

# 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)

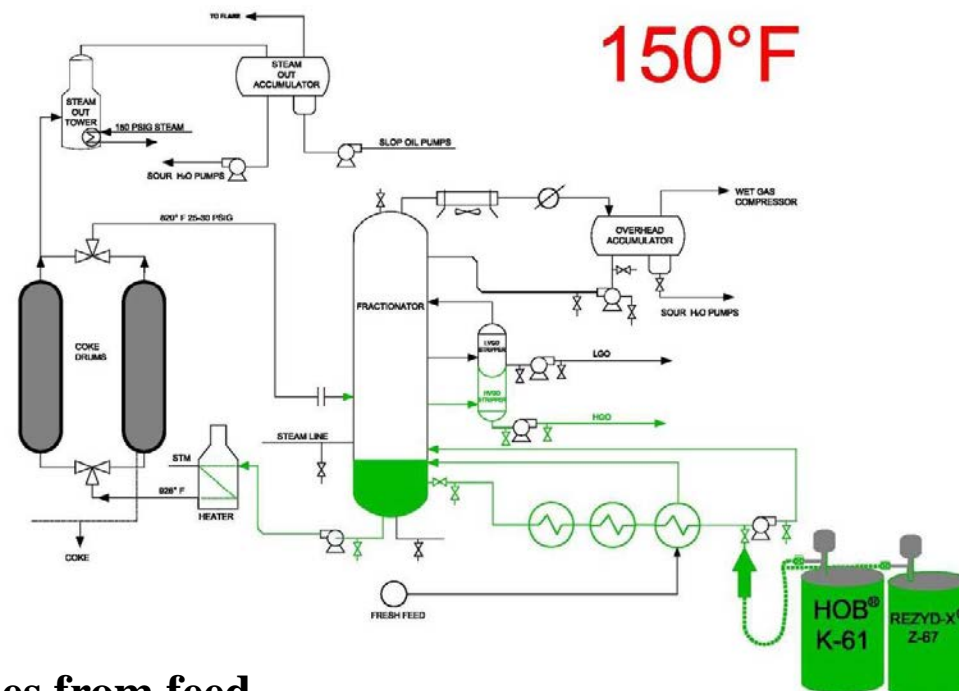
- Pyrophoric Iron Sulfide
- Heavy Asphaltenes
- Hydrogen Sulfide
- Phenols
- Benzene
- Clogged heat exchangers and bottoms lines



# Coker Decontamination Project Louisiana (Jan. 2009)

## Procedure

- Coker Unit Viscosity Flush



**Removal of heavy Asphaltenes from feed  
and heavy ends equipment**

## Slide 5

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**ps35**

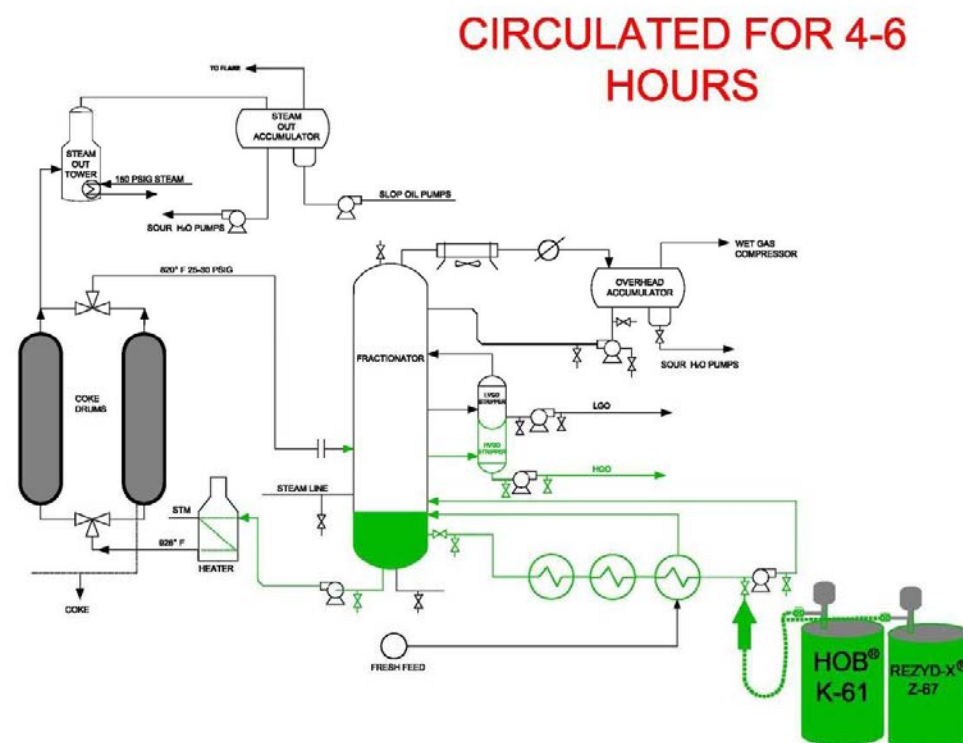
15. Slide 18-26. I don't like powder blue. It doesn't show well on a screen. Needs to be changed to something that shows well. Slides need to show a progression, like Phase 1.....Phase 2....and so on. Keep the audiences mind on the steps of the process.....that is done in <12 hours or less! OK. We need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



3.

## Slide 6

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**ps36**

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.

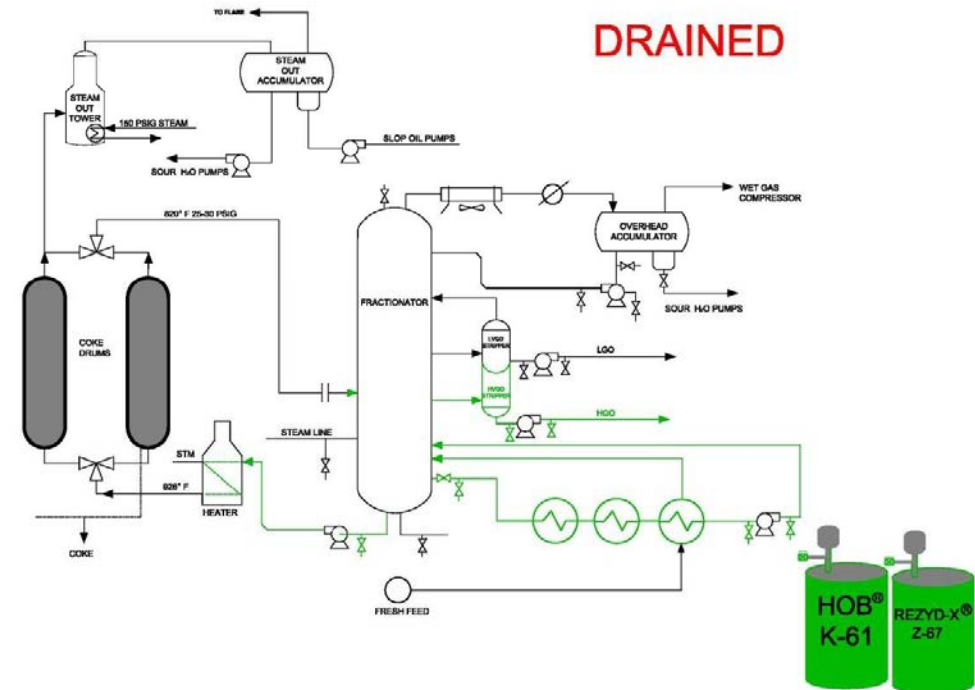
pete.shirley, 6/11/2009



# Coker Decontamination Project Louisiana (Jan. 2009)

## Procedure

- Coker Unit Viscosity Flush



## Slide 7

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**ps37**

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.

