

AXENS' IRAN SEMINAR
TEHRAN - 28 TIR 1396 (19 JULY 2017)

Heaters Optimization and Revamps



Thomas GRIMAUD,
Heurtey Petrochem

- HEURTEY PETROCHEM AT A GLANCE
- HEATER RELIABILITY IMPROVEMENT + CASE STUDY 1
- HEATER CAPACITY INCREASE + CASE STUDY 1
- HEATER EFFICIENCY INCREASE + CASE STUDY 1





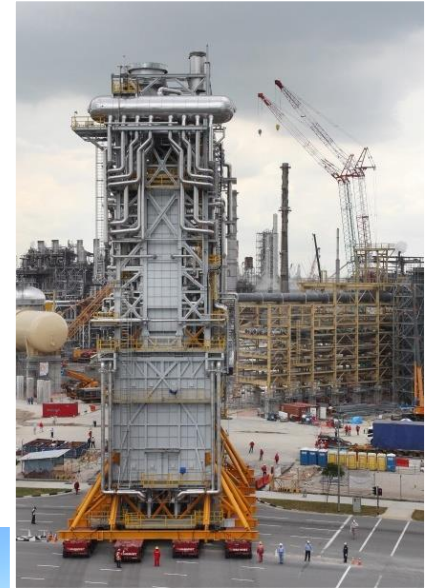
PART 1 HEURTEY AT A GLANCE

- ❖ **Leader** in Process Furnaces Design
- ❖ Owner of the international standard design software : **FRNC5** for heaters & **REFORM3** for SMR
- ❖ **Thousands of furnaces** in operation worldwide
- ❖ In-house **basic design, 3D modeling** and **manufacturing**
- ❖ **Technology neutral**
- ❖ Long-standing **partnerships with design licensors**

Refining

Petrochemical

Syngas



🌀 The ability to **control all phases** of the project execution process, from the feasibility study up to the delivery of turnkey equipment

EARLY PHASE

- Feasibility studies
- Mechanical studies
- Process studies

EXECUTION PHASE

- Detail engineering
- Prefabrication and modularization
- On-site installation
- Commissioning and start-up

AFTERSALES

- Revamping and modernization
- Spare parts sourcing
- Technical support and training





