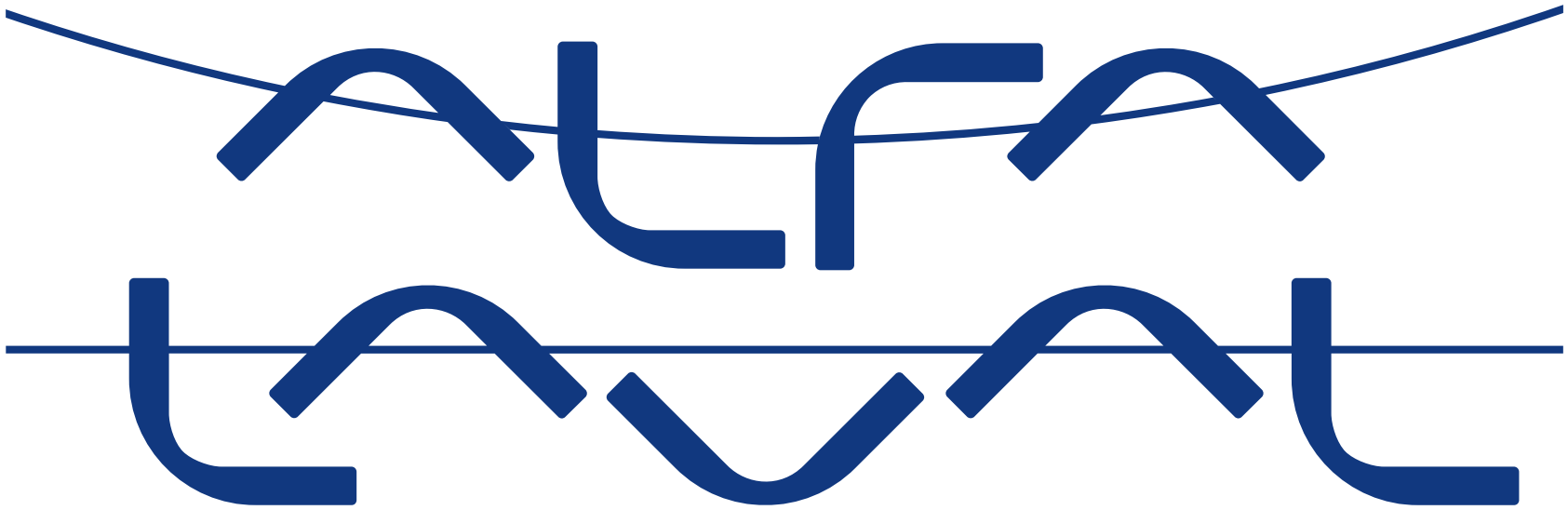
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Welcome to “Maximize Efficiency in your Refinery”!

We recommend you use the Microsoft Team app and high-speed internet to access this webinar

Maximize Efficiency in your Refinery

Focus Area: Crude Distillation Pre Heat Train Optimization and Naphtha Hydrotreater Feed-Effluent Exchanger

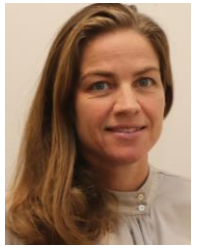
Eva Andersson
Speaker 1

Wivika Laike
Speaker 2

Erasmo Gallese
Host

Waiting slide

Eva Andersson
Speaker 1



Wivika Laike
Speaker 2

Erasmo Gallese
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Maximize Efficiency in your Refinery

