Galveston, TX May 2-6, 2011

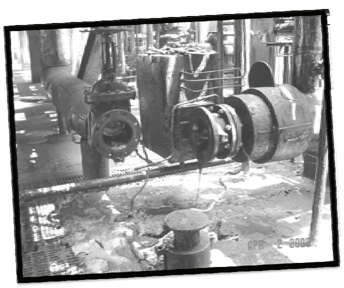
Stop Throwing Money Away in the Coker Unit!

Thomas Willingham, PE
Controls Southeast, Inc.

willingham@csiheat.com

Feedback from coker units

Chevron • CNRL • ConocoPhillips • Hovensa • Lyondell • Marathon • PetroCanada • Shell • Suncor • Total



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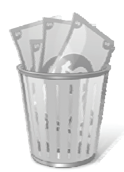


Flushing oil
Missed coker cycles
Ceramic heat blankets
600 psig steam

Problems emerge over time

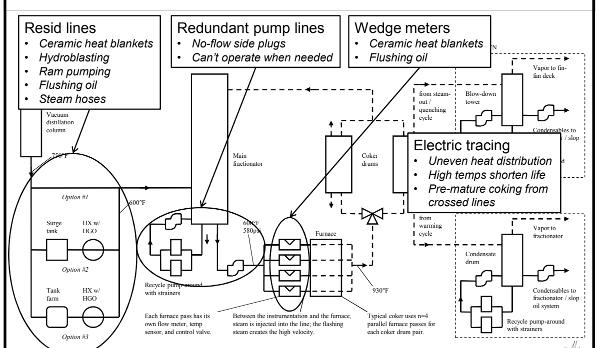
Plant start-ups focus on conversion rates, chemistry, and coke morphology… not on stress testing the thermal maintenance system

Agenda

1. What are the problems?
2. Why are there problems?
3. How much do the problems cost?
4. Is there a better way?

1 What are the problems?

Reported plugging areas



Why are there problems?

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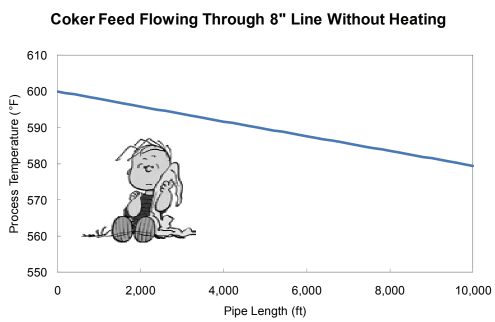
No heat needed if flowing



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No flow/ melt out = design condition #1

- No-flow condition is common…
  - Bypass lines (NNF)
  - Turnarounds
  - Upsets

→ ***Need melt-out capability!***

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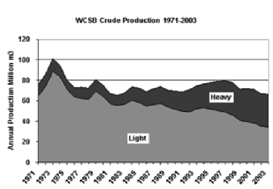
Inadequate specifications #2

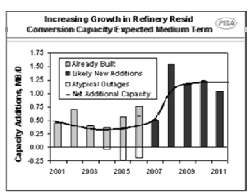
- Typical P&ID:
  - "Heat Trace", "Heavy Tracing"
- Problem?
  - Does not specify what outcome is required!
  - A single tube trace could be used and meet spec
  - Need to define more specific requirement:

    Steam tracing design basis: (1) Maintain process at 325F during no flow and (2) raise process temperature from ambient to 325F within 12 hr after loss of utilities. Vendor is required to supply calculations to show compliance.

Heavier resid makes it worse #3

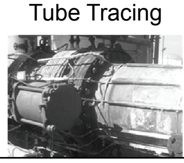
HEAVIER CRUDE SOURCES + **MORE EFFICIENT PROCESSING** = **HEAVIER RESID TO COKER**

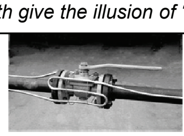




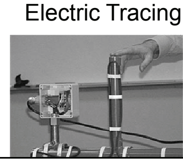
Historical heating methods ineffective #4

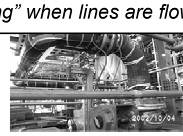
Tube Tracing





Electric Tracing





Both give the illusion of "working" when lines are flowing!

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

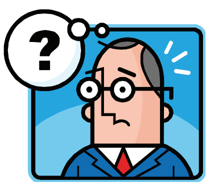
$q = \text{Constant} = q_{ambient\_loss} + q_{process}$

Low expectations of heating system

- Common Coping Mechanisms:
  - Flushing oil procedures to clear lines
  - Ceramic heat blankets
  - Hydro-blasting or other mechanical removal
  - Steam hoses
  - Ram pumping

Workarounds Common – Why Tolerated?

3 How much do the problems cost?

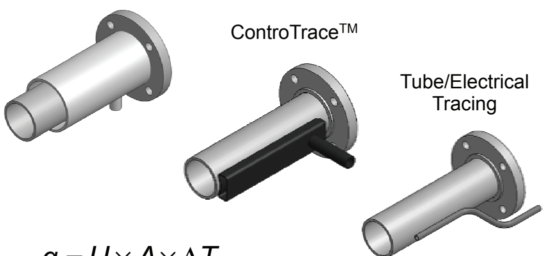


Operational cost impact

Operational Cost	$ Impact
Flushing oil *(prevent plugging prior to pending known downtime)*	
Missed coker cycles *(dependent on drum size, coke margin)*	
Plugging removal *(insulation removal/replacement; ceramic blankets)*	

Is there a better way?