PART 2 HEATER RELIABILITY IMPROVEMENT

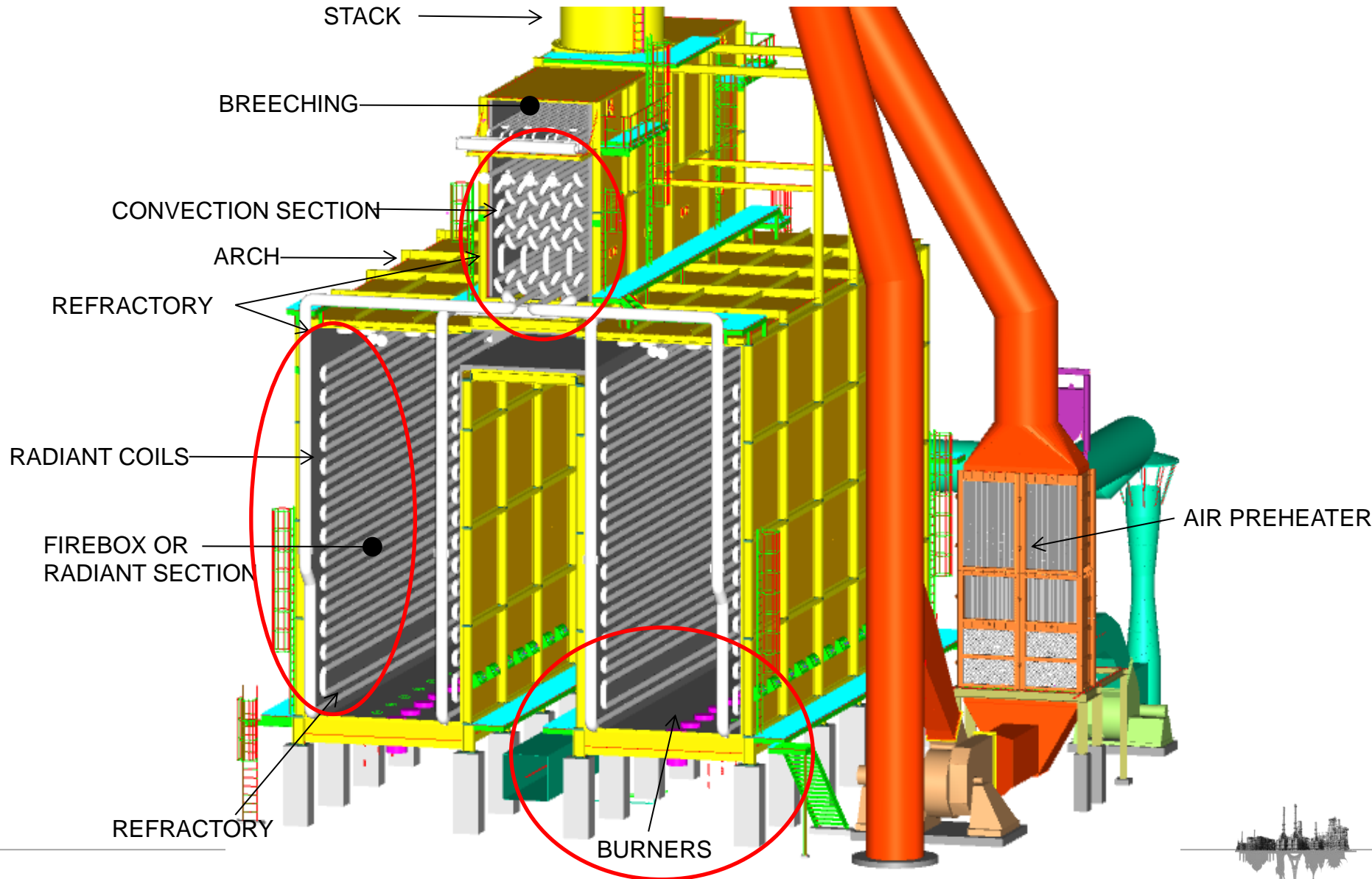
- 🔥 Level 1: Perform preventive maintenance:
 - ➔ Maintain the burners : air and fuel inlets are in proper state
 - ➔ Clean the exchange surface

- 🔥 Level 2: Ensure flame shapes and dimensions fit the heater geometry:
 - ➔ Flames shall be stiff and between half & two third of radiant length
 - ➔ Draft and excess air at their design values

- 🔥 Level 3: Reduce the heat flux by increasing the coil surface:
 - ➔ Add tubes in radiant section
 - ➔ Add tubes in convection section
 - ➔ Add extended surface (fins or studs) on the convection tubes