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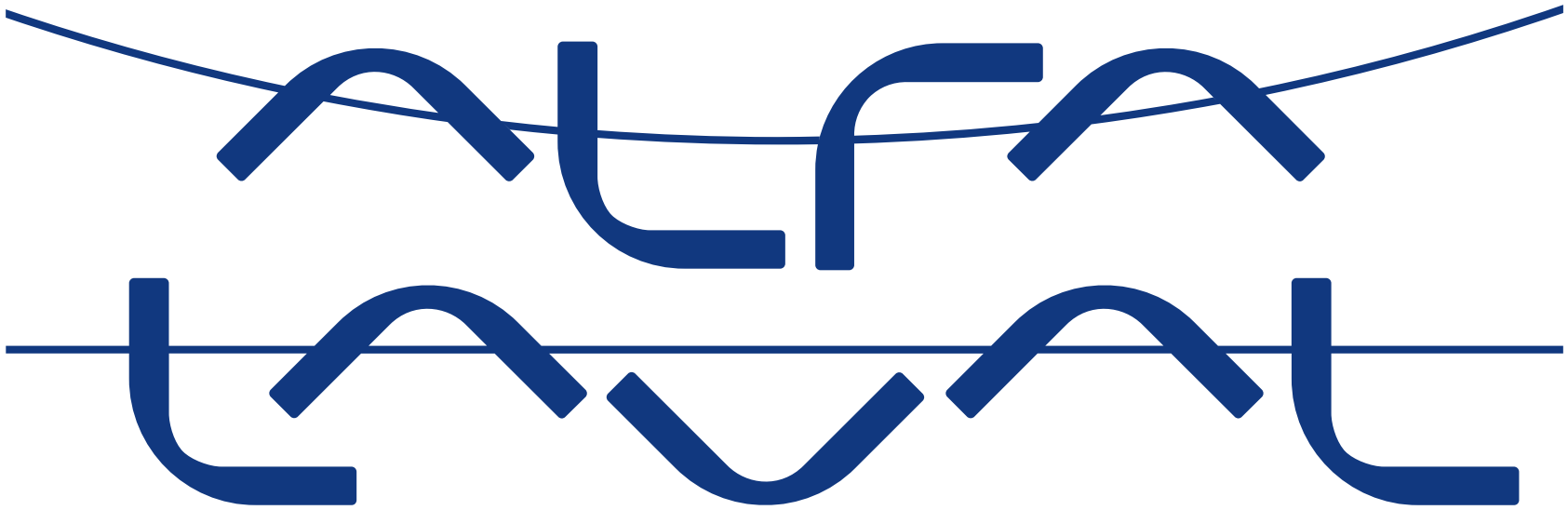
Thank you for attending!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Eva Andersson
Alfa Laval Refinery Industry Manager