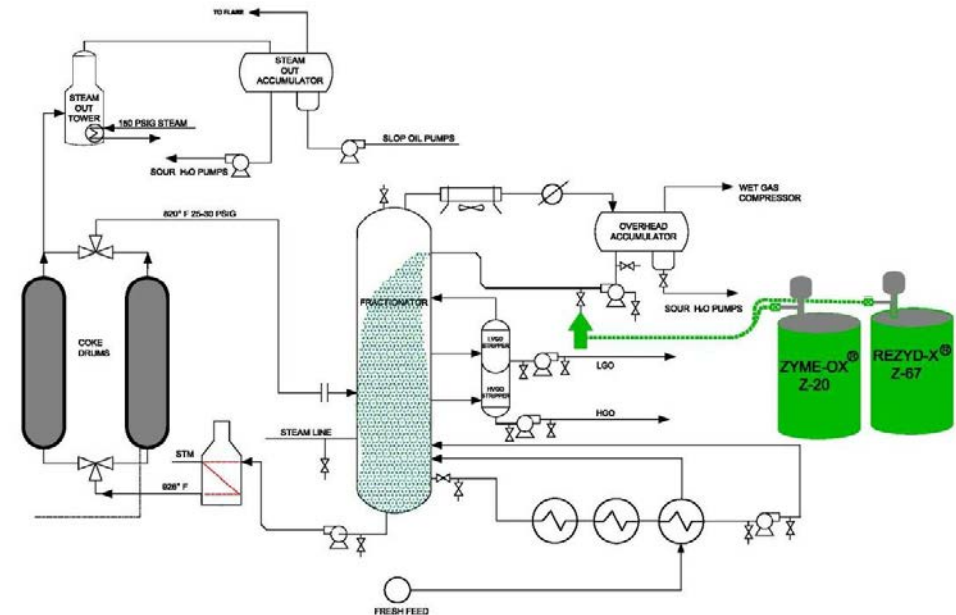
pete.shirley, 6/11/2009

# Coker Decontamination Project Louisiana (Jan. 2009)

## Procedure

- Coker Unit Viscosity Flush
- Fractionation Unit Pre-Treatment

H<sub>2</sub>O FLUSH



**Removal of Pyrophoric Iron and heavy  
Asphaltenes in packing beds**

## Slide 8

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**ps38**

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.

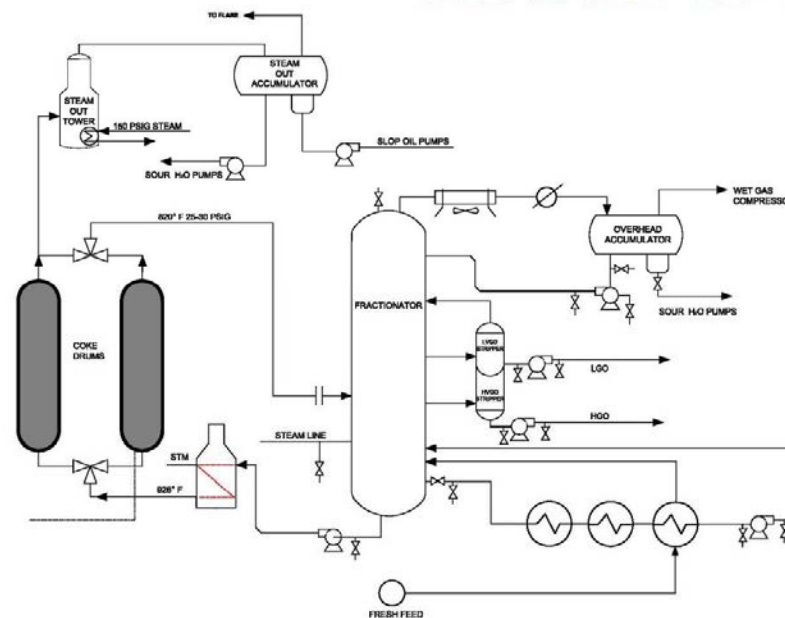
pete.shirley, 6/11/2009

# Coker Decontamination Project Louisiana (Jan. 2009)

## Procedure

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

STEAM-OUT 180°-210°F



6.

## Slide 9

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**ps39**

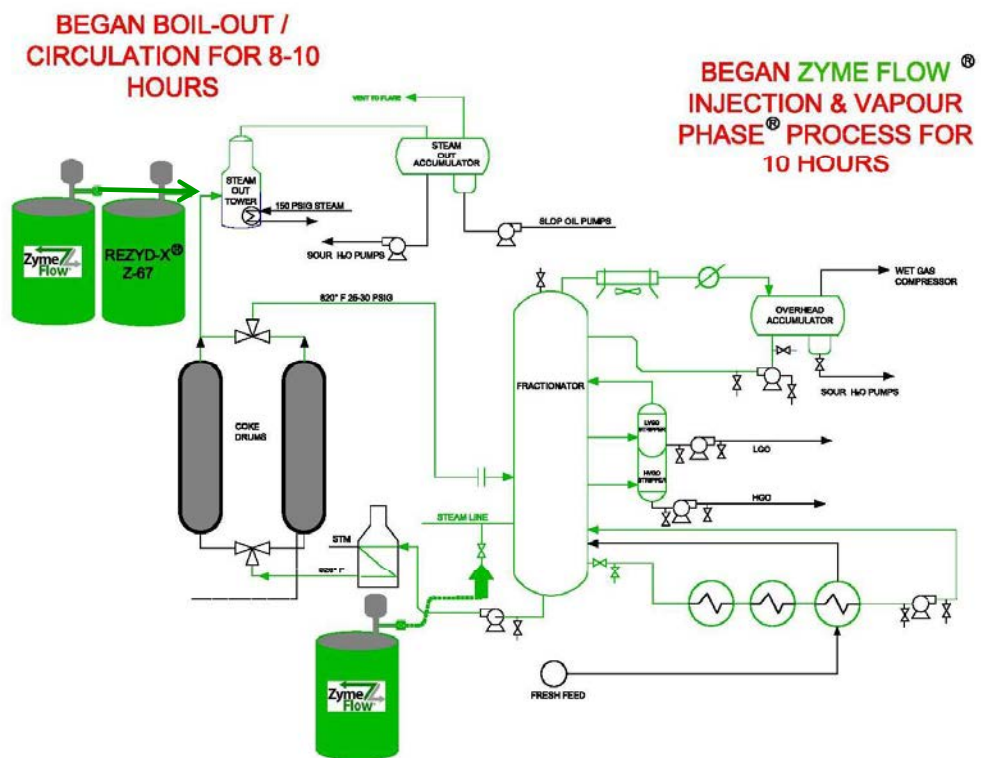
15. Slide 18-26. I don't like powder blue. It doesn't show well on a screen. Needs to be changed to something that shows well. Slides need to show a progression, like Phase 1.....Phase 2....and so on. Keep the audiences mind on the steps of the process.....that is done in <12 hours or less! OK. We need 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-Treat.
- Coker Unit Decontamination



## Slide 10

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**ps40**

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

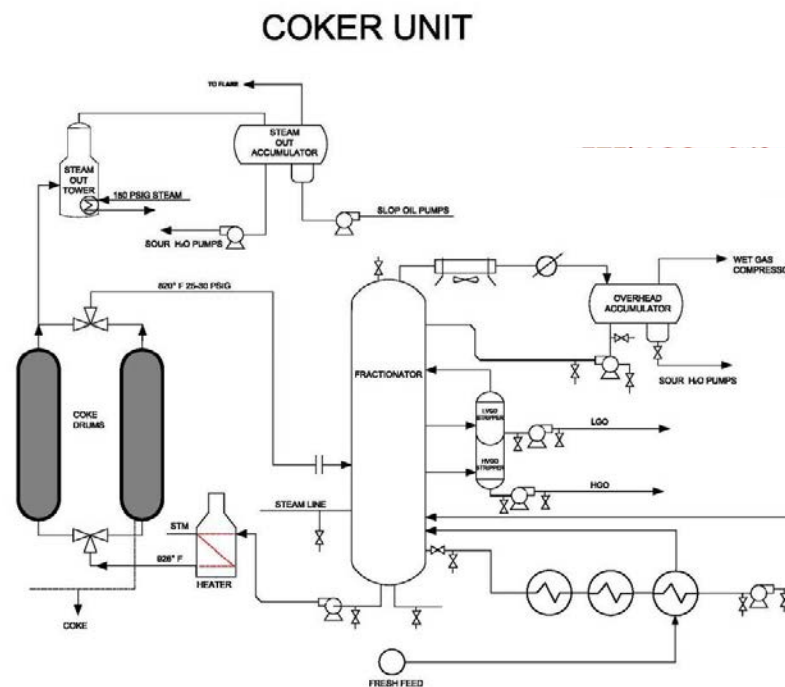
- Coker Unit Viscosity Flush
- Fractionation Unit Pre-Treatment
- Coker Unit Decontamination

All low points drained.

