Cost Effective Solution for the Efficient Cleaning and Decontamination of a Coker Unit

Calgary, Alberta, Canada
Today’s Agenda

ULI Overview

Coker Decontamination Project Overview
- ULI Product Applications
- Coker Decontamination
- Blowdown Heat Exchanger Efficiency Recovery

Other Applications
- Visbreaker decontamination
- Pre-heat exchangers

Advantages Over Conventional Decontamination Methods

Conclusions and Recommendations
What is Decontamination?

...Process of making equipment ready for personnel entry.

Removal of all hydrocarbons, gases and pyrophoric compounds that can cause danger to personnel and the unit itself.
Decontamination Project, Louisiana (Jan. 2009)

- Pyrophoric Iron Sulfide
- Heavy Asphaltenes
- Hydrogen Sulfide
- Phenols
- Benzene
- Clogged heat exchangers and bottoms lines
Louisiana Coker Planning

- Preparation is the key
- On-site planning
  - T-6 months or sooner
  - Typically on-site 5 days
- Training
  - Booklets
  - Procedures
- Walk-down immediately prior to TA start

## Coker Unit Decontamination

<table>
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<th>Task</th>
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### Concurrent Coker Problems

- **Note:**
  - It is important during the cleaning process that flow paths remain open to keep the chemicals flowing. Operations personnel shall alternate spare equipment and all by-pass valves to ensure adequate contact with the chemical. Caution should be taken to ensure that equipment is not over pressured while opening and closing by-pass valves.

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Once a steam flow has been established thru the **Main Fractionator C-A** and the tower temperature reaches 180°F – 210°F United Laboratories International, LLC shall inject 935 gallons / 17 drums of Zymeflow® UN-657 into the tower steam out line Tag111

**Note:**

*Customer* shall maintain a temperature of 180° - 210°F.

**Note:**

*Customer* shall continue the steam/chemical injection to the **Main Fractionator Tower C-A** and equipment for 8 – 12 hours until testing shows the system to be decontaminated.
Coker Decontamination Project
Louisiana (Jan. 2009)

Procedure

• Coker Unit Viscosity Flush

Removal of Heavy Asphaltenes from Feed and Heavy Ends Equipment
Coker Decontamination Project
Louisiana (Jan. 2009)

Procedure

• Coker Unit Viscosity Flush

CIRCULATED FOR 4-6 HOURS
Coker Decontamination Project
Louisiana (Jan. 2009)

Procedure

• Coker Unit Viscosity Flush
Coker Decontamination Project
Louisiana (Jan. 2009)

Procedure

- Coker Unit Viscosity Flush
- Fractionation Unit Pre-Treatment

Removal of Pyrophoric Iron and Heavy Asphaltenes in Packing Beds
Coker Decontamination Project
Louisiana (Jan. 2009)

Procedure

- Coker Unit Viscosity Flush
- Fractionation Unit Pre-Treatment
- Coker Unit Decontamination

STEAM-OUT 180°-210°F
Coker Decontamination Project
Louisiana (Jan. 2009)

Procedure

- Coker Unit Viscosity Flush
- Fractionation Unit Pre-Treatment
- Coker Unit Decontamination
Coker Decontamination Project
Louisiana (Jan. 2009)

Procedure

- Coker Unit Viscosity Flush
- Fractionation Unit Pre-Treatment
- Coker Unit Decontamination

All low points drained.
Readings of H$_2$S = 0 ppm
Benzene = 0 ppm, LEL, VOC = 0%
Zyme-Flow$^\circledR$ = 300-400 ppm
Coker Decontamination Project
Louisiana (Jan. 2009)

Procedure

• Coker Unit Viscosity Flush

• Fractionation Unit Pre-Treatment

• Coker Unit Decontamination

• Fractionation Tower Post-Rinse

Targeting Any Remaining Pyrophoric Iron Scale, Solids and Chemical Residue
Coker Decontamination Project
Louisiana (Jan. 2009)

