HEURTEY PETROCHEM

Coker Furnace Run Length
Higher Coker Furnace Run Length Benefits Refineries

How to Achieve Higher Run Length?
Maximize Days of Operation *(Run Length)* before decoking/shutdown

Furnace performance has direct impact on unit run length

Ensure proper furnace performance by

- Design
- Operation
- Online Spalling
Furnace Design Parameters

- **Uniform** firing
- Film Temperature
- **Residence Time** (velocity)
- **Flux Distribution** (Profile)
Double Fired design ensures uniform firing compared to Single Fired design.

- Double Fired: 
  - Uniform firing
  - Flux: (1.8 – 2.0) X Average Flux

- Single Fired: 
  - Non-uniform firing
  - Flux: (1.2 – 1.3) X Average Flux
Delay coking as much as possible in the furnace.

Ideally, all the flux should be at the radiant outlet tube.

Other designs, initially used for syngas reforming where reaction needs to commence at radiant inlet, result in peak flux at the radiant top.

On the contrary, our design focuses the peak flux towards the bottom tubes, thereby delaying the coke formation.
Background

- North American Installation
- Heavy feed with inorganic contents
- Furnace supplied by PCD, Licensor selection by End User

22.5’ radiant i/s height

2 radiant cells
Common Convection
2 rows of burners in each cell
Natural Draft
Problems Reported

- **Run time** between De-Coke was around 60-70 days (90+ expected)
- **High** tube metal **temperatures** on the **upper** 5 or 6 radiant tubes
- **Coking** concentrated mainly in these same **upper radiant tubes**
- **Velocity steam** - no effect
- **No apparent flame impingement** on the tubes, looked OK
Review of Problem

- Review of heater process performance did not show any probable cause.
- Process and operating parameters within specified design conditions.
- Elimination of other factors left only burner/flux profile.
- Visible Flame height was 10 to 11ft, ~50% box height.
- Detailed review found errors in burner design.
- We felt this resulted in higher flux at radiant top.
- Burner vendor was confident that burner was not the cause.
Burner tested previously but flux profile not measured.

Decided to retest the burner, as close to the burner operating conditions as possible, maintaining actual dimensions of the burner relative to the heater wall and floor.

Measure Flux profile for the above condition

If test result showed what we suspected, modify burner design to shift flux from radiant top to bottom

Verify the change by measuring flux profile with the new design
Burner Test

Test Furnace

Burner
Test Results

Existing Burner – Flux peaking at the top of radiant section

Modified Burner – Flux peaking at the bottom of radiant section

Top of Radiant Box
Site Results after Changes

- Existing burners replaced with modified burners in one furnace at site
- Run length increased to 120+ days
- Tube metal temperature dropped significantly for the upper radiant tubes
- No flame impingement on tubes
- Burners on all furnaces replaced
PCD/BHTS DESIGN
PCD/BHTS Design

PCD/Heurtey offers BHTS’ state of the art design incorporating Proprietary
- Flux profile
- Burner to tube/wall clearance
- Design specification for heater coil and transfer line resulting in proper online spalling – repeatable $\Delta T$ after each spalling
PCD/BHTS Flux Profile

- PCD/BHTS specifies the target flux profile
- Burner design incorporates the flux profile
- This is checked using CFD modeling
- Followed by Flux Profile measurement during burner test
CFD Modeling
CFD Modeling

Tubes facing the center burners

Tubes facing the side burners
Flux Profile **critical** for ensuring proper run length

Heater and burner **designs** to account for the target profile

Flux profile to be checked and confirmed using CFD Modeling and Flux Profile Measurement during burner test

Other heater design results in peak flux at the top of radiant box and **shorter run length**
Worldwide Activity

- Owns design software: FRNC5 for heaters & REFORM3 for SMR
- Dedicated manufacturing facilities,
- Highly qualified staff providing an unparalleled expertise,
- Local network operating on all strategic foreign markets,
- Capacity to conduct any type of projects, from an engineering study to the turnkey delivery of fully manufactured equipment.
THANK YOU FOR YOUR ATTENTION