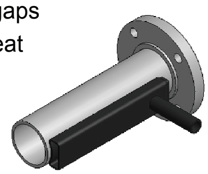
Different heating approaches



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

ControTrace

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



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

ControTrace on piping

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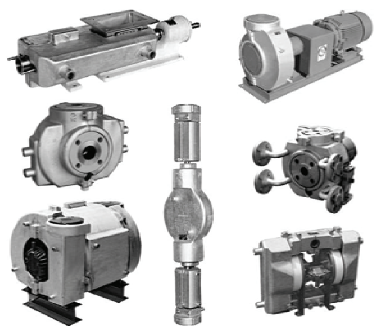
ControHeat for components



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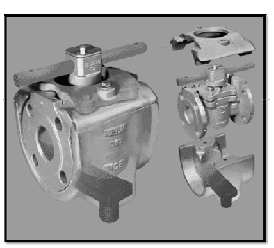
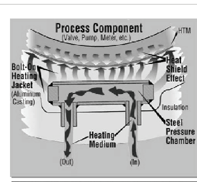
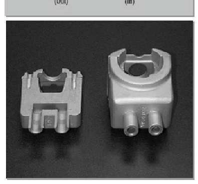
How ControHeat works







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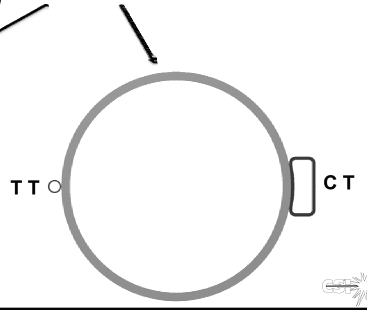
Higher U and A with CT

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

T T	U = 1
C T	U = 40



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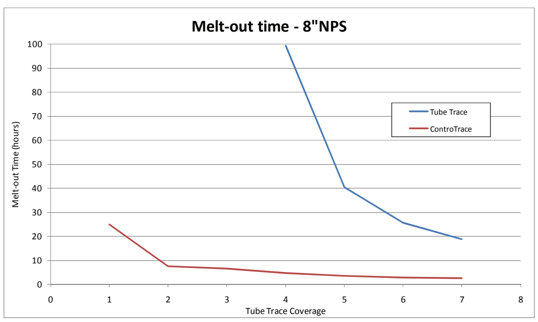
Faster melt-out with CT



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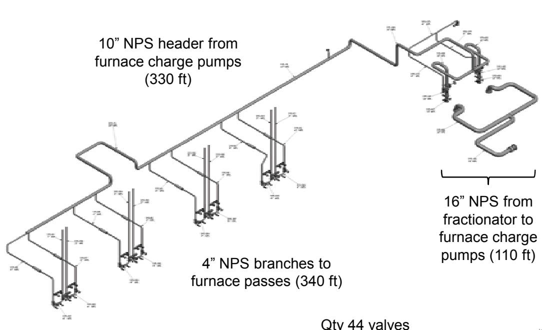
Baseline system



Qty 44 valves

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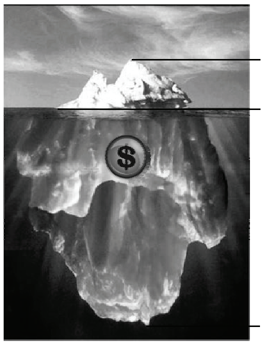
Consider all the costs!



Heating system cost

Ongoing Costs:

1. Flushing oil
2. Missed Coker cycles
3. Ceramic heat blankets
4. HP (600psig) steam

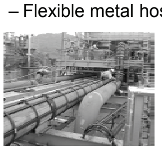
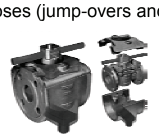
Summary & recommendations

- Specify required thermal duty for the system
- Require vendors to perform engineering to:
  - Meet thermal duty
- When evaluating a heating system, consider:
  - Will it be able to melt out?
  - Will it keep the process from plugging in no flow?
  - Capital cost of an engineered solution versus the ongoing costs of plugging

CSI general overview

1. Heated piping systems

- ControTrace™ & ControHeat™ bolt-on jacketing systems
- Jacketed piping
- Flexible metal hoses (jump-overs and jacketed)

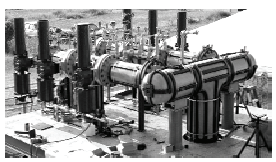




CSI general overview

1. Heated piping systems
2. **Process piping**
   – Up to 200 spools/week

CSI general overview

1. Heated piping systems
2. Process piping
3. **Specialty fabrication**
   – Code pressure vessels
   – Precision manifolds
   – Skids/modules



CSI general overview

1. Heated piping systems
2. Process piping
3. Specialty fabrication
4. **Engineering services**
   – Manifold-to-manifold responsibility
   – Thermal and fluid modeling
   – Piping and pressure vessel design
   – Project integration