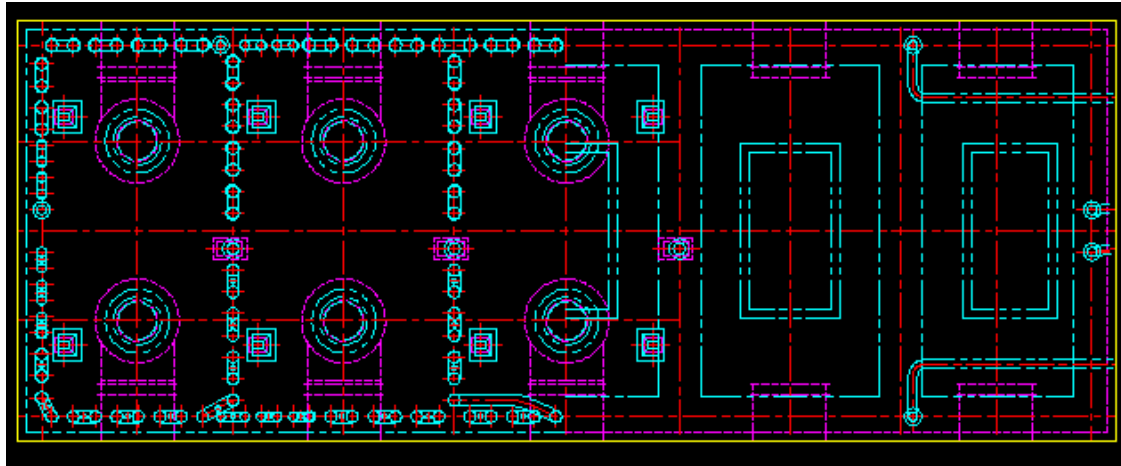


HEATERS DESCRIPTION



☯ CASE STUDY 1: CRUDE HEATER

- ☯ Description: Forced draft box heater with vertical tubes and high capacity burners
- ☯ Problem: High heat flux, flame impingement and therefore regular coking in radiant section

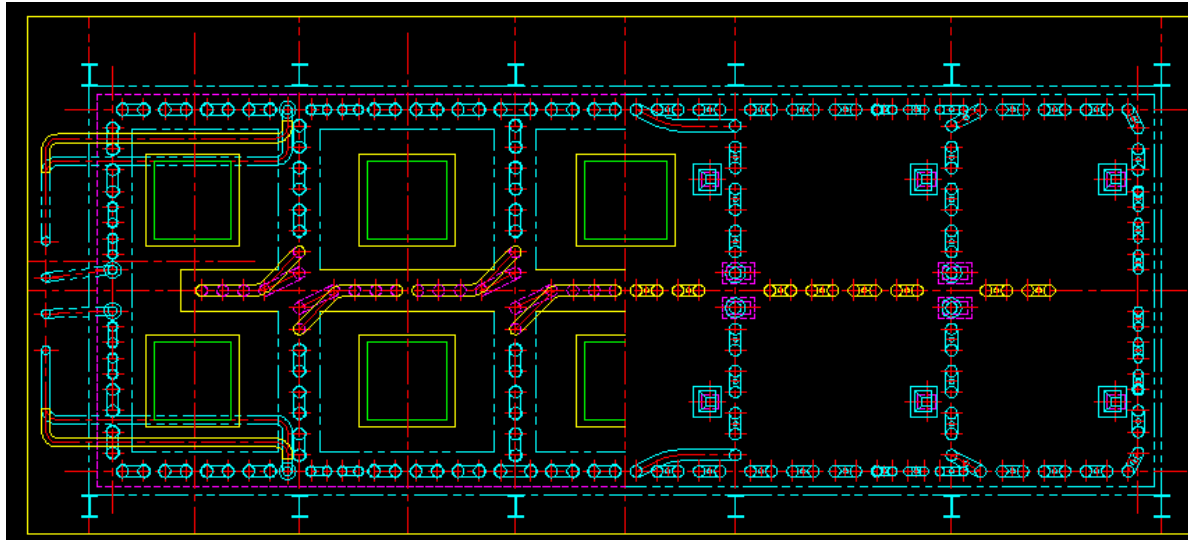


☯ Proposed modifications :

- Increase the coil surface to reduce the heat flux
- Replacement of burners with more smaller ones
- Modify the ducts for better flame shapes



- Retained scope of revamping :
 - ➔ Addition of tubes in the radiant section
 - ➔ Replacement of the existing convection with a new one having a new configuration
 - ➔ Modification of the flue gas ducts between the radiant & convection sections
 - ➔ Modification of the burners to have thinner flames



- Crude heater revamping was performed in 34 days turn-around and allowed :
 - ➔ Reduction of heat flux in radiant section by more than 12%
 - ➔ Flame impingement cancellation





