



HEURTEY PETROCHEM

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Coker Furnace Run Length



REFCOMM[®]
MUMBAI
17-20 Oct 2016

Higher Coker Furnace Run Length Benefits Refineries



How to **Achieve** Higher Run Length?



FURNACE DESIGN

DCU - Objective

- ▮ 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

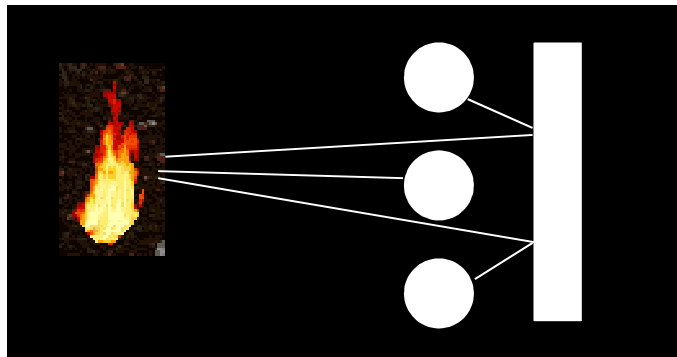
Furnace Design Parameters

- ✓ **Uniform** firing
- ✓ Film Temperature
- ✓ **Residence Time** (velocity)
- ✓ Flux Distribution (**Profile**)

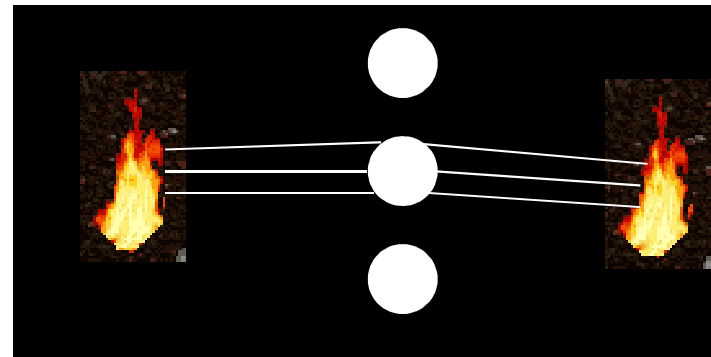
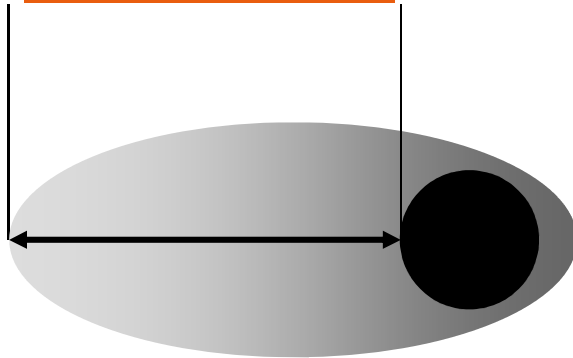


Uniform Firing

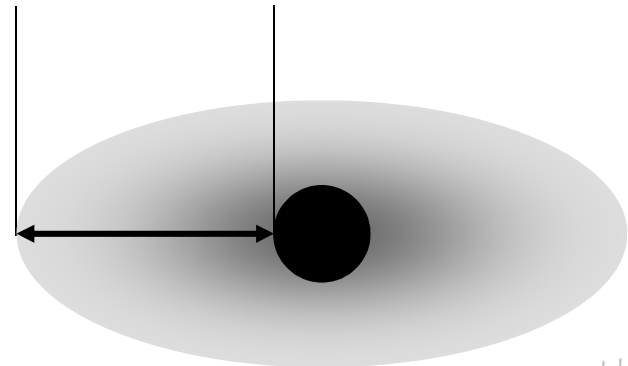
 **Double Fired** design ensures uniform firing compared to **Single Fired** design