Maximizing Crude Distillation Efficiency with Alfa Laval Solutions

Focus Area: Retrofit & Revamp of existing Crude Units

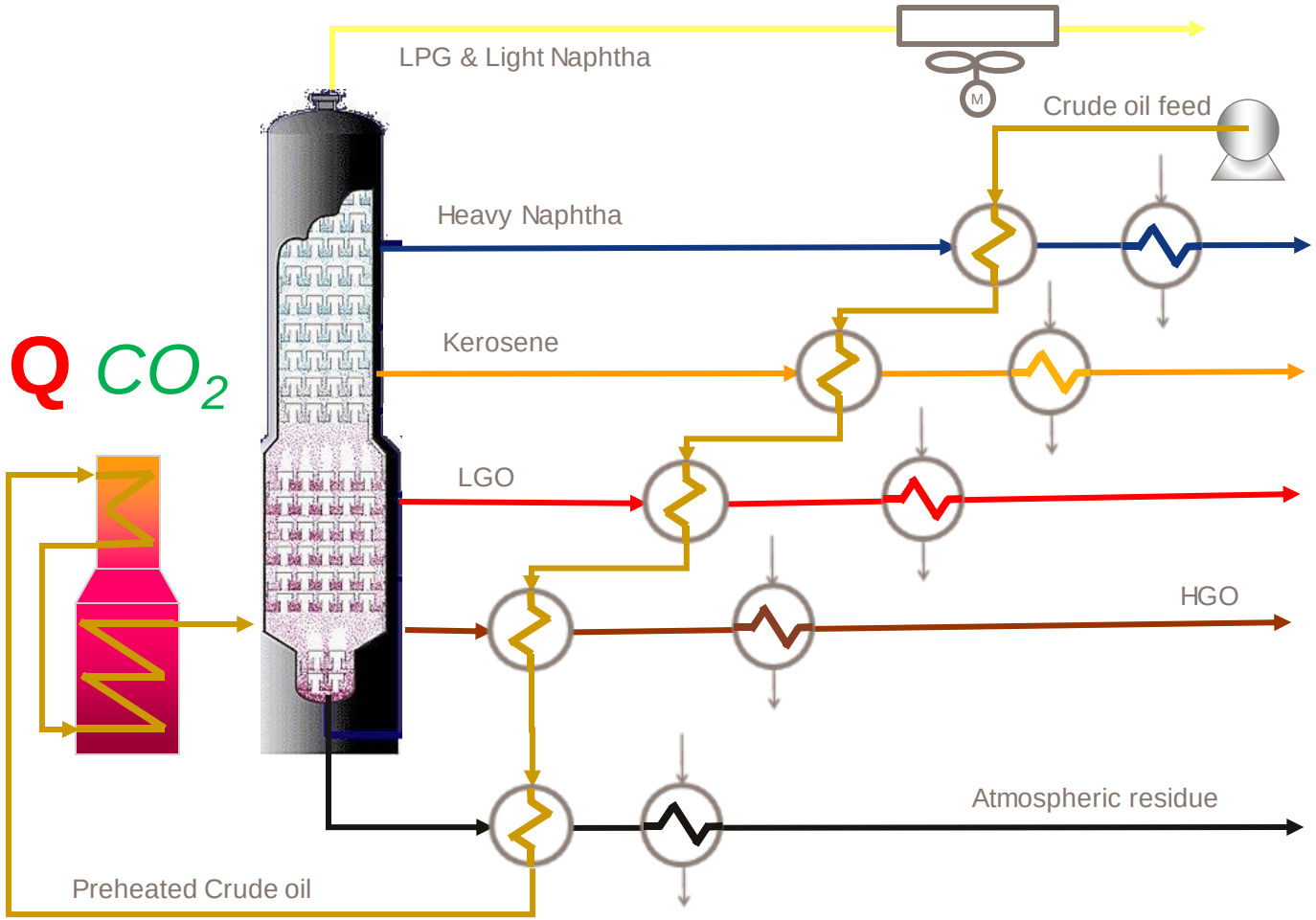
Outline of the Webinar

- Top Challenges of Crude Distillation
- The Problem Solver
- Improve the process efficiency:
  - Step 1, 2 and 3
  - Real Cases implemented in each Step above

Top Challenges of Crude Distillation

– And the impact of traditional heat exchanger solutions

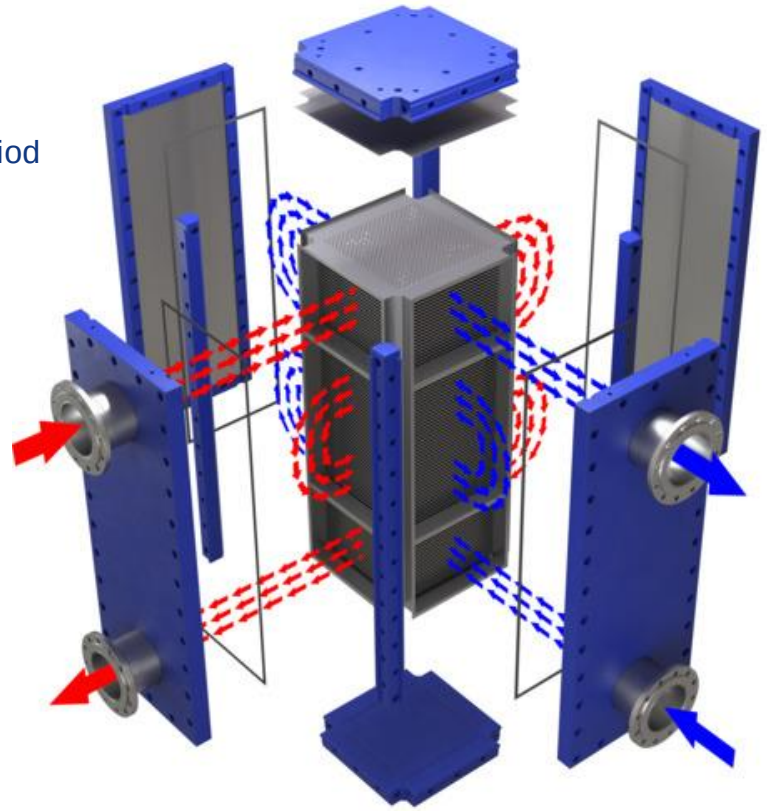
- Capacity / Throughput
- Product yield/quality
- Energy Efficiency
- Availability / Uptime / Reliability



