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

Coke Drum Workshop
6-7 August, 2009, Rio de Janeiro - Brazil
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.

Involves...

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
Coker Decontamination Project
Louisiana (Jan. 2009)

**Procedure**

- Coker Unit Viscosity Flush

Removal of heavy Asphaltenes from feed and heavy ends equipment

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15. Slide 18-26. I don't like powder blue. It doesn't show well on a screen. Needs to be changed to something that shows well. Slides need to show a progression, like Phase 1......Phase 2...and so on. Keep the audiences mind on the steps of the process......that is done in <12 hours or less! OK. We need the print version right away and the animation version later. We have a little time to work on this.

pete.shirley, 6/11/2009
Coker Decontamination Project
Louisiana (Jan. 2009)

Procedure

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pete.shirley, 6/11/2009
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pete.shirley, 6/11/2009
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
15. Slide 18-26. I don't like powder blue. It doesn't show well on a screen. Needs to be changed to something that shows well. Slides need to show a progression, like Phase 1......Phase 2...and so on. Keep the audiences mind on the steps of the process......that is done in <12 hours or less! OK. We need the print version right away and the animation version later. We have a little time to work on this.

pete.shirley, 6/11/2009
Coker Decontamination Project
Louisiana (Jan. 2009)

Procedure

• Coker Unit Viscosity Flush

• Fractionation Unit Pre-Treatment

• Coker Unit Decontamination
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pete.shirley, 6/11/2009
Coker Decontamination Project
Louisiana (Jan. 2009)

Procedure

• Coker Unit Viscosity Flush

• Fractionation Unit Pre-Treat.

• Coker Unit Decontamination
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pete.shirley, 6/11/2009
Coker Decontamination Project
Louisiana (Jan. 2009)

Procedure

• Coker Unit Viscosity Flush

• Fractionation Unit Pre-Treatment

• Coker Unit Decontamination

All low points drained.
Readings of H2S = 0 ppm
Benzene = 0 ppm, LEL, VOC = 0%
Zyme Flow = 300-400 ppm
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pete.shirley, 6/11/2009
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
15. Slide 18-26. I don't like powder blue. It doesn't show well on a screen. Needs to be changed to something that shows well. Slides need to show a progression, like Phase 1...Phase 2...and so on. Keep the audiences mind on the steps of the process...that is done in <12 hours or less! OK. We need the print version right away and the animation version later. We have a little time to work on this.

pete.shirley, 6/11/2009
**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.
15.  Slide 18-26.  I don't like powder blue.  It doesn't show well on a screen.  Needs to be changed to something that shows well.  Slides need to show a progression, like Phase 1......Phase 2...and so on.  Keep the audiences mind on the steps of the process......that is done in <12 hours or less!  OK.  We need the print version right away and the animation version later.  We have a little time to work on this.

pete.shirley, 6/11/2009
Actual Coker Fractionation Decontamination Results
16. Slide 27. Good slide
January 2009 Coker Decontamination Project
Slide 28. Tell me why this is relevant? No one will even be able to see this on a screen. This is a blow down CAD drawing that was done during a coker planning job. This is where we were going to talk about our planning capabilities.

pete.shirley, 6/11/2009
Fin Fan Heat Exchanger Efficiency Recovery at Port Arthur Texas

Simple problems can mean simple applications
VapourPhase® 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
1. Slide 29-31. Delete. Not relevant to the primary message. The blow down fin-fan was on our original abstract and something that interested coker.com. I think it is relevant because it discusses an actual coker fin-fan heat exchanger defouling.

pete.shirley, 6/11/2009
Visbreaker Unit Decontamination

**HOB™ LIGHT OIL VISCOSITY WASH**

VapourPhase®

Circulate 4-6 hours
19. Slide 32-34. Grudging OK, but story needs to be woven into the presentation…… It’s in here to show visbreaker capabilities
pete.shirley, 6/11/2009
Visbreaker Unit Decontamination

Vapour Phase® 10 Hours

HOB™ LIGHT OIL VISCOSITY WASH
VapourPhase®

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19. Slide 32-34. Grudging OK, but story needs to be woven into the presentation...... It's in here to show visbreaker capabilities

pete.shirley, 6/11/2009
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
19. Slide 32-34. Grudging OK, but story needs to be woven into the presentation...... It's in here to show visbreaker capabilities
pete.shirley, 6/11/2009
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
replaced this from cylce cutter stock
Susan.Moore, 6/2/2009

