Stop Plugging Those Coker Lines!

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Heavy process subject to “plugging”
False sense of security
Specific problem areas
Overview

1. Game changer
2. Available heating technologies
3. ControTrace usage
4. Concern areas

PROCESS FLOW STOPS + HEAVIER FEEDSTOCK = INCREASED "PLUGGING" RISK
2 main types of plugging

### Bypass Lines
- **Piping, valves, instruments, pumps**
- **Flow switched to bypass line, but bypass is plugged**
- **Operations stopped until: (a) plug removed or (b) flow switched back to main line**
- **Frequency= 2-4X/yr**

### Main Line
- **Non-thermal issue brings down unit for extended time**
- **Issue resolved, but plug prevents restart**
- **Operations stopped until plug removed**
- **Frequency= Every 2-10 yrs**

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**Delayed Coker Process Diagram**

- **Vacuum distillation column**
  - **750°F**

- **Surge tank**
  - **600°F**

- **Tank farm**
  - **600°F**

- **Vacuum distillation column**
  - **HX w/ HGO**

- **Main fractionator**
  - **Main line**
    - **Non-thermal issue brings down unit for extended time**
    - **Issue resolved, but plug prevents restart**
    - **Operations stopped until plug removed**
    - **Frequency= Every 2-10 yrs**

- **Bypass line**
  - **Piping, valves, instruments, pumps**
  - **Flow switched to bypass line, but bypass is plugged**
  - **Operations stopped until: (a) plug removed or (b) flow switched back to main line**
  - **Frequency= 2-4X/yr**

- **Condensate drum**
  - **Vapor to fractionator / slop oil system**
  - **Recycle pump-around with strainers**

- **Furnace**
  - **Each furnace pass has its own flow meter, temp sensor, and control valve.**
  - **Between the instrumentation and the furnace, steam is injected into the line; the flashing steam creates the high velocity.**
  - **Typical coker uses n=4 parallel furnace passes for each coker drum pair.**

- **930°F**

- **Blow-down tower**
  - **Condensables to fractionator / slop oil system**
  - **Recycle pump-around with strainers**

- **From warming cycle**
- **From quenching cycle**
Typical Specific Problem Areas

- **Wedge meters in front of Furnaces**
  - Trouble with plugging
  - Need to use flushing oil to keep free
  - Use of Ceramic heat blankets to operate

- **Redundant pump lines**
  - No-flow side plugs, can’t operate when needed

- **Resid feed lines plug**
  - Ceramic heat blankets - Flushing oil
  - Hydroblasting - Steam hoses
  - Ram pumping

- **ET Lines**
  - Pre-mature coking from crossed lines
  - Uneven temperature distribution
  - Failed systems allow plugged lines
Have you done this to melt out a line?

If you need a Rosebud, ceramic heat blanket, steam hose, etc. to melt out your lines, your heating system is not working!
Have you had to remove a plug with mechanical means?

What value is this heat tracing providing?

• It allowed the resid to plug
• It can’t melt it out
• What is the difference between this tracing and having no tracing at all?
Pipe heating technologies

• Foundation is:
  \[ q = U \times A \times \Delta T \]

• Create \( \Delta T \) with high-temp heating medium

• Difference is in \( U, A \)

• 3 steam/oil heating technologies
  • Jacketed piping
  • Conventional tube tracing
  • ControTrace
Jacketed piping

- Process flows through core piping
- Jacket completely surrounds core
- Heating medium flows through annular space
- Maximum U and A $\Rightarrow$ best thermal capability
- >2X material of process piping
- 3-5X labor of process piping
- Cross-contamination risk

$$q = U \times A \times \Delta T$$
Tube tracing

- Process flows through piping
- ½” tubing is banded onto piping
- Heating medium flows through tubing
- Can use mastic to improve heat transfer
- Add tubes for more heat
- Two circles touching at a point—maybe

\[ q = U \times A \times \Delta T \]
Common coker complaints

- Poor heat transfer contact
- Uneven heating
- Required steam pressure is very high
- Breaks easily (walked on)
- Could make it work until received heavier feed
- Can be tough to service valves

\[ q = U \times A \times \Delta T \]
ControTrace

- Process flows through piping
- 2”X1” rectangular tubing is banded onto piping
- Designed with ASME Section VIII
- Contoured to fit pipe OD
- Heating medium flows through tracing
- Use mastic to remove air gaps
- Add elements for more heat

\[ q = U \times A \times \Delta T \]
Higher U and A

\[ q = U \times A \times \Delta T \]

<table>
<thead>
<tr>
<th>TT</th>
<th>U = 1</th>
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<tbody>
<tr>
<td>CT</td>
<td>U = 40</td>
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ControHeat

- ControHeat for valves, pumps, instrumentation
ControHeat

• Steel pressure chamber embedded in aluminum casting for excellent heat transfer

• Designed, built, and tested in accordance with ASME Section VIII, Division 1

• Jacket for valves, pumps, meters, fittings, flanges – virtually any type of process equipment
Choose the right technology

Conventional tube tracing vs. ControTrace
Choose the right technology
CT in the Coker Unit

Delayed Coker Process Diagram

ControlTrace application
non-ControlTrace application

Vacuum distillation column

Option #1
Surge tank  HX w/ HGO

Option #2
Tank farm  HX w/ HGO

Option #3

Recycle pump-around with strainers

Main fractionator

Coker drums

580psi

Furnace

930°F

Each furnace pass has its own (1) flow meter (2) temp sensor (3) control valve (4) steam injector. Typical coker uses n=4 parallel furnace passes for each coker drum pair.

BLOW-DOWN
Vapor to fin-fan deck
from steam-out / quenching cycle
Blow-down tower
Condensables to fractionator / slop oil system
Recycle pump-around with strainers

CONDENSATE DRUM
Vapor to fractionator
Condensate drum
Condensables to fractionator / slop oil system
Recycle pump-around with strainers
General recommendations

Use ControTrace for…

1. Lines between vac tower and coker furnace
2. No-flow lines
3. Heavier product
4. Critical components
Modified setup (TT/Elec blankets)  

Electric blankets semi-permanently attached to piping

CSI Solution (CT/CH)  
Installation Drawing

CSI bolt-on technology (ControTrace / ControHeat)  
provides solution for hybrid Tube Tracing / Electric Blanket heating of coker line
Specific target areas

1. Wedge flow meters prior to coker furnace
2. Bypass/recirculation lines/strainers
   a. Fractionator
   b. Coke condensate drum
   c. Blow-down area
3. Drains to OWS throughout the unit
Summary

• Flowing process gives a false sense of security
• Heavier feedstock changes the game
• Coking experts are turning to more robust heating system (ControTrace)

• Specific target areas:
  • Wedge flow meters prior to coker furnace
  • Bypass/recirculation lines/strainers
  • Drains to OWS throughout the unit

• Call us if we can help
Thank you!

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