The Problem Solver

– Compabloc welded plate heat exchanger

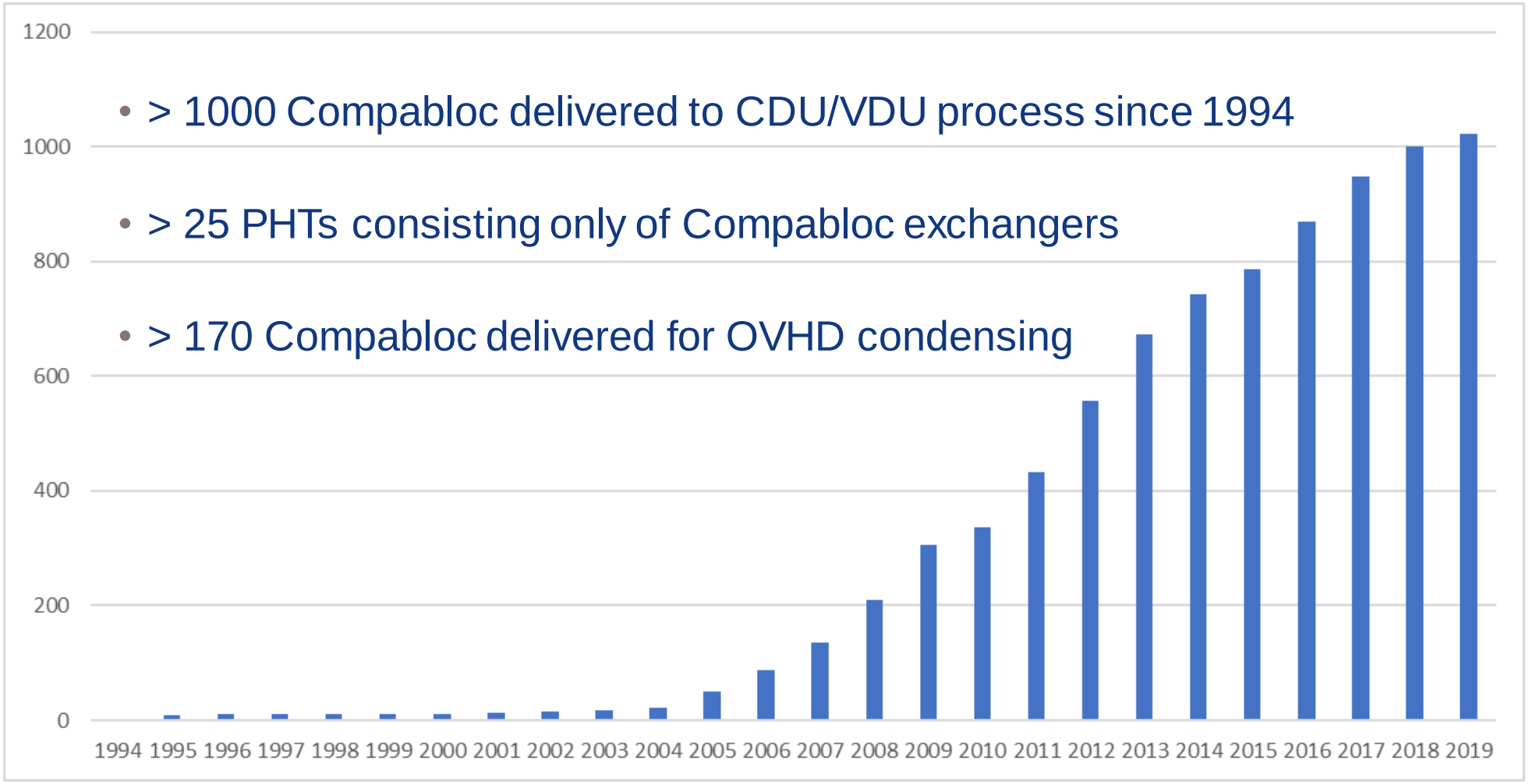
- Heat Transfer Efficiency
  - 3-5 times higher efficiency compactly assembled -> 4000 m2 S&T HTA* fits in 3 m2 plot space
  - Single exchanger replaces up to 8 S&Ts in series -> Reduced overall PHT pressure drop
- Fouling Tendency
  - Up to 10 times higher shear stress in heat transfer channels -> 3 times longer operating period in-between cleanings
- Energy Efficiency
  - Overall PHT pinch of 5 deg C -> >25% increased energy recovery
  - OVHD condensing pressure drop < 10 kPa
- Maintenance
  - Fewer heat exchangers to clean
  - Easy access to heat transfer area -> 1-3 days down-time needed for cleaning
- Repair/Replacement
  - Cost-efficient high-grade materials
  - Design pressure up to 60 barg @ 400 deg C



