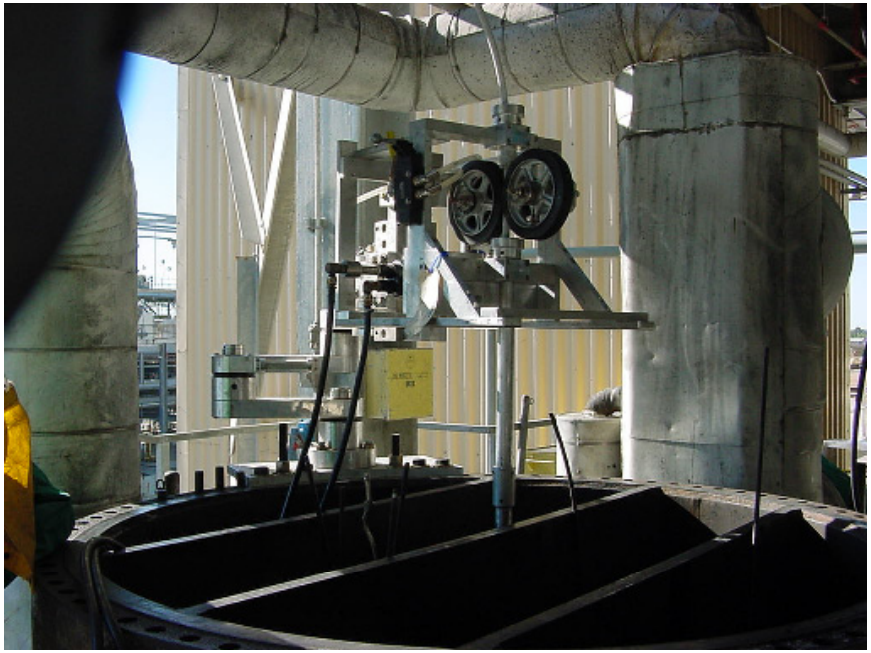
Recommended Process Equipment Cleaning

- Use of Automated Technology to Remove Personnel from the Line of Fire
- Improved Worker Performance
- Improved Quality
- Improved Equipment Run Time

Automation is the solution…

Many tooling systems have been developed to Automate Cleaning Solutions to Reduce Personnel Exposure and Improve Cleaning Efficiency.

- **Vertical RotoLazer**



- **DuraflexX System**

Duraflexxx Automated Lancing System

- Benefits of the DuraFlexxx Automated Flex Lancing System
  - Designed to Produce Superior Cleaning of Heat Exchanger Tubes
  - Un-paralleled Operator Safety
  - IRIS Quality Cleanliness Upon Request
  - 10K, 20K or 40K Available

Customer Challenge

- A Mid-West Refinery Required Cleaning Overhead Fin Fan Coolers to IRIS Inspection Quality During A Fall 2009 Turnaround
- 24 Banks of Fin Fan Coolers
- 5,432 Total Tubes
  - 1" X 32' tubes
- Cleaning Timeline Was Set At Twelve Days

Project Results

- Project Cleaning Time Was Reduced by 20% Using 40,000 PSI
- All 5,432 Tubes Were Cleaned With ZERO Re-runs!
- Reduced Overall Project Cost
- Dramatically Improved Heat Transfer Efficiency

RotoLazer™ system

- *Designed and built by HydroChem*
- *7/8” ID to 6” ID pipe or tubes*
- *Up to 200 ft from access point*
- *Navigate multiple 90° bends and 180°s*
- *Nozzle spins up to 800rpm*
- *Nozzle hugs wall*
- *20k or 40k available*

Automated Vessel Cleaning

- 3-D RotoJet Technology
- Specially Designed Automated Equipment
  - Tower Cleaning Package Includes:
    - Centering Device
    - Wench & Cable
    - Protective Shroud
- Cleans Towers, Vessels, and Transfer Lines
- No Vessel Entry Required

Additional SRU Services

- ZE-Vac™ – Zero Emissions Wet Vacuum Services
- Turnaround Bundle Pad Management
  - Documentation / Cataloging Exchangers
  - Cleaning for NDT and IRIS Inspection
  - Video tube Inspection
- Hydrocutting Services
- Coating Removal & Surface Preparation

Summary

- The Introduction of New Products and Technology Has Greatly Improved Clearing and Preparing SRU's for Inspections and required Maintenance Activities

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Thank You!