Procedure

• Coker Unit Viscosity Flush
• Fractionation Unit Pre-Treatment
• Coker Unit Decontamination
• Fractionation Tower Post-Rinse

Customer very satisfied with the results and with the time frame in which the decontamination was completed.
Actual Coker Fractionation Decontamination Results
January 2009 Coker Decontamination Project
Fin Fan Heat Exchanger Efficiency Recovery at Port Arthur Texas

Simple problems can mean simple applications
Vapour-Phase® With Rezyd-X® and Zyme-Flow®
Quickly Recovered Blowdown Heat Exchanger

Before

After
Completed in 1/3 the time!

SAFER

FASTER

LESS COSTLY

WILL NOT DAMAGE EQUIPMENT
Visbreaker Unit Decontamination

Circulate 4-6 hours

HOB™/ LIGHT OIL VISCOSITY WASH
Vapour-Phase®
Visbreaker Unit Decontamination

HOB™/LIGHT OIL VISCOSITY WASH
Vapour-Phase®

Vapour-Phase® 10 Hours

Visbreaker decontamination
Visbreaker Tower, Stripper, Soaker, Exchanger and Overhead

• Combination of Vapour-Phase® and Circulation
• 9 ½ hours to decontaminate
• Results:
  ▪ H₂S, LEL free
  ▪ Beds and trays were oil free
  ▪ Exchangers were easily pulled
Feed Pre-Heat Exchangers

- Treat heavy asphaltenes
- LCO stock with Rezyd-X®
- Softens and breaks up hydrocarbon deposits
- Makes it easier to clean and pull bundle
Single Exchanger Circulation Example

Pre Heat exchangers
RESULTS PROVEN
Pre-Hydro-blasted—Rezyd-X® and HOB™
“The exchanger bundles were much easier to pull out of the shells than they have ever been before using this cleaning technique. The carbon buildup that was left in the bundles was also easier to clean with water blasting than it had ever been before.”
Asphalt Build-Up in Pre-Heat Train

Before: Thermal Imaging Shows “Cold” Areas Where Heat Transfer is Impeded by Asphalt Deposits
After 12 Hours Flushing with Rezyd-X® and HOB™ K-61

Entire vessel warm (180°F) asphalt gone. Notice water boot where the fouling began.

After: Thermal Imaging shows uniform heat transfer and recovered efficiency.
Results of Zyme-Flow® Decontamination Process

- Benzene Removed
- Hydrocarbons (LEL’s) removed
- H₂S Oxidized
- Pyrophorics Oxidized
- Reduced Mech. Cleaning
- Ammonia removed
- WWTP Friendly Wastewater Stream
- Recovered Heat Exchanger Efficiencies

Decontamination performed within 12 Hours
Prevent Pyrophoric Iron Sulfide Fires

- Tight packing traps small particles of FeS, polymer, and heavy oil
- Oil & Polymer protects FeS from common oxidizer solutions
- When dry and in contact with air—a fire!
Safety from Pyrophoric Iron Sulfide

- Pre-Conditioning Flush over Packing using Rezyd-X®/Zyme-Flow®
- Zyme-Flow® + Water + Steam to finish the oxidation during normal decontamination
- Post-rinse with Zyme-Ox® and water; Thermal Shocking Contaminate Scale
Visbreaking Unit – Bed 3
Visbreaking Unit – Bed 4
Visbreaking Unit – Bed 4 Distributor
This could be you . . .

Northern USA Apr, 2009

“... The TA has gone extremely well and we are moving into start-ups. The Zymeflow™ chemicals worked very well on all units.“

South American Customer, Feb, 2009

“...The decontamination was successful. Equipment was clean. There was no hydrocarbon residue and no Little Devils (Pyrophorics)“

Europe, Jun, 2001

“...The decontamination project was successful in eliminating the toxic compounds from the column within 12 hours of Zyme-Flow application. Also much better cleaning was encountered in this column compared with other methods.”
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Conclusion