C-weld™
XCore™
SmartClean™
+Seal
ALOnsite™

Compabloc deliveries to CDU/VDU Distillation

– A technically proven solution



- > 1000 Compabloc delivered to CDU/VDU process since 1994
- > 25 PHTs consisting only of Compabloc exchangers
- > 170 Compabloc delivered for OVHD condensing

Step 1: Last position(s) in CDU PHT

– Case Study: North European Refinery, 220 kbbl/day CDU

COMPABLOC SOLUTION

✓ Minimized fouling tendency
- Improves energy efficiency
- De-bottlenecks pump & heater limitations
- Provides adequate cooling of pump-arounds fluids

✓ Increased energy recovery
- Further reduced fuel consumption/emissions, or
- Capacity increase without increasing green house gas emissions

PROJECT CHARACTERISTICS

- Low Complexity
- No Technical Risk / Improved Reliability
- Quick Implementation Time
- Low Project Cost
- Short Pay-back Time, normally less than 12-18 months

Case Study:

1 Compabloc replaced 4 S&Ts in hot end of PHT,
- increasing energy recovery with 7 MW,
- reducing fuel cost with 2,2 MEUR / year*
- reducing the CO_2 emissions with 14 600 tonnes / year*
- more cooling of PA -> increased product yield
- less fouling & increased reliability

In operation since beg of 2014, inspected & cleaned once

* Assuming fuel cost of 300 EUR / ton FOE, furnace efficiency of 65% and gas firing

Step 2: OVHD condensing

– Case Study: South European Refinery, 120 kbbl/day CDU

COMPABLOC SOLUTION

✓ Increased crude preheating
- Improved desalter efficiency, and/or
- Reduced fuel consumption/emissions

✓ Reduced pressure drop in OVHD system
- Further reduced fuel consumption/emissions, and
- Improved distillation efficiency

✓ Upgraded material in condenser
- Improved reliability

PROJECT CHARACTERISTICS

- Higher Complexity
- Implementation normally during T/A
- Increased project cost
- Project Pay-back Time, typically around 18-24 months

Case Study:

2+1 Compablocs replaced 4 S&Ts in OVHD/crude service,
- reducing exchanger pressure drop from 25 to 12 kPa,
- reducing pressure in flash zone with 0,3 bar
- reducing furnace duty with 4 MW*,
- reducing fuel cost with 1,2 MEUR / year*
- reducing the CO_2 emissions with 14 600 tonnes / year*
- increased reliability

In operation since beg of 2014, never cleaned

* Assuming COT reduction of 3 deg C / 0,1 bar reduction, fuel cost of 300 EUR / ton FOE, furnace efficiency of 65% and gas firing

Step 3: Major Revamp

– Case Study: East European Refinery, 85 kbbl/day CDU

COMPABLOC SOLUTION

✓ Maximized crude preheating
- Hot end of PHT + OVHD to crude + around the pinch point
- Minimized fuel consumption/emissions – at least 25% reduction

✓ Reduced pressure drop in overall PHT
- Possibility to increase throughput with existing pump

✓ Redesign of PHT for new crude slates/product split
- Maximize profitability from your refinery

PROJECT CHARACTERISTICS

- Complex
- Implementation normally during T/A
- Further increased project cost
- Project Pay-back Time, typically around 24 months

Case Study:

7 Compablocs added in hot end of PHT,
- increasing CIT from 200 to 260 deg C
- reducing furnace duty with 17,7 MW*,
- reducing fuel cost with 5,5 MEUR / year*
- reducing the CO_2 emissions with 48 300 tonnes / year*
- optimized for heavy & light crude blends

In operation since beg of 2014, cleaning done during T/A

* Assuming fuel cost of 300 EUR / ton FOE, furnace efficiency of 65% and gas firing

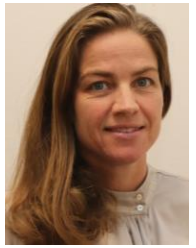
Top Challenges of Crude Distillation

– And your problem solver

- ✓ Capacity / Throughput
- ✓ Product yield/quality
- ✓ Energy Efficiency
- ✓ Availability / Uptime / Reliability

Let us discuss how we can help you maximize the efficiency of your Crude Distillation!