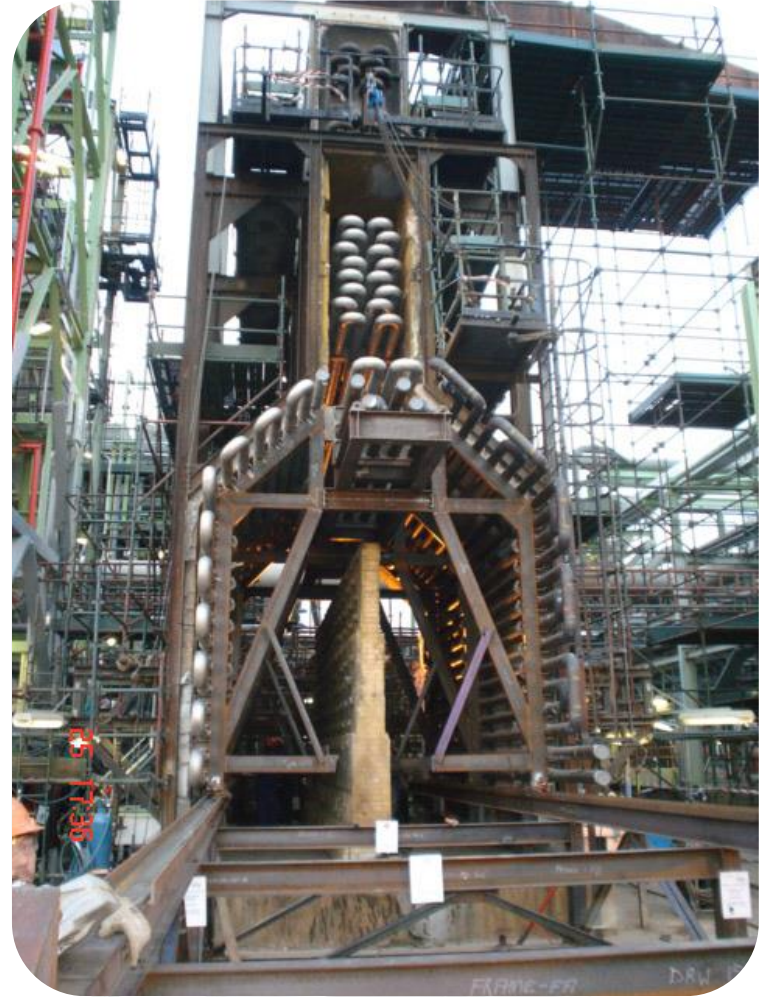
PART 3 HEATER CAPACITY INCREASE

Reasons:

- ➔ Feed modification
- ➔ Increase flowrate
- ➔ Lower inlet temperature
- ➔ Higher outlet temperature

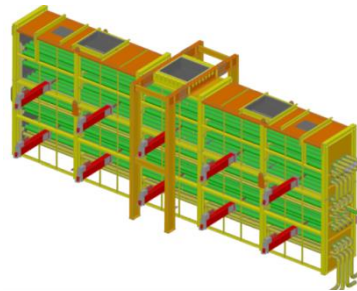
Different solutions can be applied:

- ➔ Increase heater coil surface in radiant section
- ➔ Modify or replace convection section
- ➔ Modify or replace the burners



CASE STUDY 2 : Crude heater revamping

- ➔ Natural draft box heater with horizontal tubes in radiant section
- ➔ Target : Heater capacity increase : +40%
- ➔ Proposed modifications :
 - Convection section replacement with new coil configuration.
 - Addition of retractable sootblowers : to keep convection coil clean while firing fuel oil.
 - Burner replacement: to increase heat release (new duty).
 - Stack replacement : to compensate higher flue gas pressure drop.

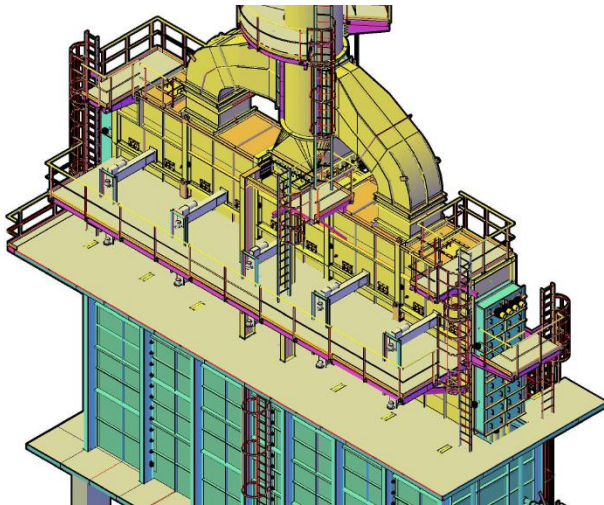


HEATER CAPACITY INCREASE

Revamping elements were designed and delivered in 9 months

→ Expected results :

- Heater capacity increase : +40%
- Heater efficiency increase : +10%.





