



# Husky Investigation Update

Superior, Wisconsin

December 12, 2018





# Presentation Overview

- **CSB Overview**
- **Husky Refinery Overview**
- **Husky Incident**
- **Torrance Refinery Incident**
- **Investigation Path Forward**



# CSB OVERVIEW



## About the CSB

- Authorized by CAAA of 1990 and became operational in January 1998
- 3/5 current board members
- 10 investigators
- 30 total staff members
- Offices in DC and Denver
- Modeled after NTSB



## About the CSB

- Independent federal agency charged with investigating industrial chemical accidents.
- Board members are appointed by the President and confirmed by the Senate.
- CSB conducts root cause investigations of chemical accidents at fixed industrial facilities.
- The agency does not issue fines or citations, but does make recommendations to plants, regulatory agencies such as to OSHA, EPA, industry organizations, and labor groups.



# Investigation Process

- Incident Screening
- Field Stage
- Factual Updates
- Report Writing and Analysis
- Report Review
- Final Release



# Investigation Activities To-Date

- Interviewed over 50 witnesses
- Requested and Reviewed over 14,000 pages of process documentation
- Met with multiple industry experts
- Performed metallurgical and chemical testing





# Husky Refinery Overview





# Husky Refinery

- Superior, Wisconsin
- Constructed in 1950
- 50,000 bpd crude oil distillation capacity
- Husky acquired from Calumet November 2017