(1.8 – 2.0) X Average Flux

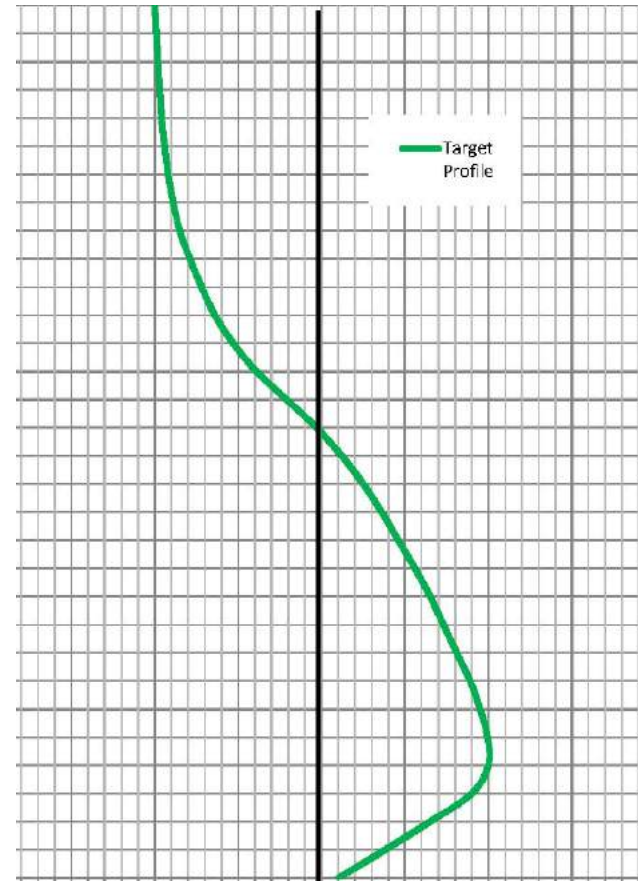


(1.2 – 1.3) X Average Flux



- 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.

Flux Profile

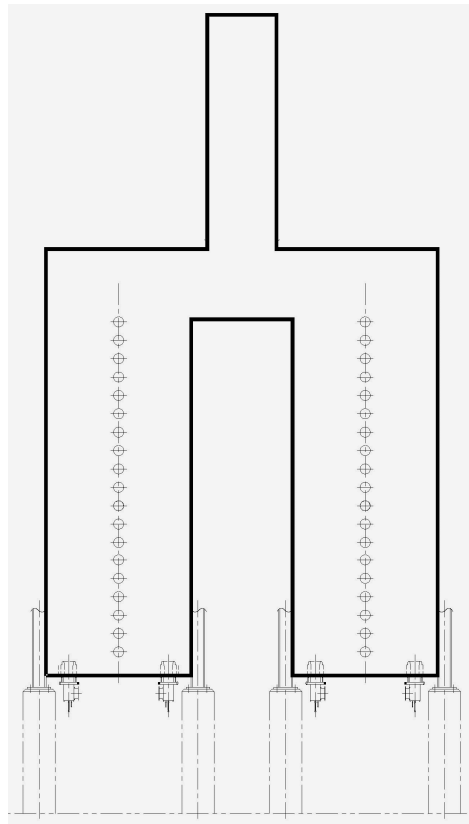


CASE STUDY

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 11 ft, ~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 Review