Readings of H<sub>2</sub>S = 0 ppm

Benzene = 0 ppm, LEL, VOC = 0%

Zyme Flow = 300-400 ppm



## Slide 11

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**ps41**

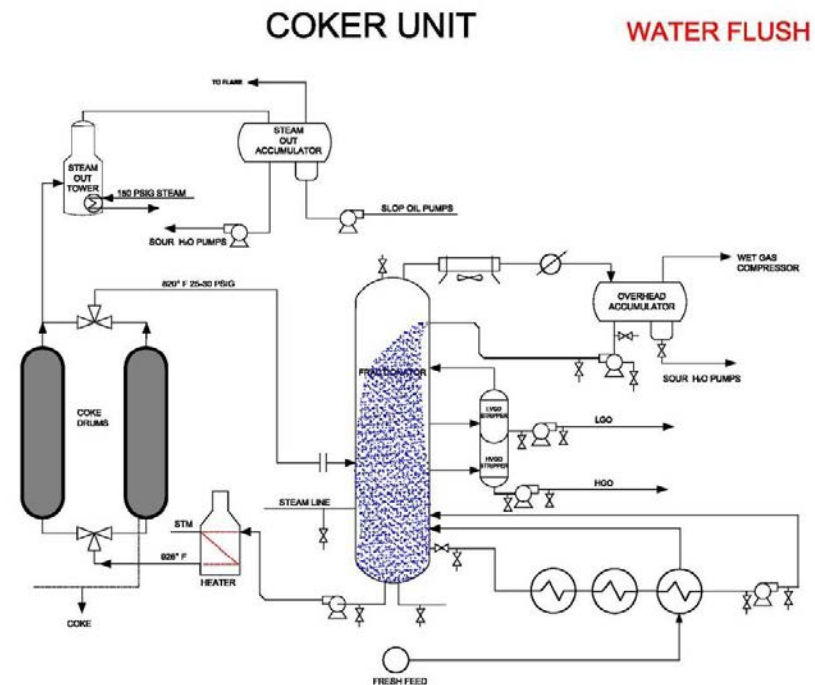
15. Slide 18-26. I don't like powder blue. It doesn't show well on a screen. Needs to be changed to something that shows well. Slides need to show a progression, like Phase 1.....Phase 2....and so on. Keep the audiences mind on the steps of the process.....that is done in <12 hours or less! OK. We need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



**Targeting any remaining Pyrophoric Iron scale,  
solids and chemical residue**

## Slide 12

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**ps42**

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.

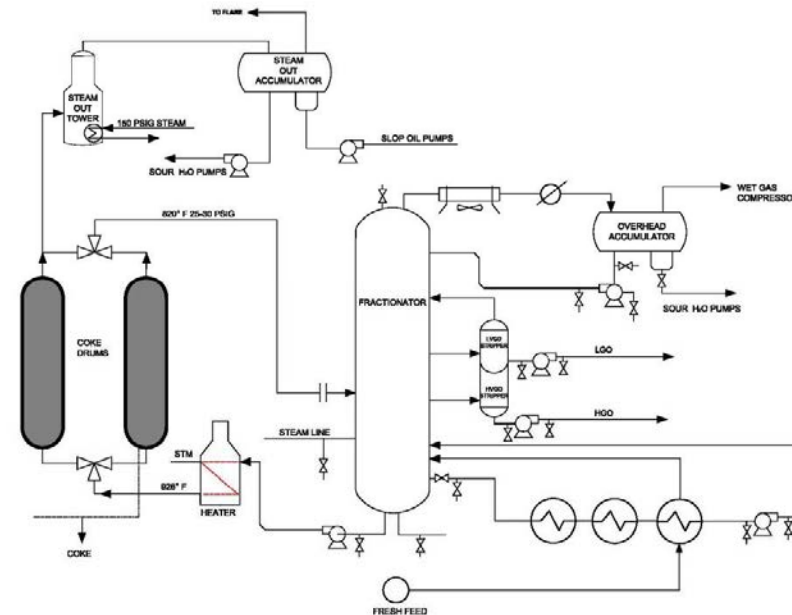
pete.shirley, 6/11/2009

# Coker Decontamination Project Louisiana (Jan. 2009)

## Procedure

READY FOR ENTRY

- 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.**

## Slide 13

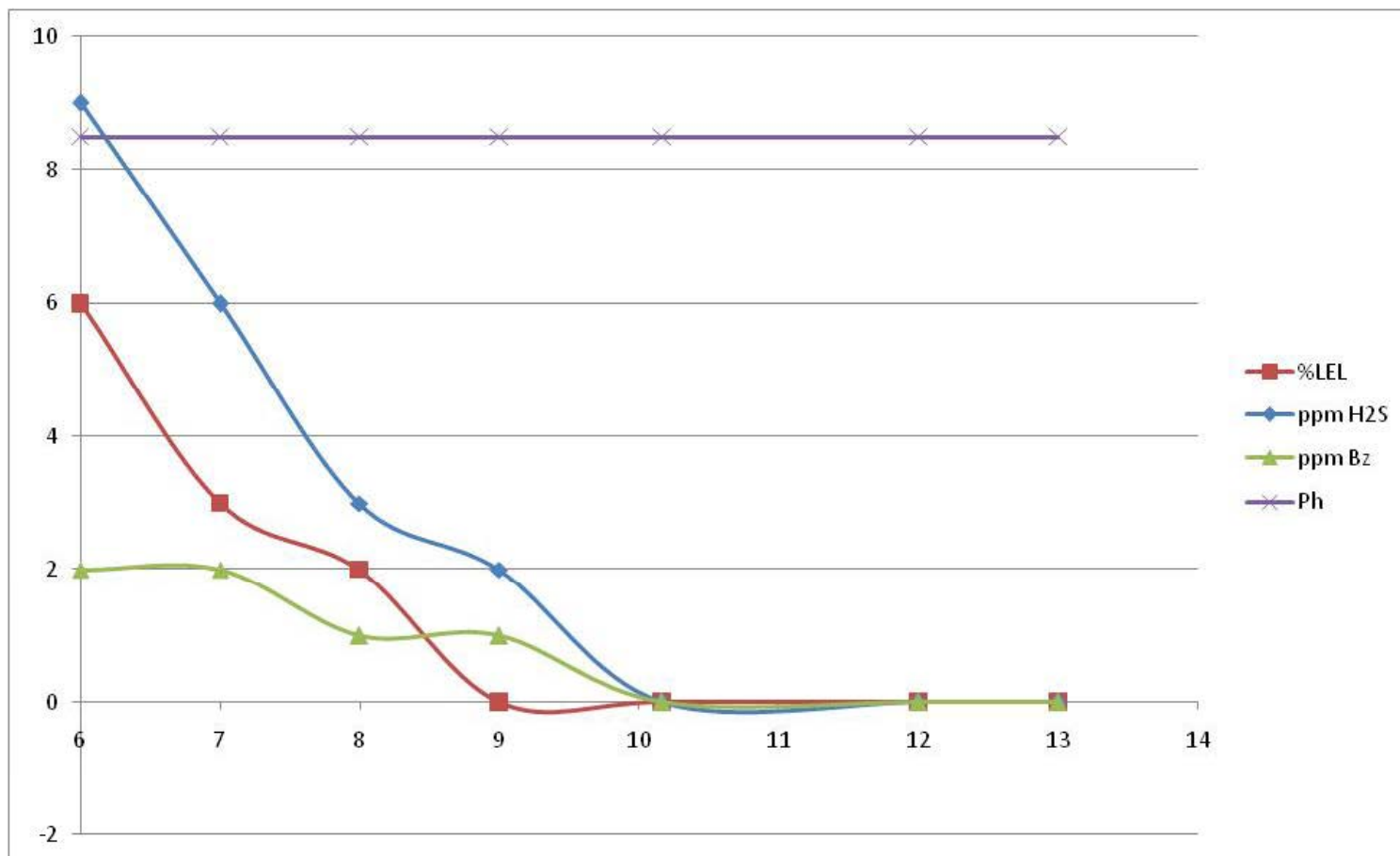
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**ps43**