Source: <https://www.eia.gov/petroleum/refinerycapacity/>



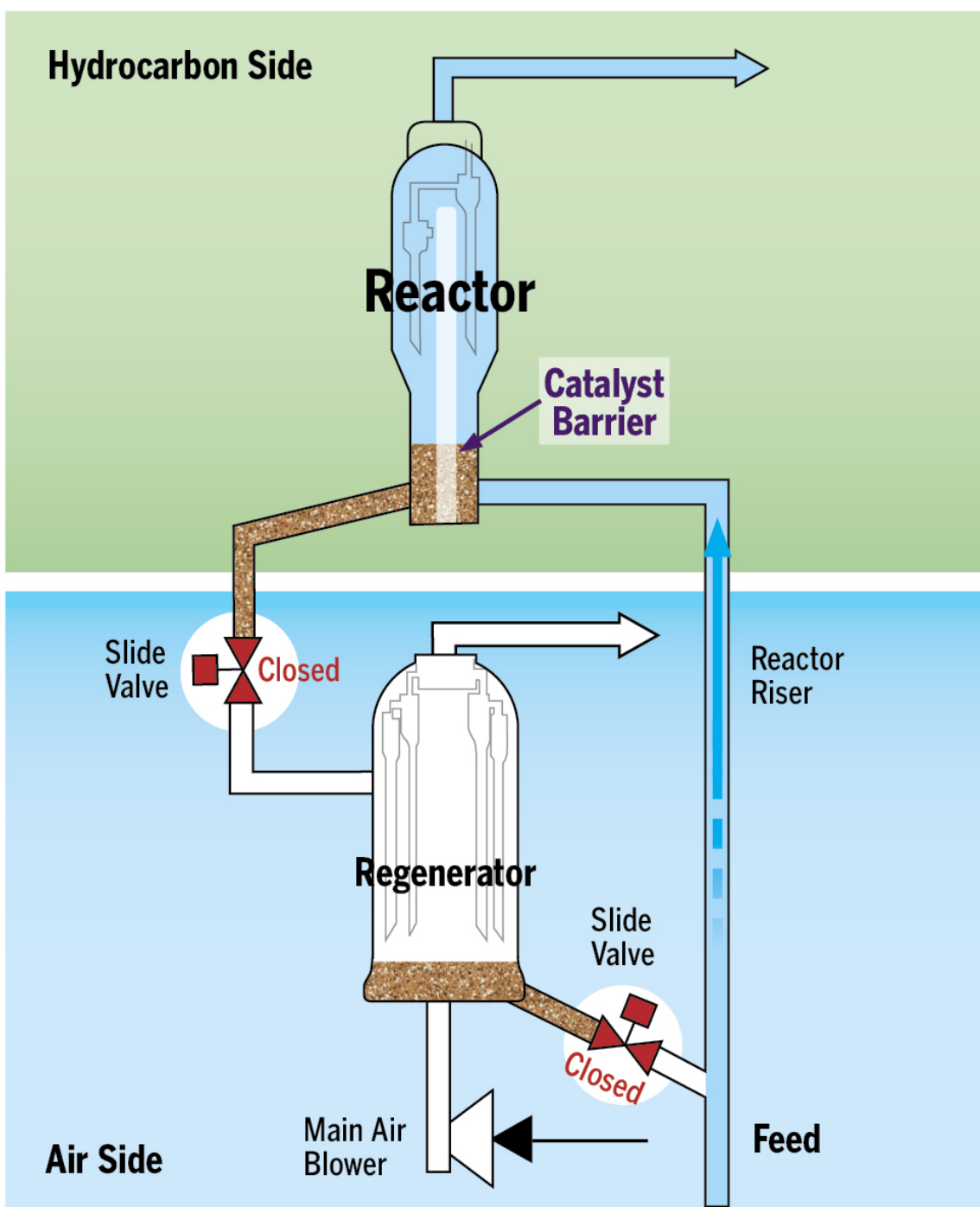
# FCC Overview

- **Converts low-value long-chain hydrocarbons into higher-value molecules**
- **Cracks the molecules using catalyst and high heat**
- **Important in production of gasoline**



# Superior FCC Unit

- **Constructed in 1961**
- **11,000 bpd fresh feed**
- **Stacked FCC Design**
- **Gas Concentration Plant attached**





# Incident Description



# Incident

- **April 26, 2018**
- **Explosion in FCC**
- **11 on-site workers reported OSHA recordable injuries**
- **Debris impacted surrounding equipment**
- **Numerous fires**
- **Evacuation of portion of town**



U.S. Chemical Safety and  
Hazard Investigation Board







## Contractors On-Site

- **Explosion occurred during contractor break**
- **Many contractors had been in and around the equipment minutes prior to the explosion**

