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 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
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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Reflux/Drum
Light/Cycle/Oil
Pumparound

Heavy/Cycle/Oil
Pumparound

Heavy/Slurry/Oil
Pumparound

Main Column

Reflex Drum

Light Cycle Oil
Pumparound

Light Cycle Oil

Heavy Cycle Oil
Pumparound

Heavy Slurry Oil
Pumparound

Heavy Slurry Oil