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



14

Slide 14

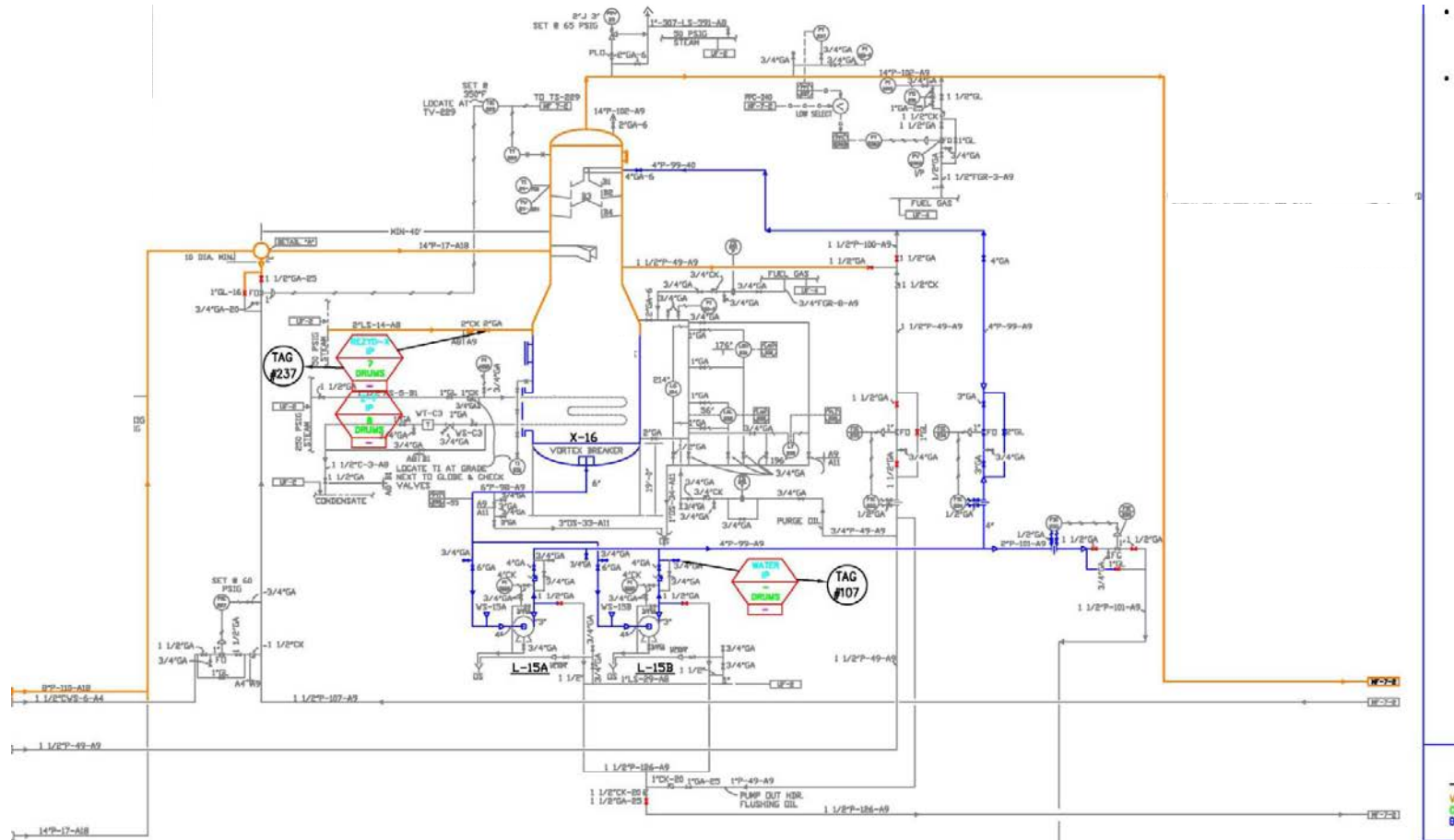
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ps34

16. Slide 27. Good slide  
pete.shirley, 6/11/2009



# January 2009 Coker Decontamination Project



## Slide 15

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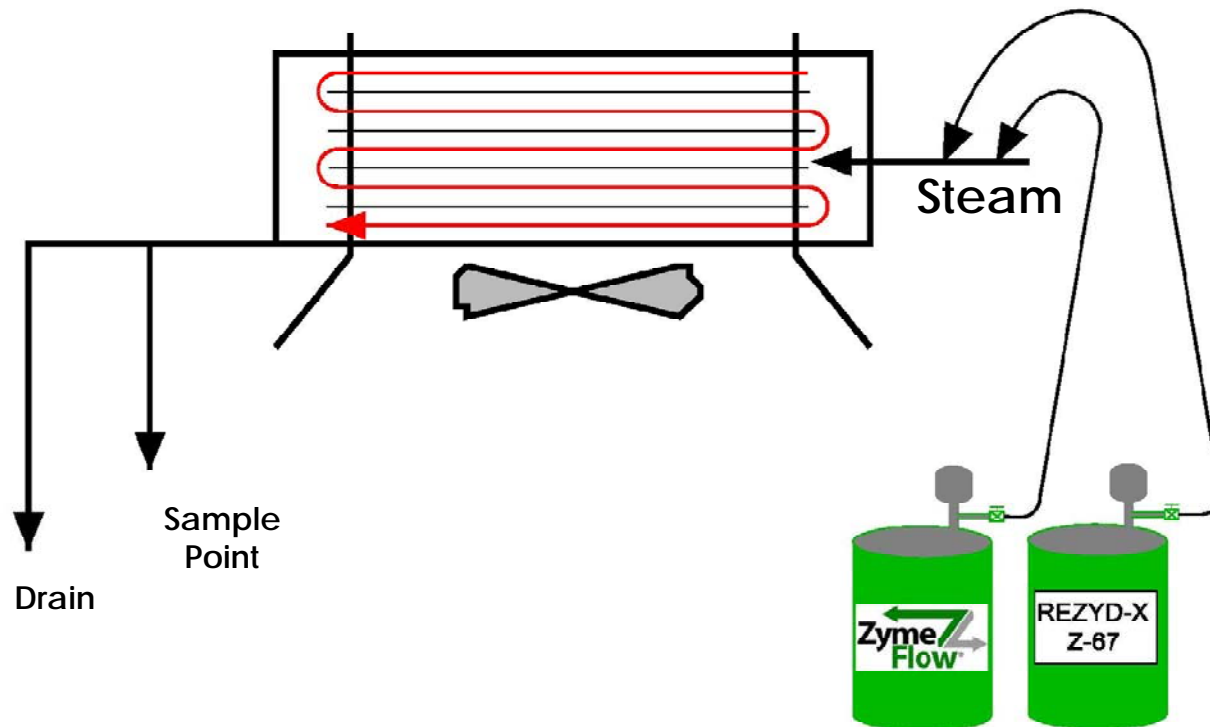
**ps32**