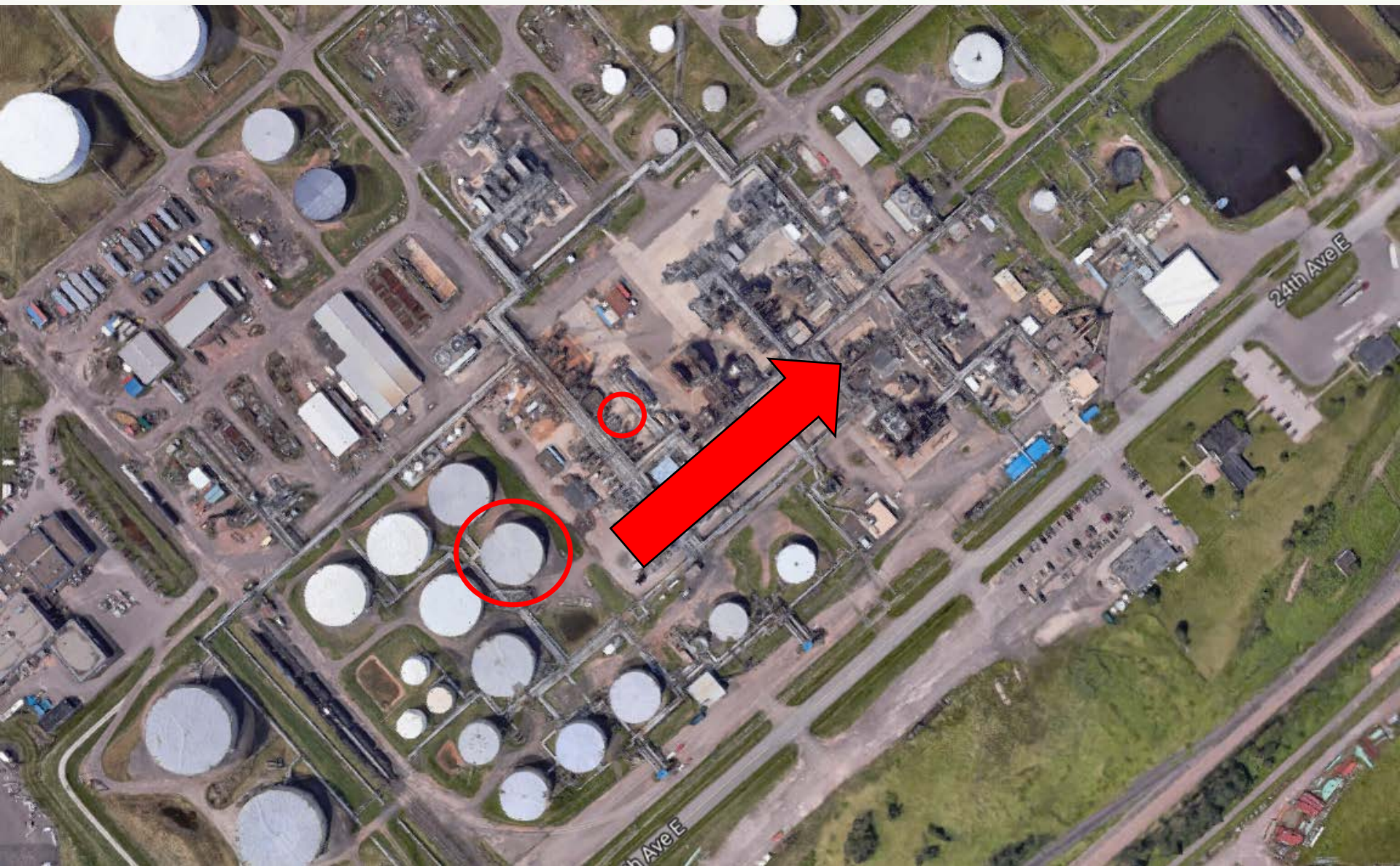


# Asphalt AST

- Contained about 50,000 barrels of asphalt
- ~15,000 barrels of asphalt released into refinery
- Ignited ~2 hours after initial explosion













# FCC Explosion

- **Primary and sponge absorber involved in explosion**
- **Located in gas plant**
- **Pyrophoric iron sulfide known to be present in absorbers**







# Absorber Details

- **Primary absorber**
  - 69.5 feet tall, 36 inch ID, 250 psig MAWP, SA-212-B steel
- **Sponge absorber**
  - 48 feet tall, 30 inch ID, 250 psig MAWP, SA-201-A steel