- ❧ 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

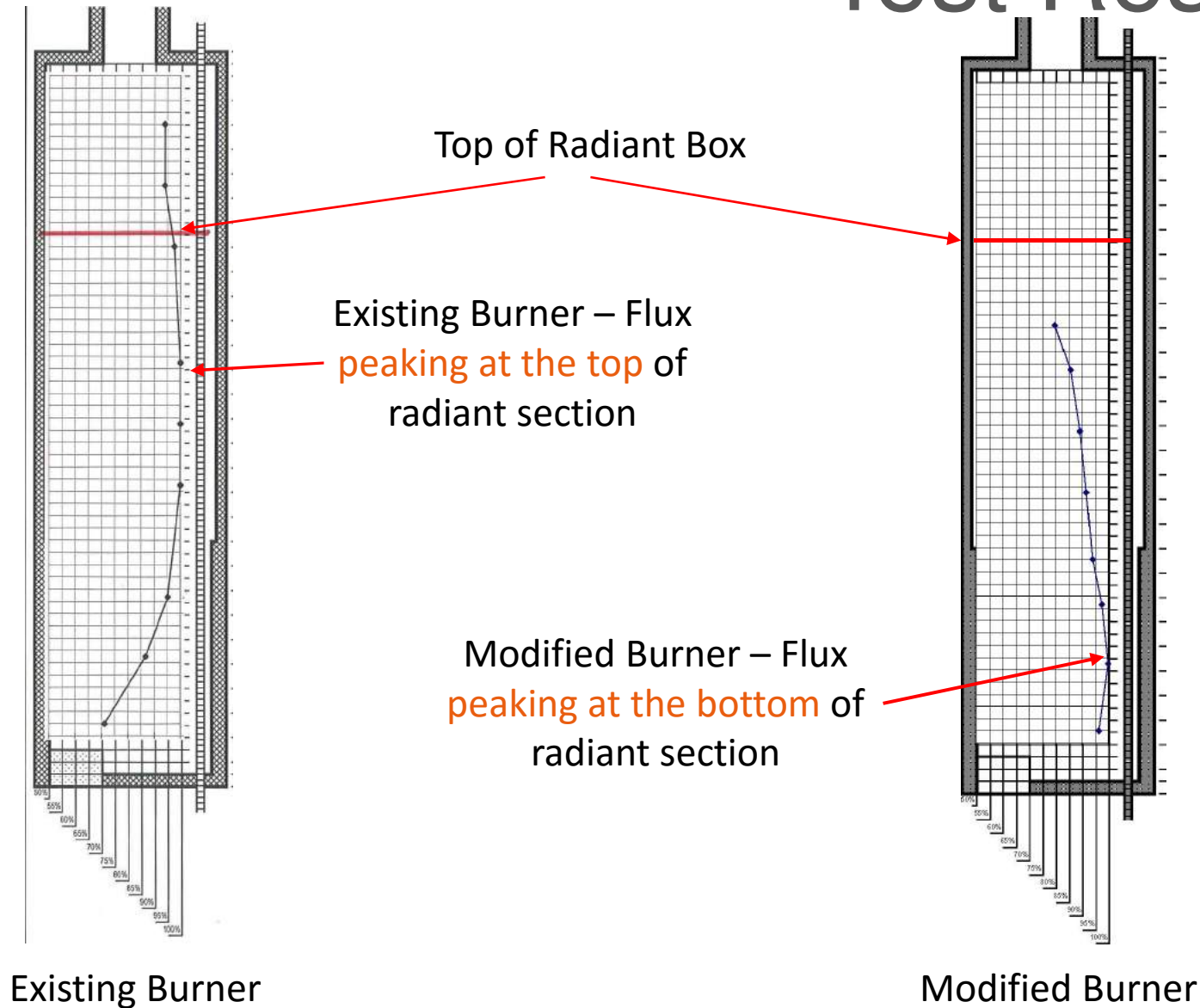


Test Furnace

Burner



Test Results



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 ΔT** after each spalling

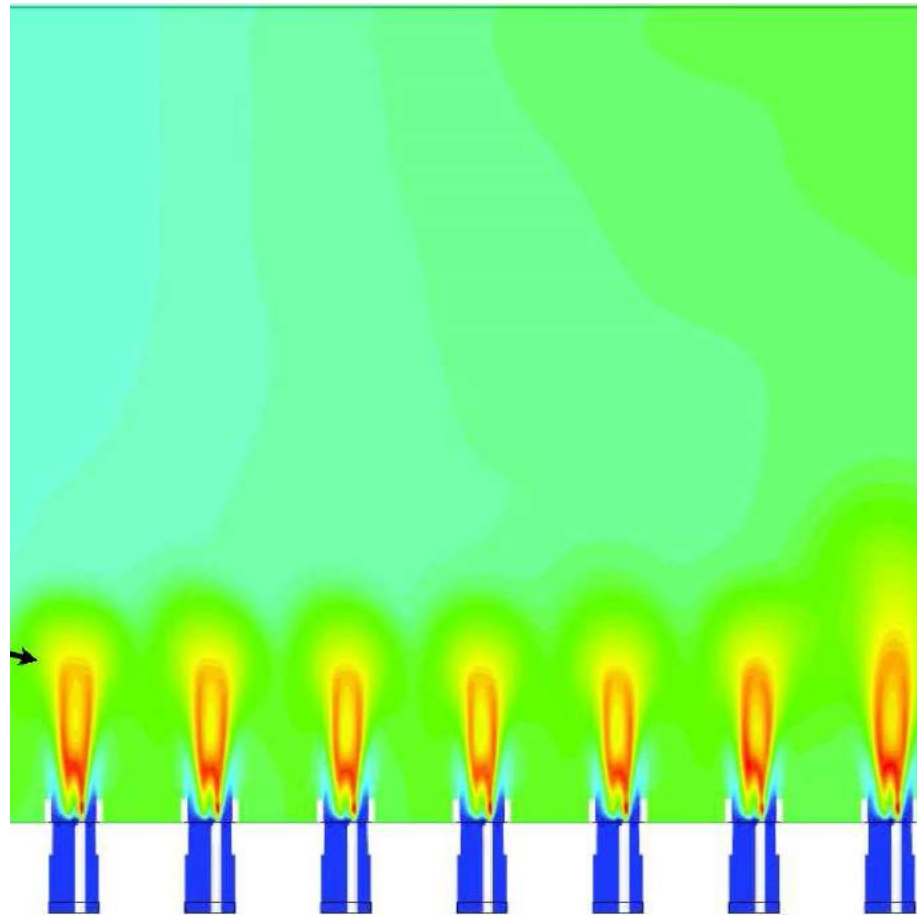