17. 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

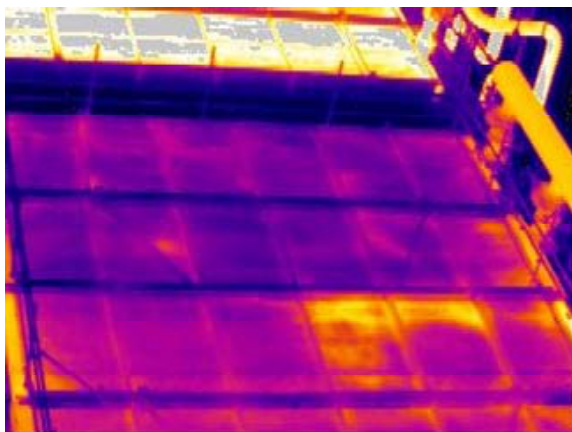


## Fin Fan Heat Exchanger Efficiency Recovery at Port Arthur Texas

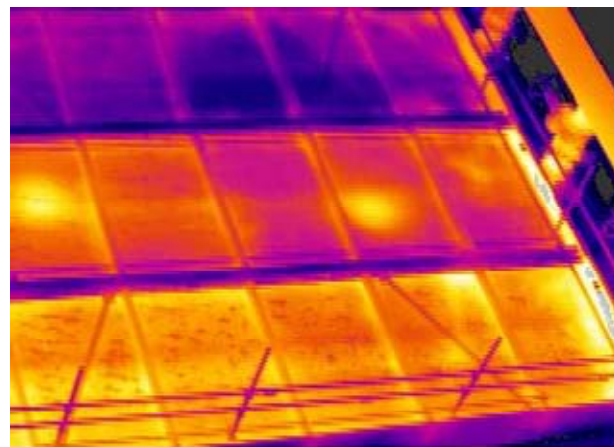


Simple problems can mean simple applications

## VapourPhase<sup>®</sup> With Rezyd-X<sup>®</sup> and Zyme-flow<sup>®</sup> Quickly Recovered Blowdown Heat Exchanger



Before



After

0.75 days ————— Zyme-Flow® Process

# ZYME FLOW PROCESS

## Completed in 1/3 the time!

### SAFER

4 days

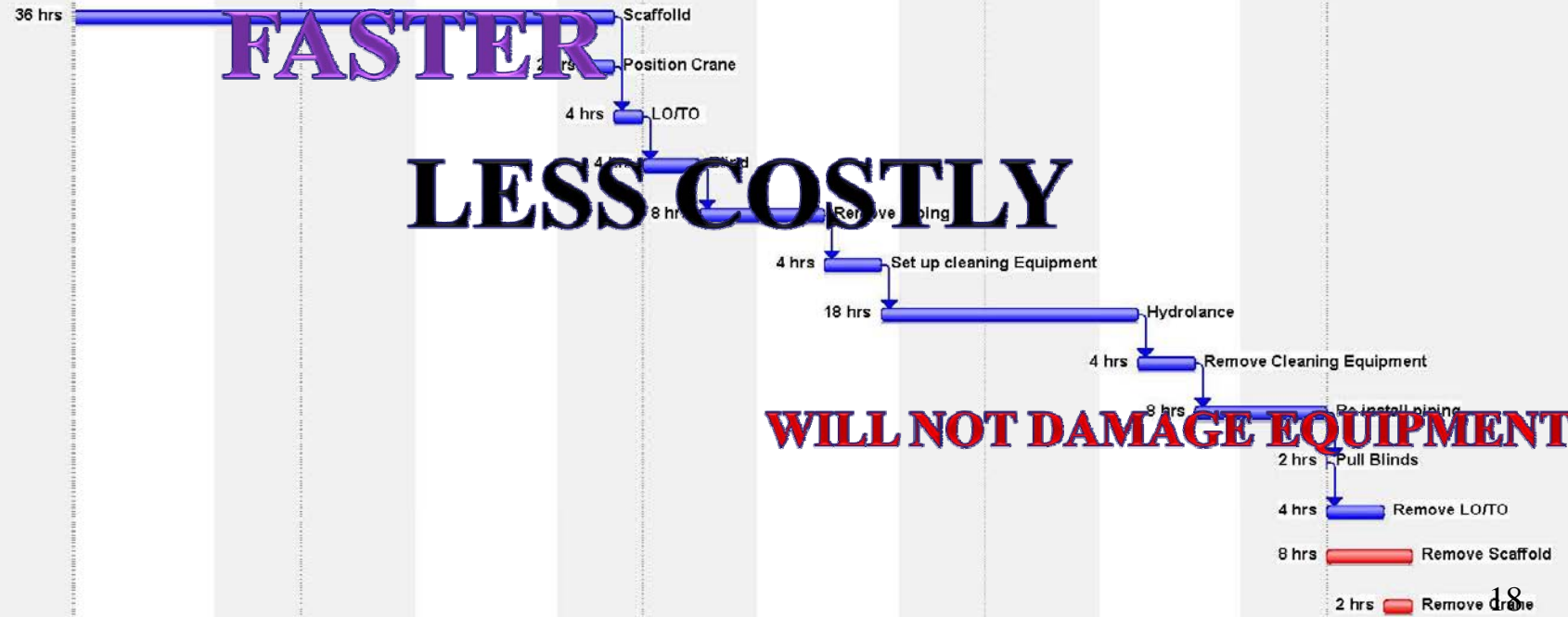
Traditional

36 hrs

### FASTER

### LESS COSTLY

### WILL NOT DAMAGE EQUIPMENT



## Slide 18

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**ps30**

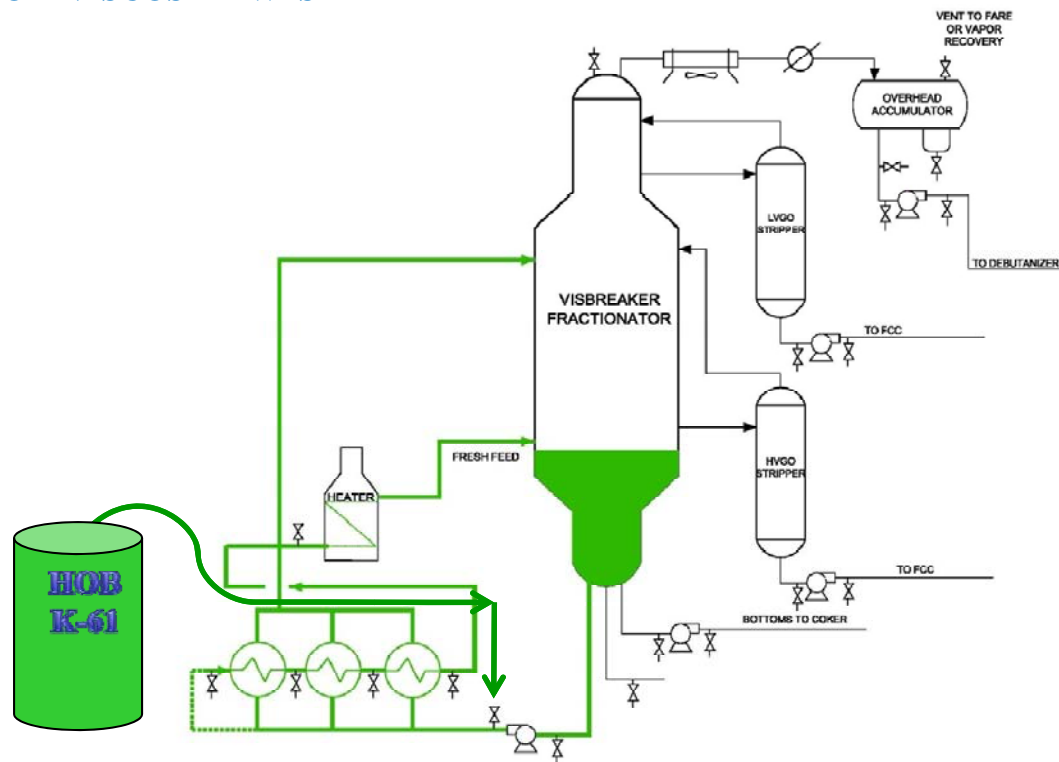
1. Slide 29-31. Delete. Not relevant to the primary message. The blow down fin-fan was on our original abstract and something that interested coker.com. I think it is relevant because it discusses an actual coker fin-fan heat exchanger defouling.

pete.shirley, 6/11/2009

# Visbreaker Unit Decontamination

Circulate 4-6 hours

HOB™/ LIGHT OIL VISCOSITY WASH  
VapourPhase®



3.