Maximize Efficiency in your Refinery
Naphtha Hydrotreater Feed-Effluent Exchanger

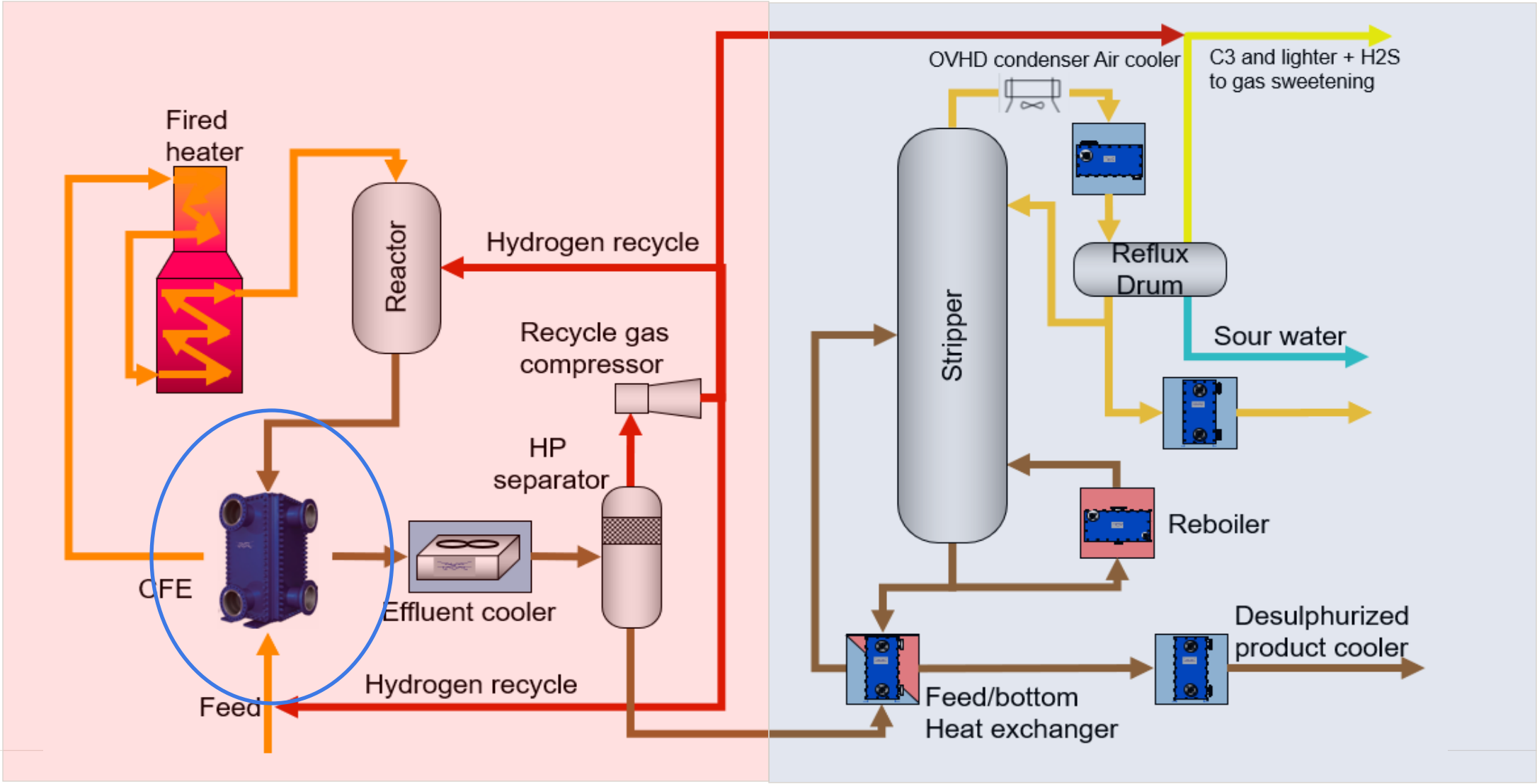


Wivika Laike

Outline of the presentation

- Overall Challenges of Naphtha Hydrotreater Preheating
- Hydrotreater Preheating Design Challenges
- Real Case stories from the field