PCD/BHTS Flux Profile

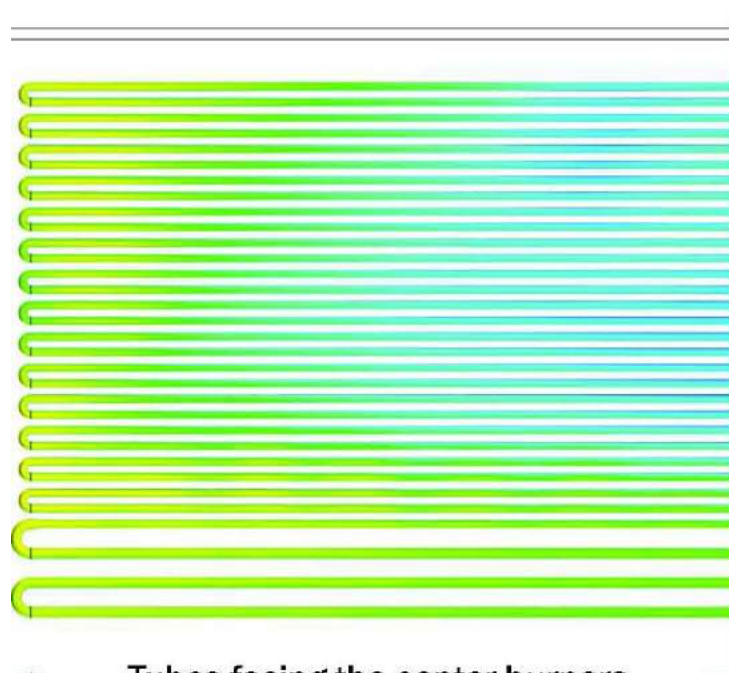
- PCD/BHTS specifies the **target** flux profile
- Burner **design** incorporates the flux profile
- This is checked using **CFD** modeling
- Followed by **Flux Profile** measurement during burner test