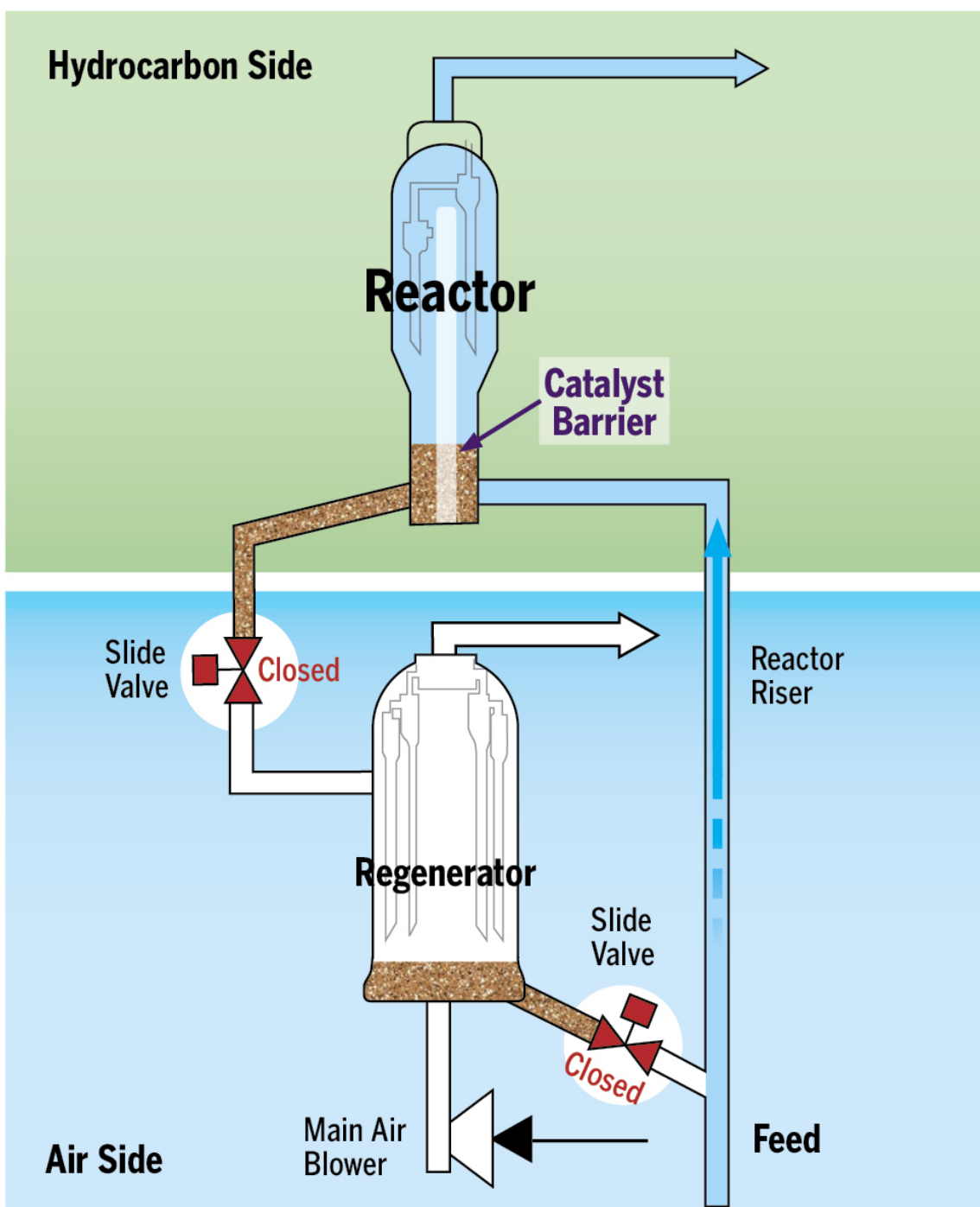
# Operations Activities

- Entire refinery was going into turnaround
- Shutting down FCC
- FCC Feed stopped at 5:40 AM morning of explosion
- Steam used to clear riser, slide valves closed