## Slide 19

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ps25

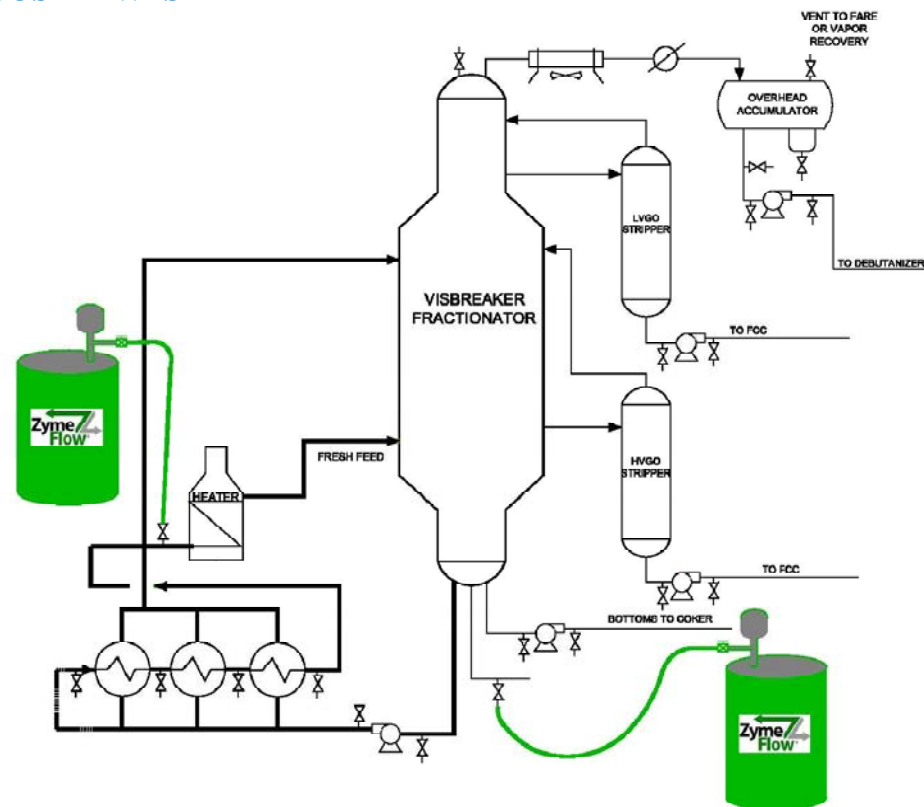
19. Slide 32-34. Grudging OK, but story needs to be woven into the presentation..... It's in here to show visbreaker capabilities  
pete.shirley, 6/11/2009



# Visbreaker Unit Decontamination

## Vapour Phase® 10 Hours

HOB™/ LIGHT OIL VISCOSITY WASH  
VapourPhase®



6.

## Slide 20

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**ps26**

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:
  - H<sub>2</sub>S, LEL free
  - Beds and trays were oil free
  - Exchangers were easily pulled

## Slide 21

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ps27

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 <sup>SM9</sup> heavy asphaltenes
- LCO stock with Rezyd-X®
- Softens and breaks up hydrocarbon deposits
- Makes it easier to clean and pull bundle

## Slide 22

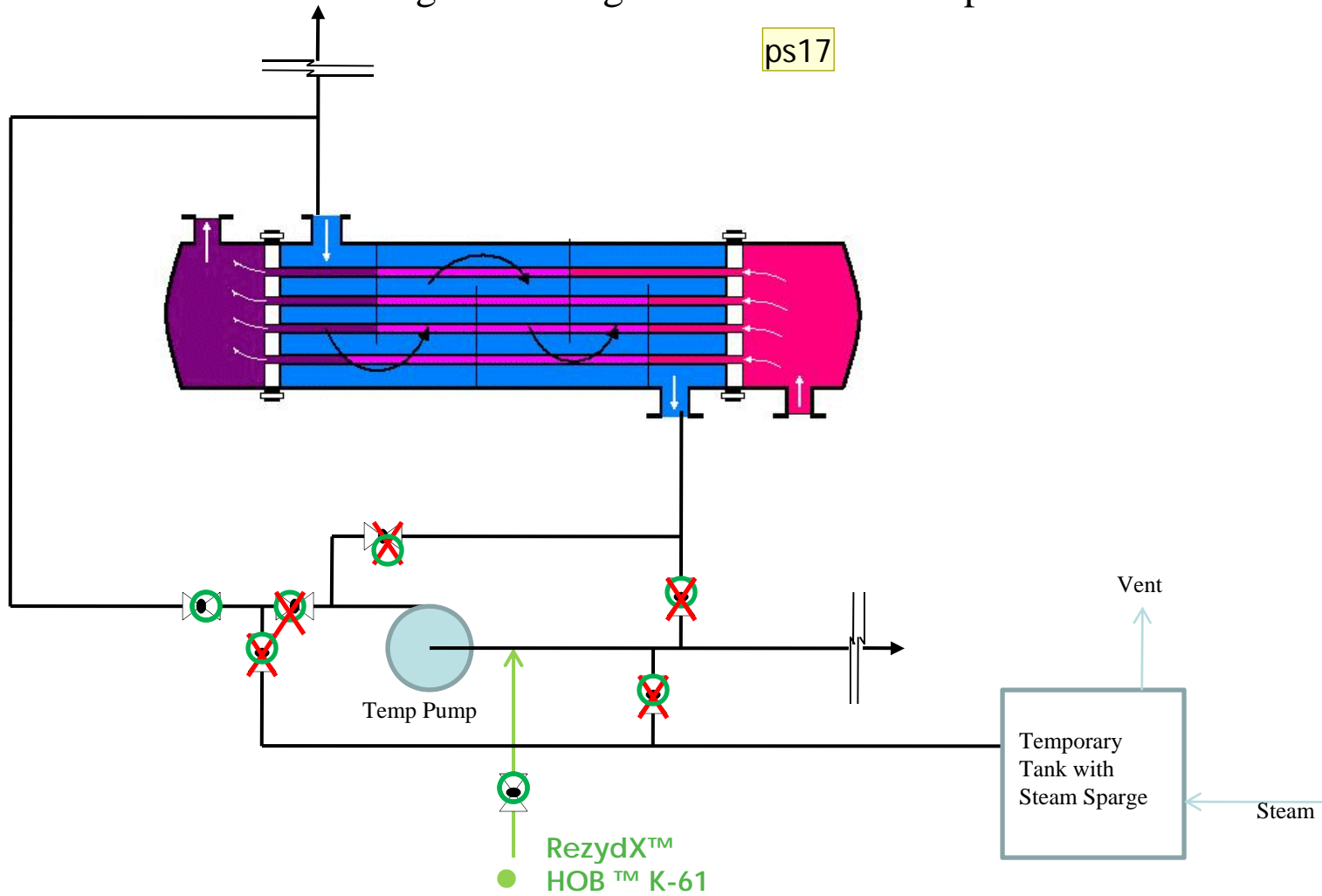
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**SM9** replaced this from cylce cutter stock  
Susan.Moore, 6/2/2009

**ps19** 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

ps17



## Slide 23

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**ps17**

Improve graphics and animation

pete.shirley, 4/22/2009

**ps20**

pete.shirley 6/11/2009

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



*RESULTS PROVEN*  
Pre-Hydro-blasted—Rezyd-X® and HOB™



## Slide 24

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ps21

pete.shirley 6/11/2009

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

## Coker Preheat Train Exchangers

“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.”