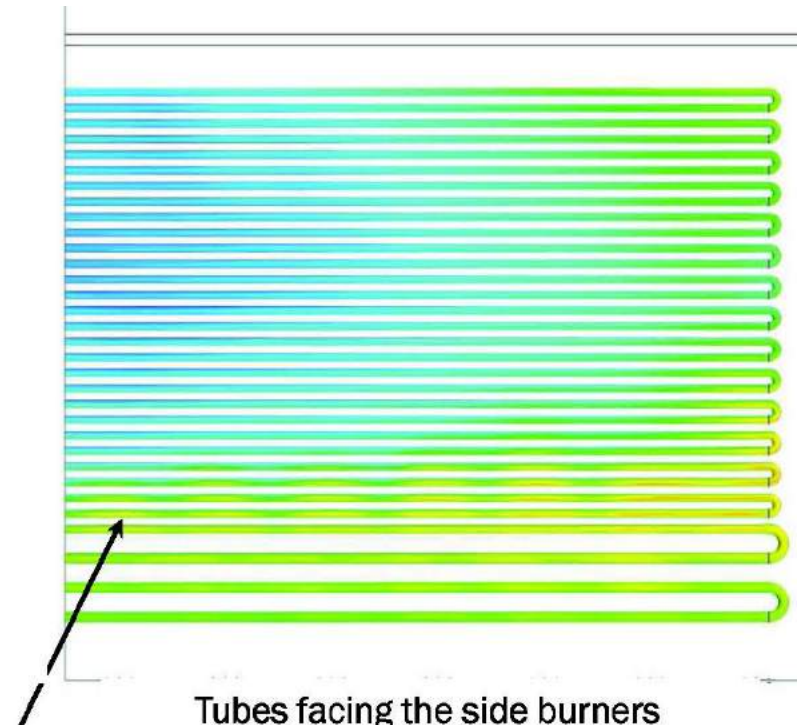
CFD Modeling



CFD Modeling



Tubes facing the center burners



Tubes facing the side burners

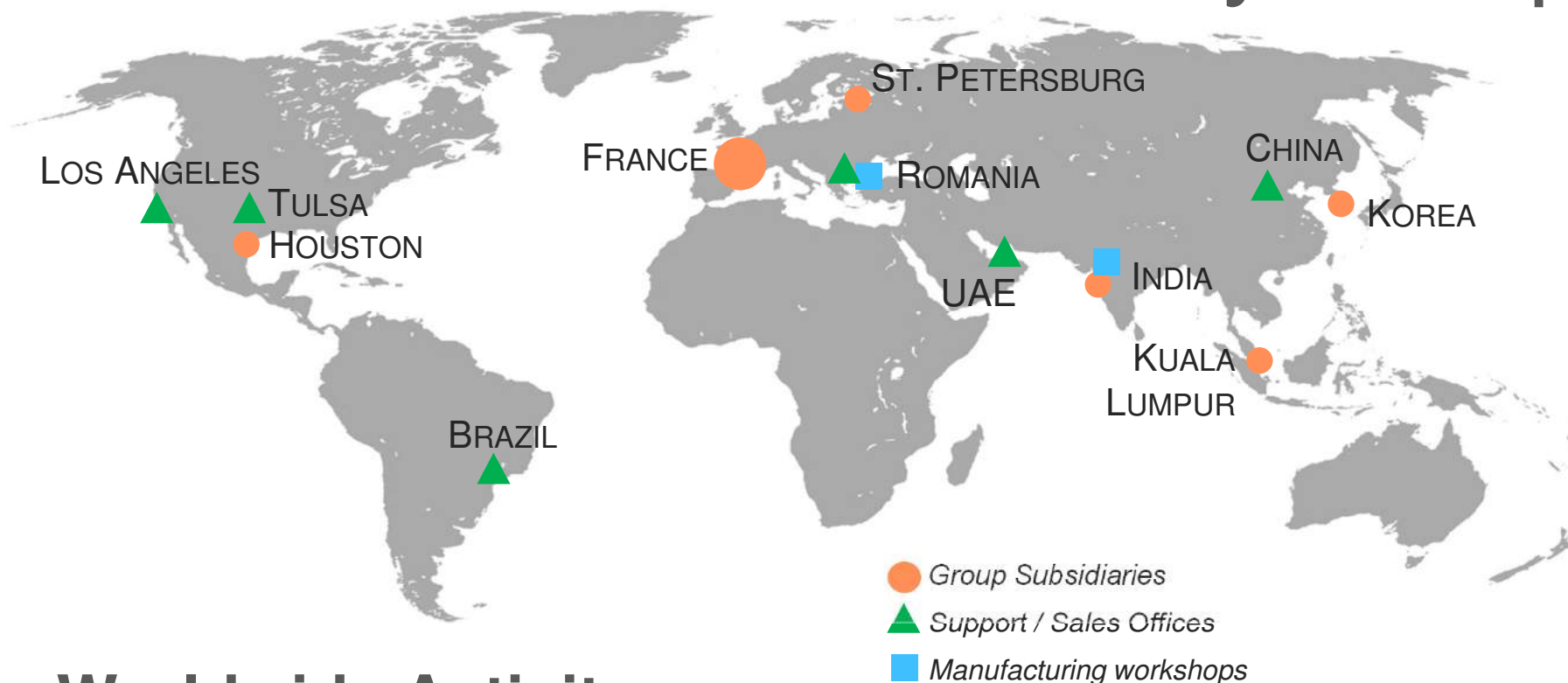


SUMMARY

Summary

- 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.



Questions ?

**THANK YOU FOR YOUR
ATTENTION**