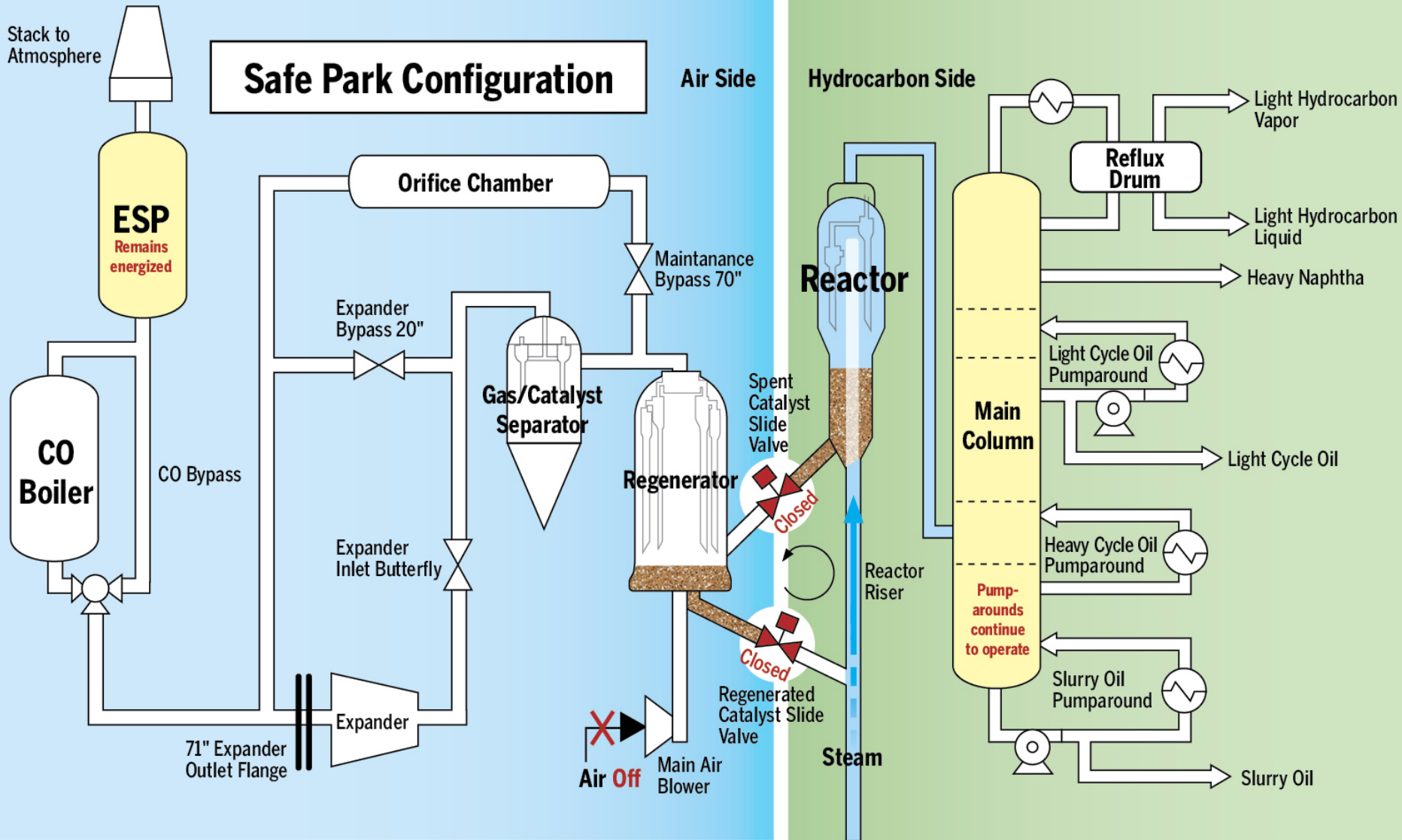
## Operations Activities

- **Twenty minutes after Spent Catalyst Slide Valve closed, lost differential pressure.**
- **No DP for extended periods of time, indicating air incursion into the reactor**
- **Explosion at 10:00 AM, about 4 hours after shut down began**