PART 4 HEATER EFFICIENCY INCREASE

Reasons:

- ➔ Reduce the heat loss to atmosphere
- ➔ Reduce the fuel consumption
- ➔ Respect of environmental norms & laws

Different solutions can be applied:

- ➔ Level 1: Optimize and control heaters operation
- ➔ Level 2: Perform preventive maintenance
- ➔ Level 3: Modify convection section
- ➔ Level 4: Replace or Install an Air Pre Heating system



CASE STUDY 3: Crude heater revamping, Greece

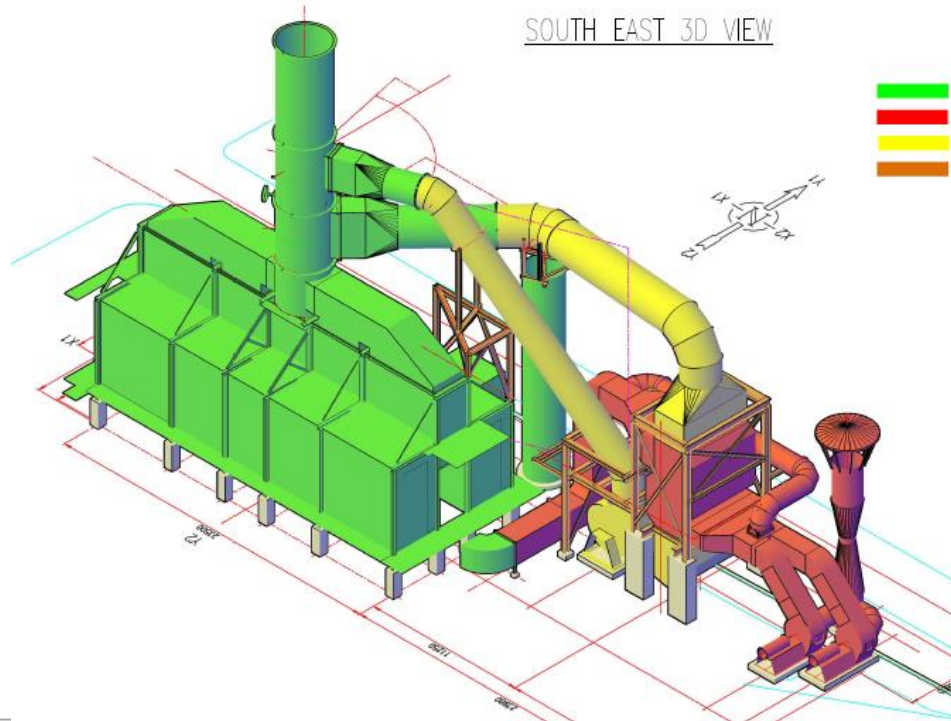
- ➔ Forced draft box heater with horizontal tubes in radiant section with an existing APH system
- ➔ Target :
 - Heater efficiency increase : above 90% (+10%)
 - Heater duty secured at its original design (reduced to 78%)



☞ CASE STUDY 3 : Crude heater revamping

➔ Proposed modifications:

- Replacement of existing corroded APH system with a more efficient one
- Glass tubes to allow a lower flue gas temperature

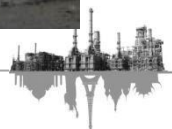


HEATER EFFICIENCY INCREASE

Revamping elements were installed during heater operation to keep the shutdown time within 30 days:

→ Results :

- Heater efficiency : 90.3%
- Heater capacity secured



Heater design
checking

Spare parts
supply

Refinery staff
training

HEURTEY PETROCHEM CAN HELP

Instrumentation
and control
optimization

Furnace
inspection and
field survey

Contact us

HEURTEY PETROCHEM

8 COURS LOUIS LUMIÈRE • 94306 VINCENNES CEDEX FRANCE
revamps@heurtey.com • www.heurtey.com • +33 (0) 1 41 93 80 00