## Slide 25

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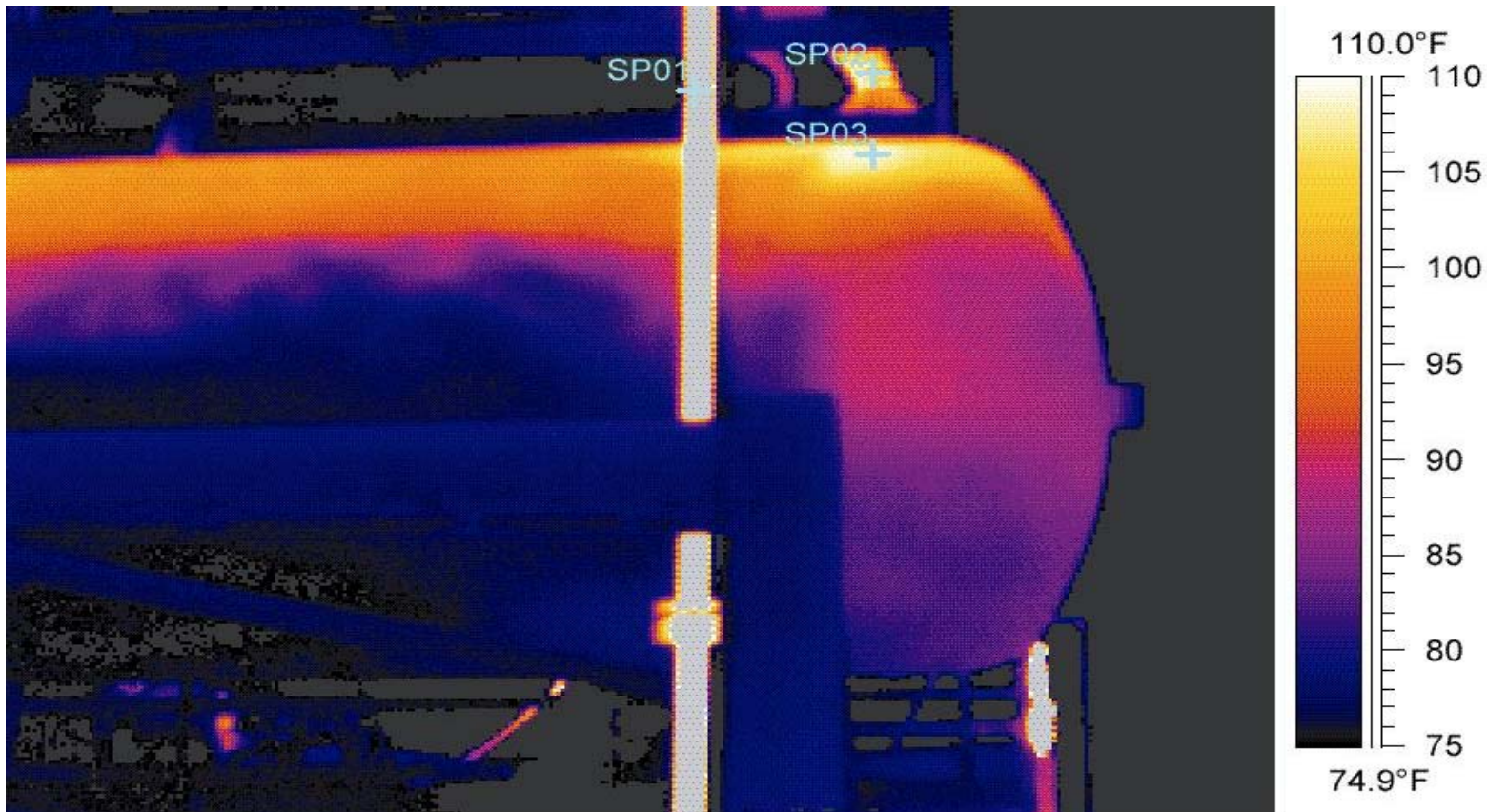
ps22

pete.shirley 6/11/2009

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

## Asphalt Build-Up in Pre-Heat Train



Before: Thermal Imaging Shows “Cold” Areas Where Heat Transfer is Impeded by Asphalt Deposits

## Slide 26

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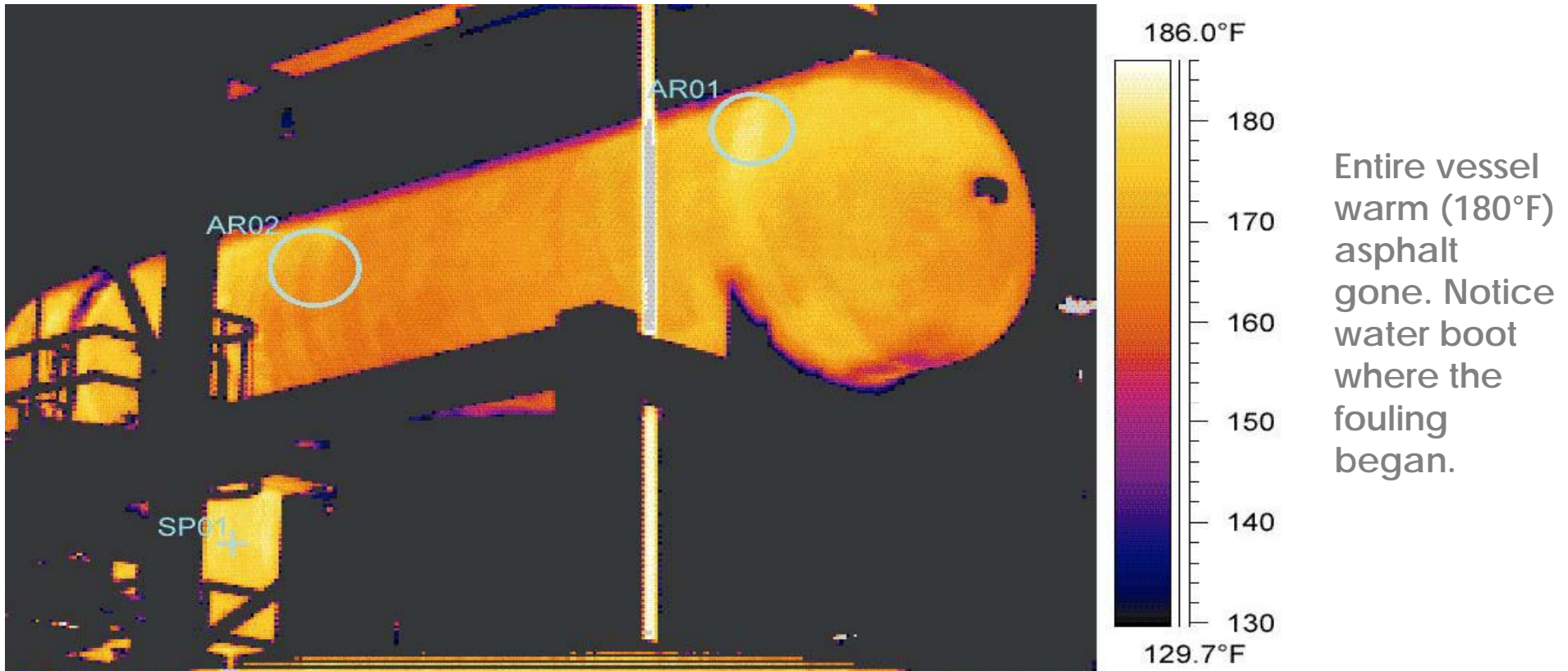
ps23

pete.shirley 6/11/2009

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

## After 12 Hours Flushing with RezydX™ and HOB™ K-61



After: Thermal Imaging shows uniform heat transfer and recovered efficiency.