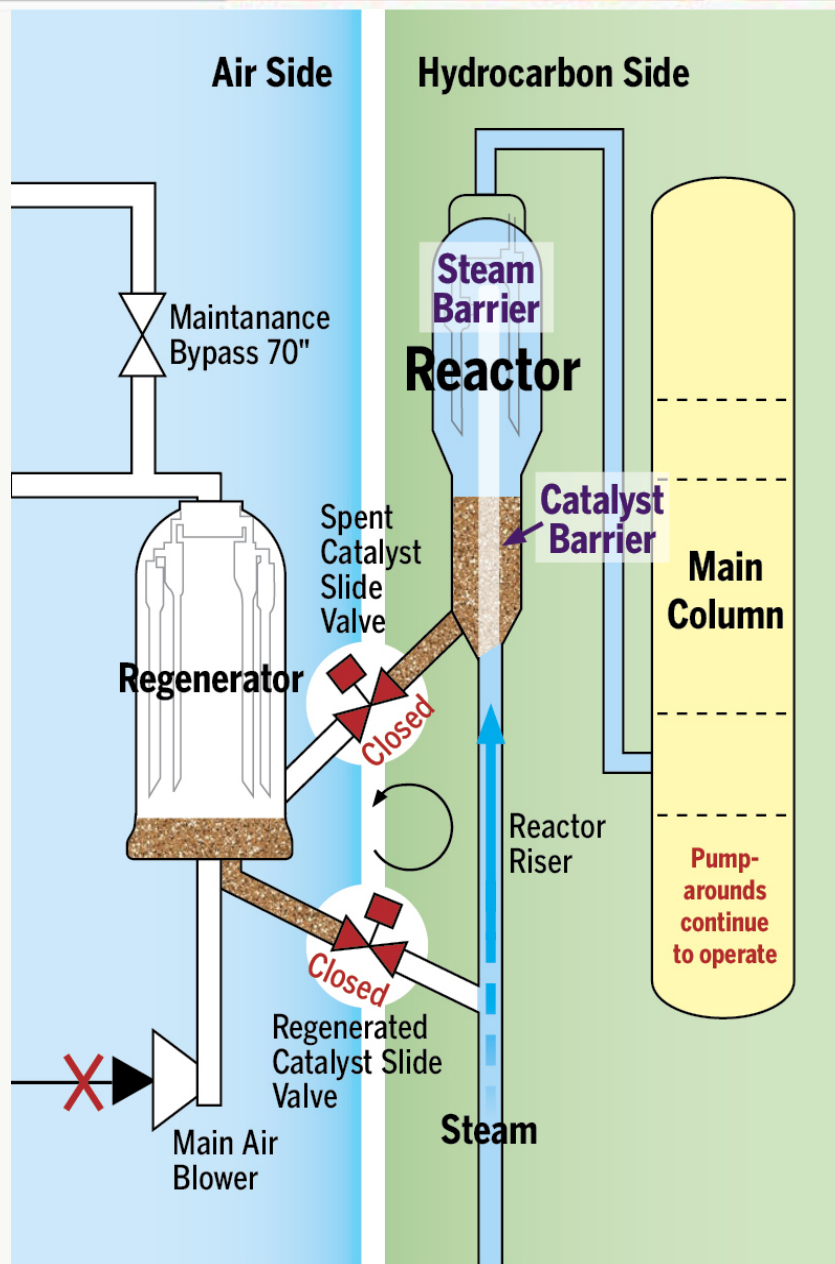


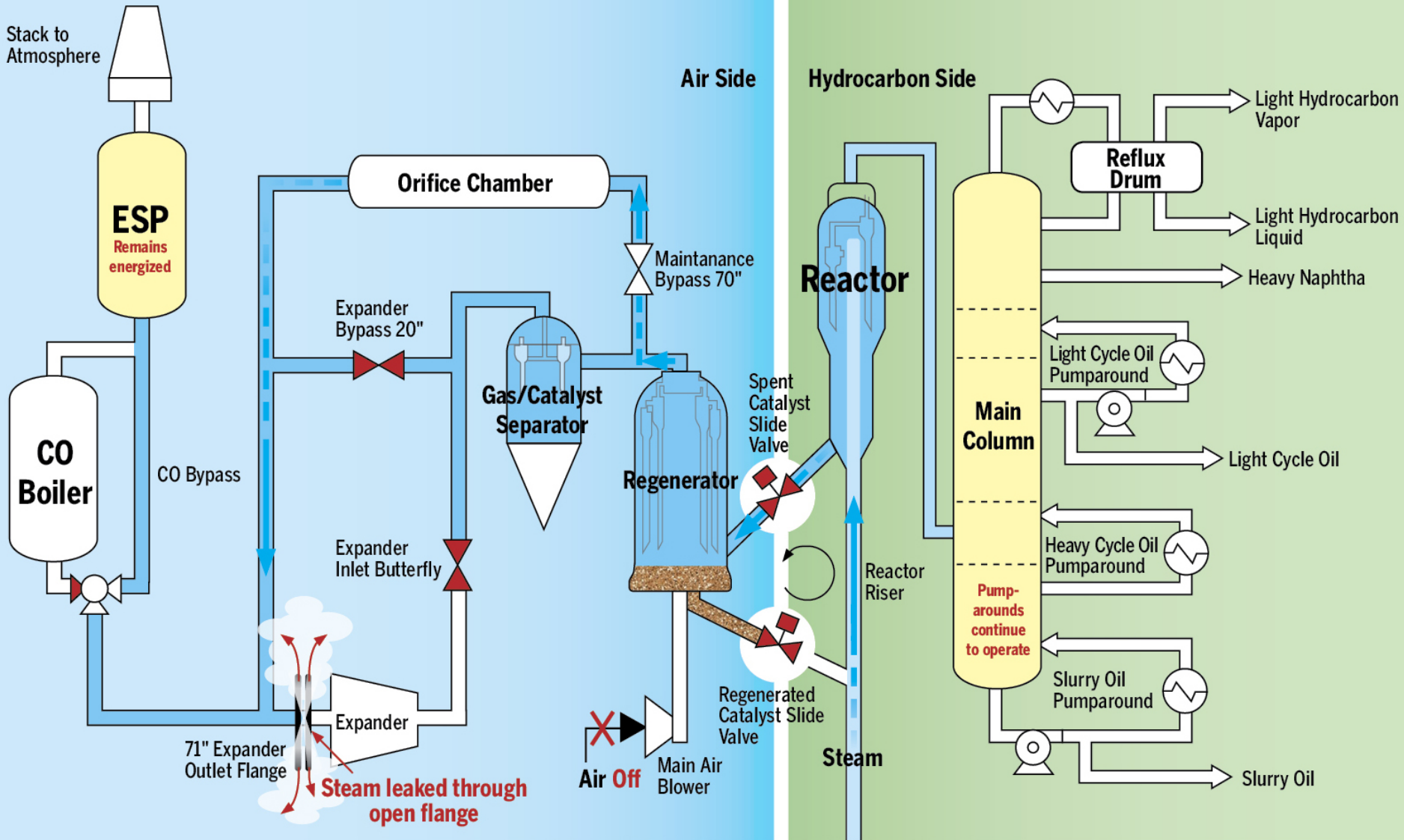


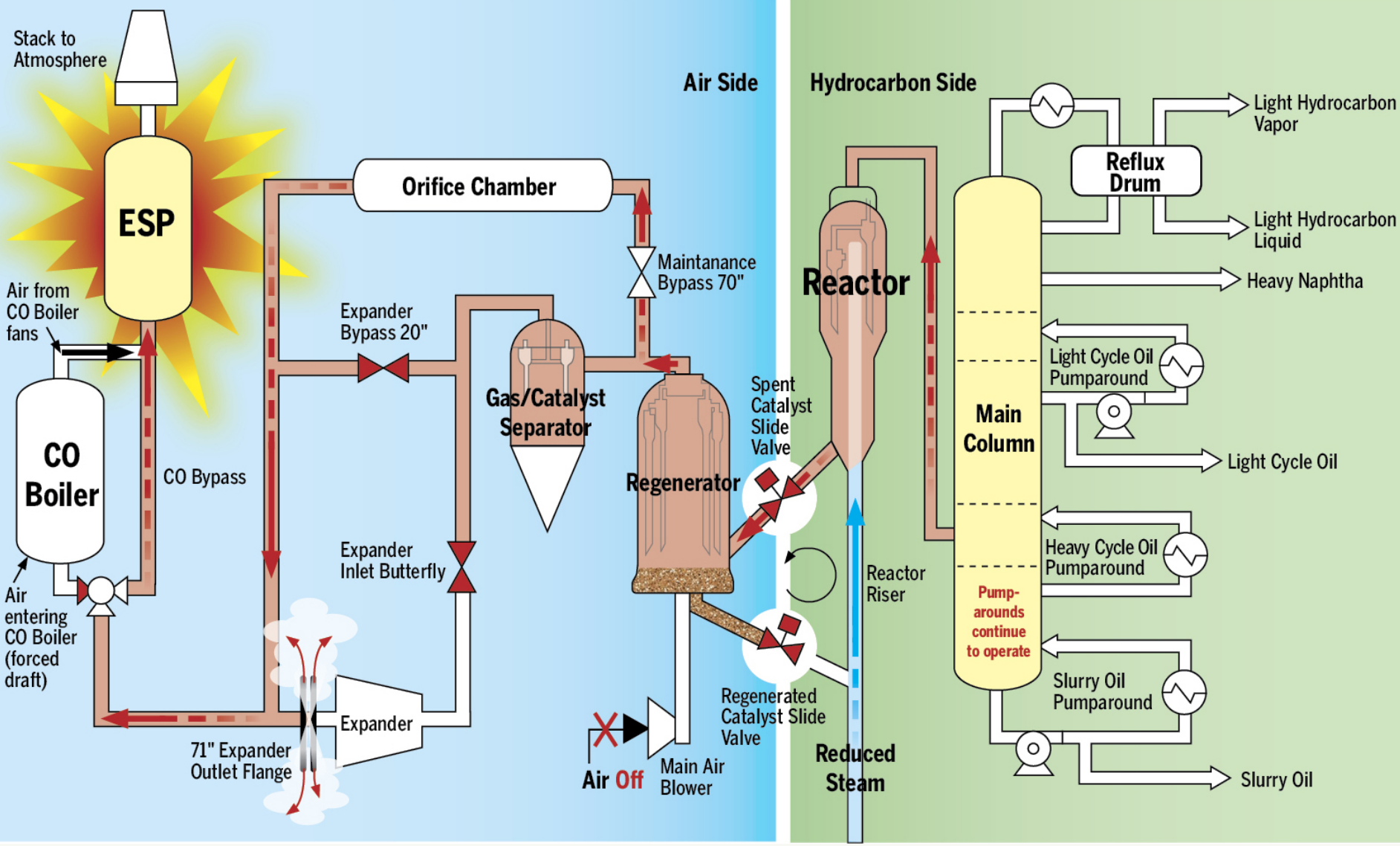
# Torrance Incident Overview













## Torrance Similarities

- Reversal during non-routine operation
- Flammable mixture formed and found ignition source within process equipment
- Relied on slide valve to provide catalyst barrier during shutdown process