Typical Hydrotreating Process



Europe Hydrotreating Capacity

– 13 MBD Production Capacity in Europe

90GW

9GW savings

2-9MW per unit

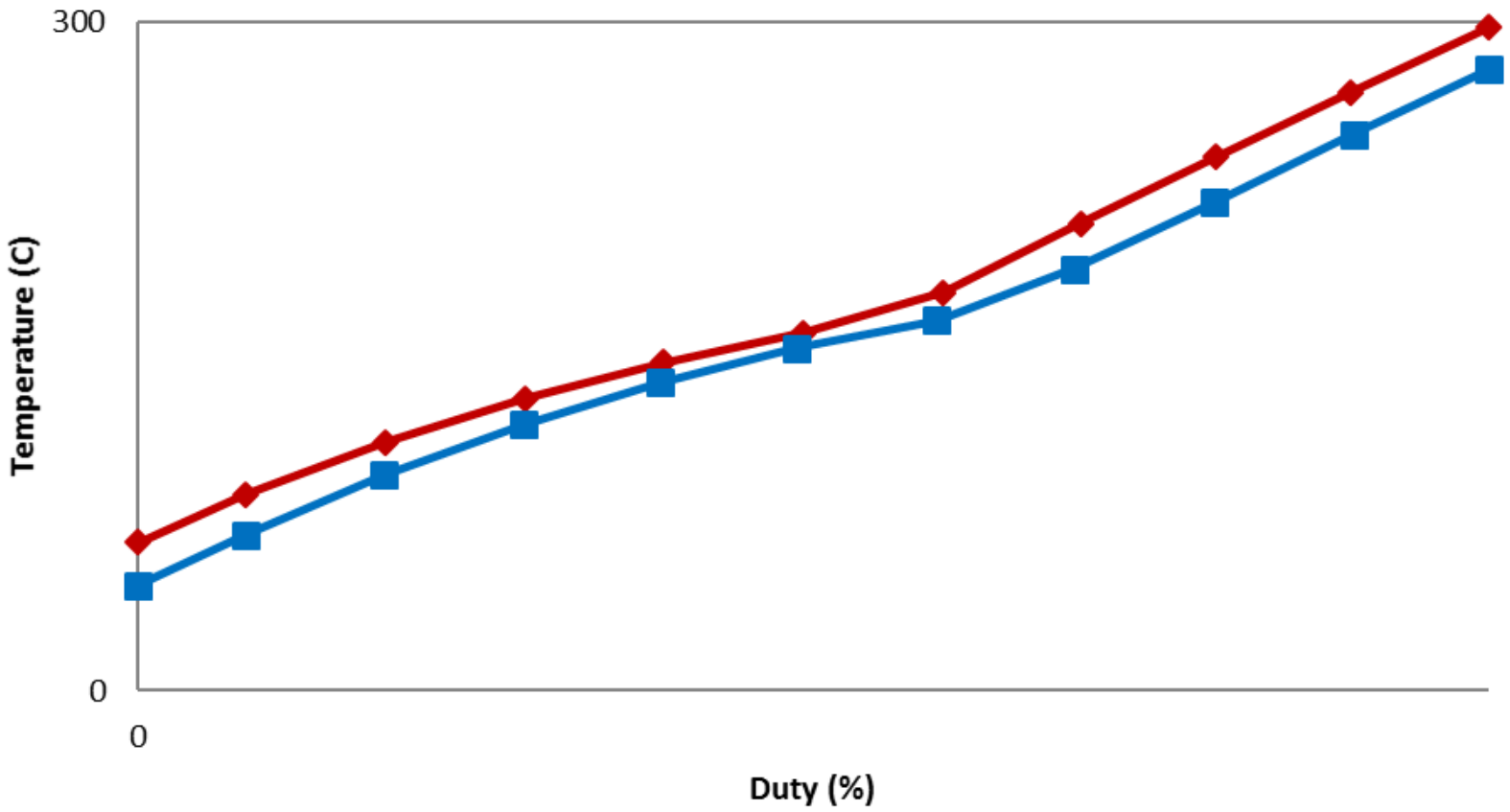
Overall Challenges for Hydrotreating Preheating