## Slide 27

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ps24

pete.shirley 6/11/2009

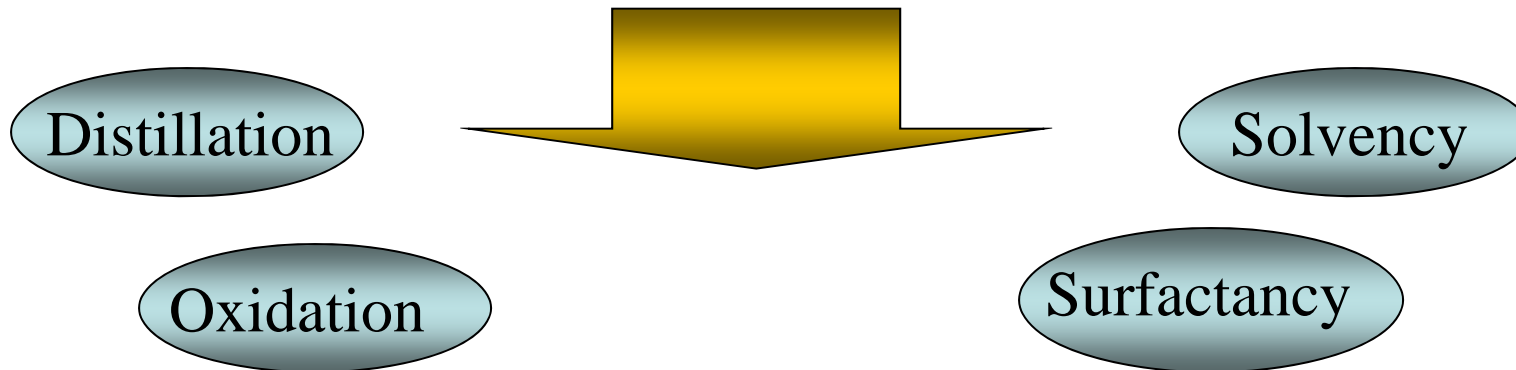
20. Slide 35-40. Sell me on why these need to be included. There is a market for pre-heat exchanger cleaning on visbreakers and cokers. This was an opportunity to discuss the capabilities of rezyd-x and ZF for defouling heavy Asphaltenes.

pete.shirley, 6/11/2009



## Results of Zyme-Flow® Decontamination Process

- Benzene Removed
- Hydrocarbons (LEL's) removed
- H<sub>2</sub>S Oxidized
- Pyrophorics Oxidized
- Reduced Mech. Cleaning
- Ammonia removed
- WWTP Friendly Wastewater Stream
- Recovered Heat Exchanger Efficiencies



**Decontamination performed within 12 Hours**

## Slide 28

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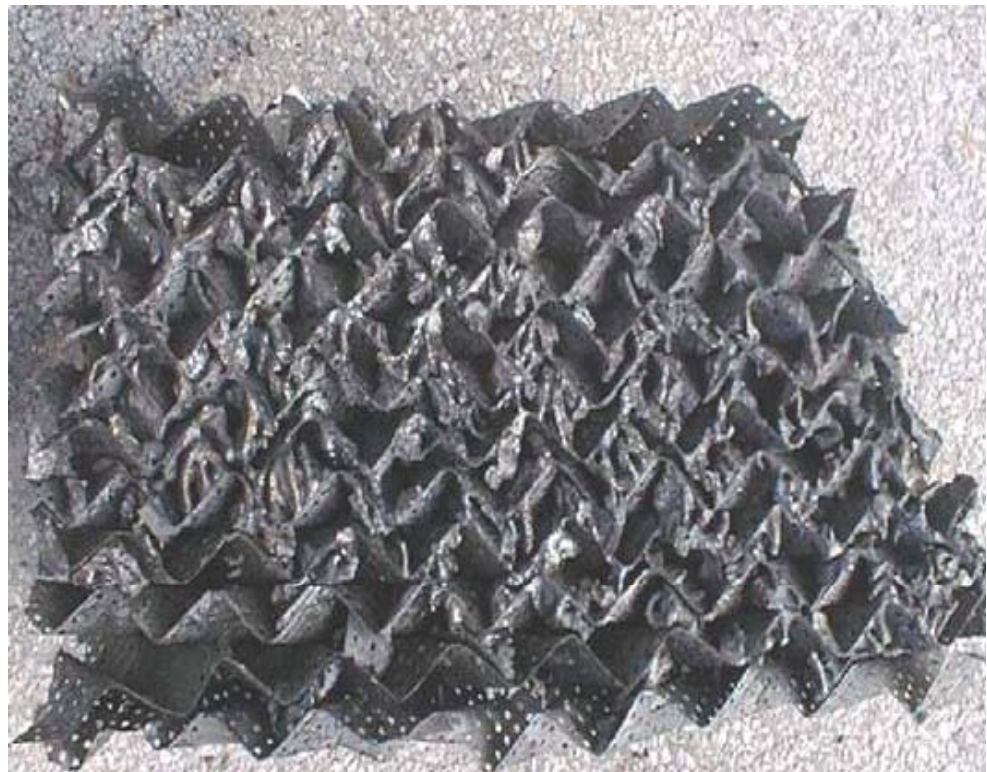
ps47

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!



## Slide 29

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ps45

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 Contaminate Scale



## Slide 30

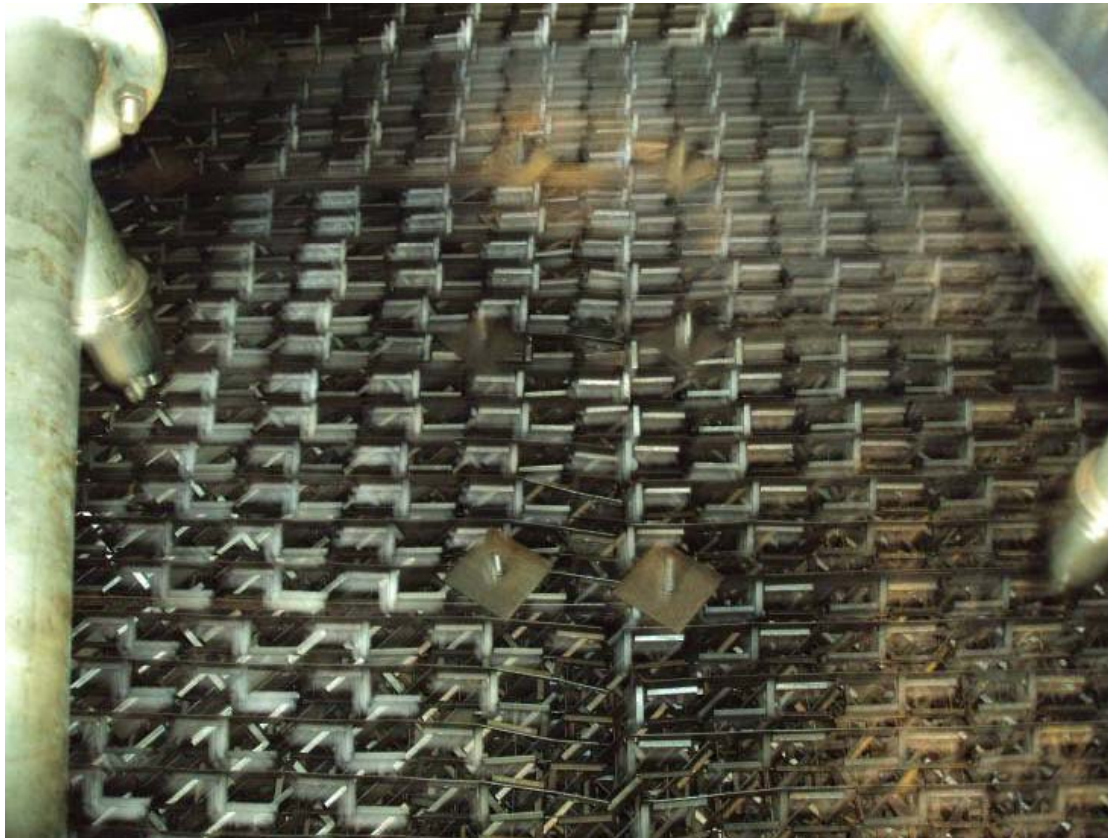
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**ps46**

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





## 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.

## Slide 34

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**ps18**

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

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# Conclusion