20. Slide 35-40. Sell me on why these need to be included. There is a market for pre-heat exchanger cleaning on visbreakers and cokers. This was an opportunity to discuss the capabilities of rezyd-x and ZF for defouling heavy Asphaltenes.
pete.shirley, 6/11/2009
Single Exchanger Circulation Example

Vent

Temporary Tank with Steam Sparge

Pre heat exchangers
Improve graphics and animation
pete.shirley, 4/22/2009

ps20

pete.shirley 6/11/2009

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pete.shirley, 6/11/2009
RESULTS PROVEN
Pre-Hydro-blasted—Rezyd-X® and HOB™
20. Slide 35-40. Sell me on why these need to be included. There is a market for pre-heat exchanger cleaning on visbreakers and cokers. This was an opportunity to discuss the capabilities of rezyd-x and ZF for defouling heavy Asphaltenes.
“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.”
20. Slide 35-40. Sell me on why these need to be included. There is a market for pre-heat exchanger cleaning on visbreakers and cokers. This was an opportunity to discuss the capabilities of rezyd-x and ZF for defouling heavy Asphaltenes.
Asphalt Build-Up in Pre-Heat Train

Before: Thermal Imaging Shows “Cold” Areas Where Heat Transfer is Impeded by Asphalt Deposits
20. Slide 35-40. Sell me on why these need to be included. There is a market for pre-heat exchanger cleaning on visbreakers and cokers. This was an opportunity to discuss the capabilities of rezyd-x and ZF for defouling heavy Asphaltenes.
After 12 Hours Flushing with RezydX™ 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.
20. Slide 35-40. Sell me on why these need to be included. There is a market for pre-heat exchanger cleaning on visbreakers and cokers. This was an opportunity to discuss the capabilities of rezyd-x and ZF for defouling heavy Asphaltenes.
Results of Zyme-Flow® Decontamination Process

- Benzene Removed
- Hydrocarbons (LEL’s) removed
- \( \text{H}_2\text{S} \) Oxidized
- Pyrophorics Oxidized
- Reduced Mech. Cleaning
- Ammonia removed
- WWTP Friendly Wastewater Stream
- Recovered Heat Exchanger Efficiencies

Decontamination performed within **12 Hours**
12. Slide 14. Not “Benefits” that is a sales phrase. Should be “Results of the ULI Decon Process” for example. Why is this slide in front of your actual decon process slides? Results always implies that it goes at the end. Cart is before the horse here. This was in the product applications section. Moved to the end “results” section.

pete.shirley, 6/11/2009
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!
13. Slide 15-16. Again these are results and should go after you have given your paper on what we did. Why aren't we using the ESSAR pictures too? As I recall the ESSAR pictures were of a vac tower. The purpose of this slide was to highlight the results we have had with iron pyrophoric capabilities. It was in the capabilities section.

pete.shirley, 6/11/2009
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 Contaminant Scale
13. Slide 15-16. Again these are results and should go after you have given your paper on what we did. Why aren’t we using the ESSAR pictures too? As I recall the ESSAR pictures were of a vac tower. The purpose of this slide was to highlight the results we have had with iron pyrophoric capabilities. It was in the capabilities section.

pete.shirley, 6/11/2009
Visbreaking Unit – Bed 3
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.
22. Slide 46. Needs to be cleaned up and professionalized. Why is the customer comment from the USA in Spanish... and the customer comment from South America in English? Since it was bi-lingual presentation we thought it would be clever. Translated back to English.

pete.shirley, 6/11/2009
Contact Information

Peter Shirley  
Vice President / Division Manager  
United Laboratories International, LLC  
Ph: 832-775-1600  
E-mail: pete.shirley@zymeflow.com

Paulo Menezes  
United Zyme Flow do Brasil, Ltda  
Ph: 55-71-3341 5865  
E-mail: menezesp1@terra.com.br

Martha Smith  
Director, Latin American Sales  
United Laboratories International, LLC  
Ph: 832-775-1525  
E-mail: martha.smith@zymeflow.com
Conclusion