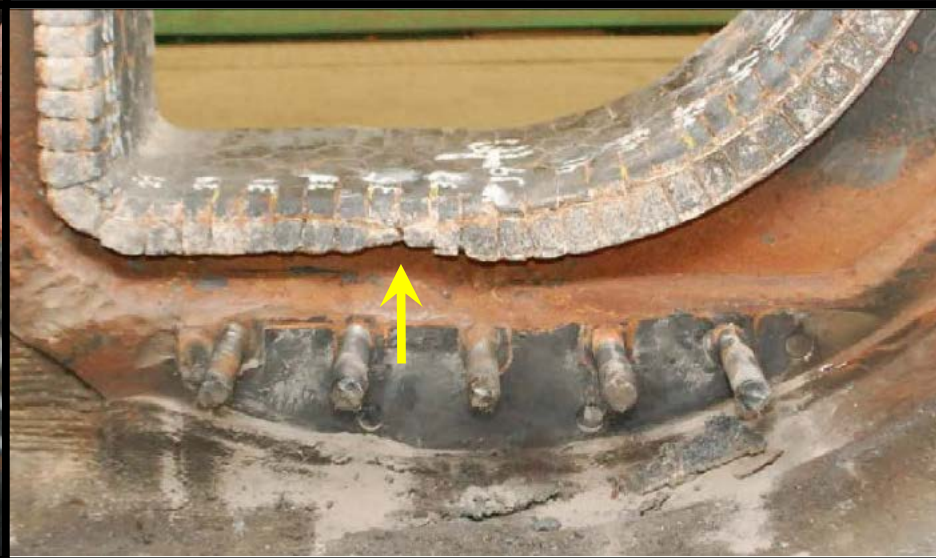
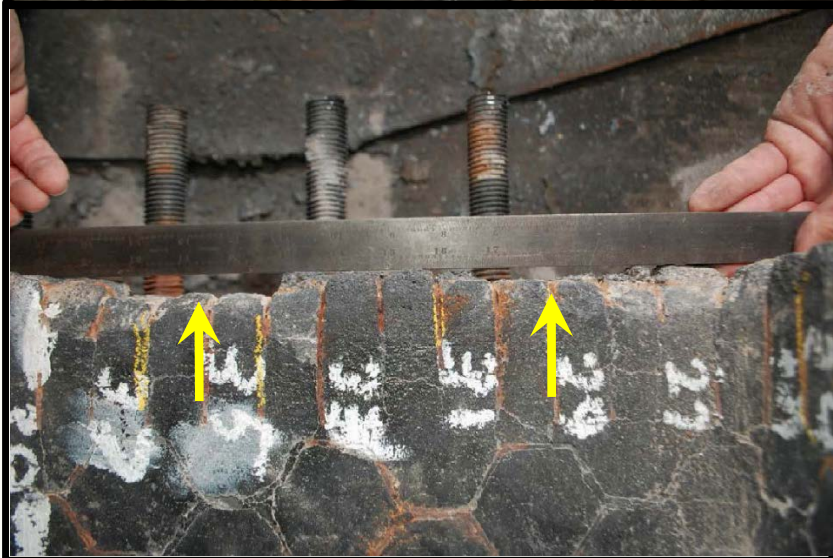
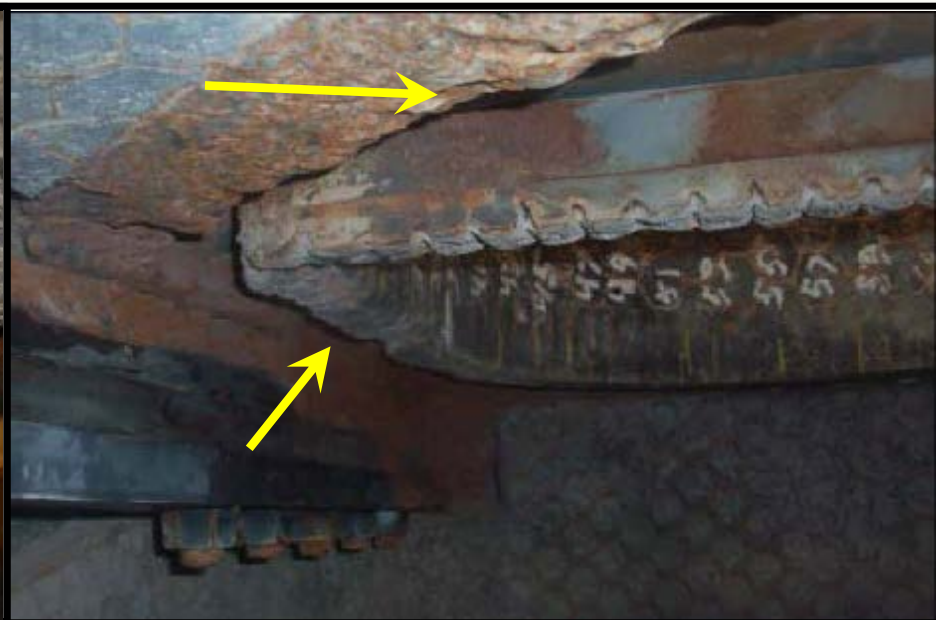
## Slide Valve Erosion

- Incident occurred during the end of the run
- Slide valve in constant use
- Slide valve eroded, but not abnormally
- Slide valve intended to serve function it may not be designed for















# Investigation Path Forward

- Field Stage Complete
- Factual Update Issued
- ER Response Video
- **Analysis and Report Writing**
- **Public Input**
- Review
- Final Report Release



## Questions to Answer

- **How to safely shut down an FCC without a reversal**
- **Maintaining separation of hydrocarbon and air**
- **Ensuring safety barriers for all modes of operation**
- **How to account for steam pressure in PHA/LOPA**



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