- Capacity limitations
- Reliability
- Project ROI
- Sustainability

Hydrotreating Preheating Design Challenges

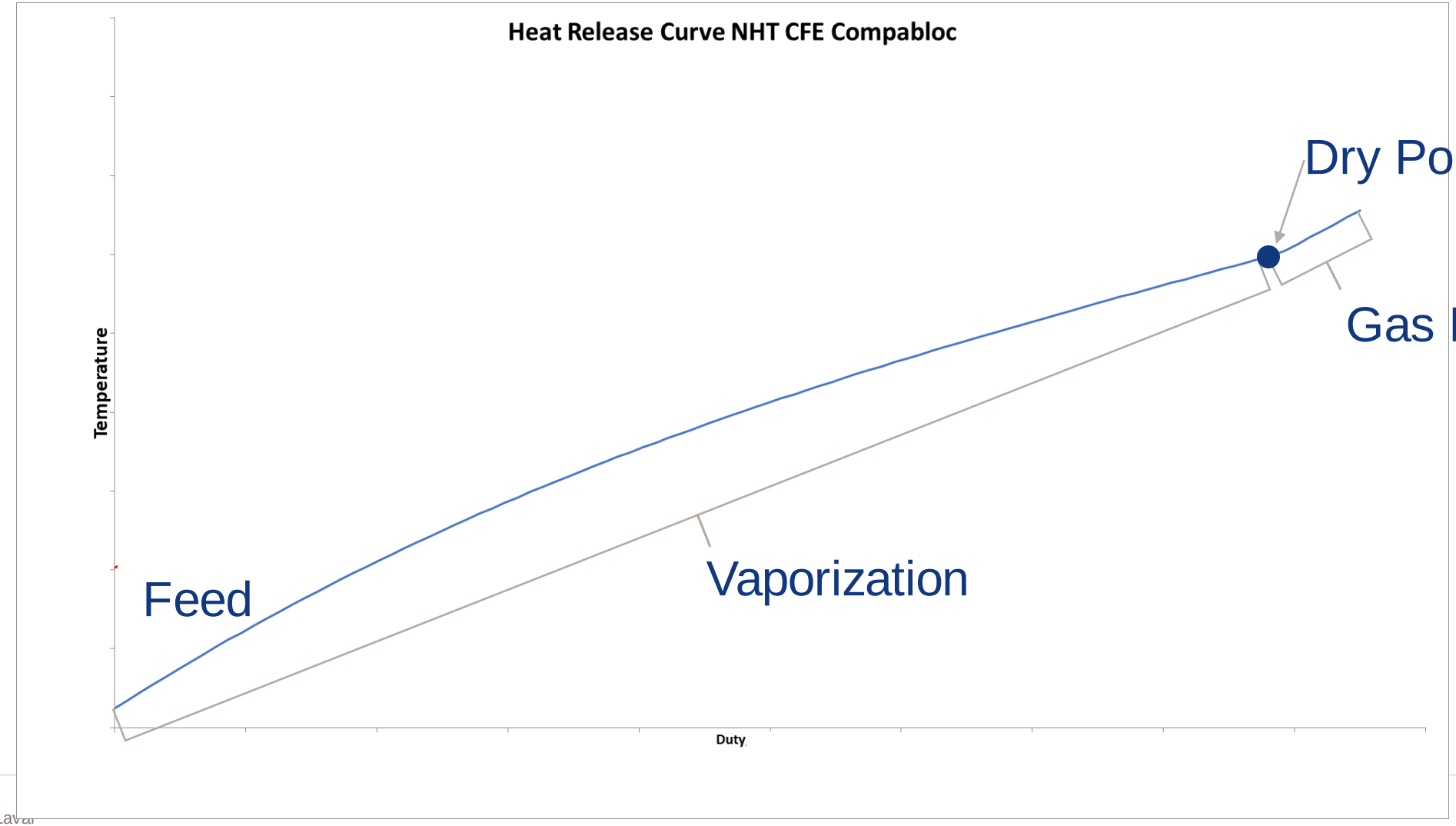
Thermal Design

– Heat Release Curve



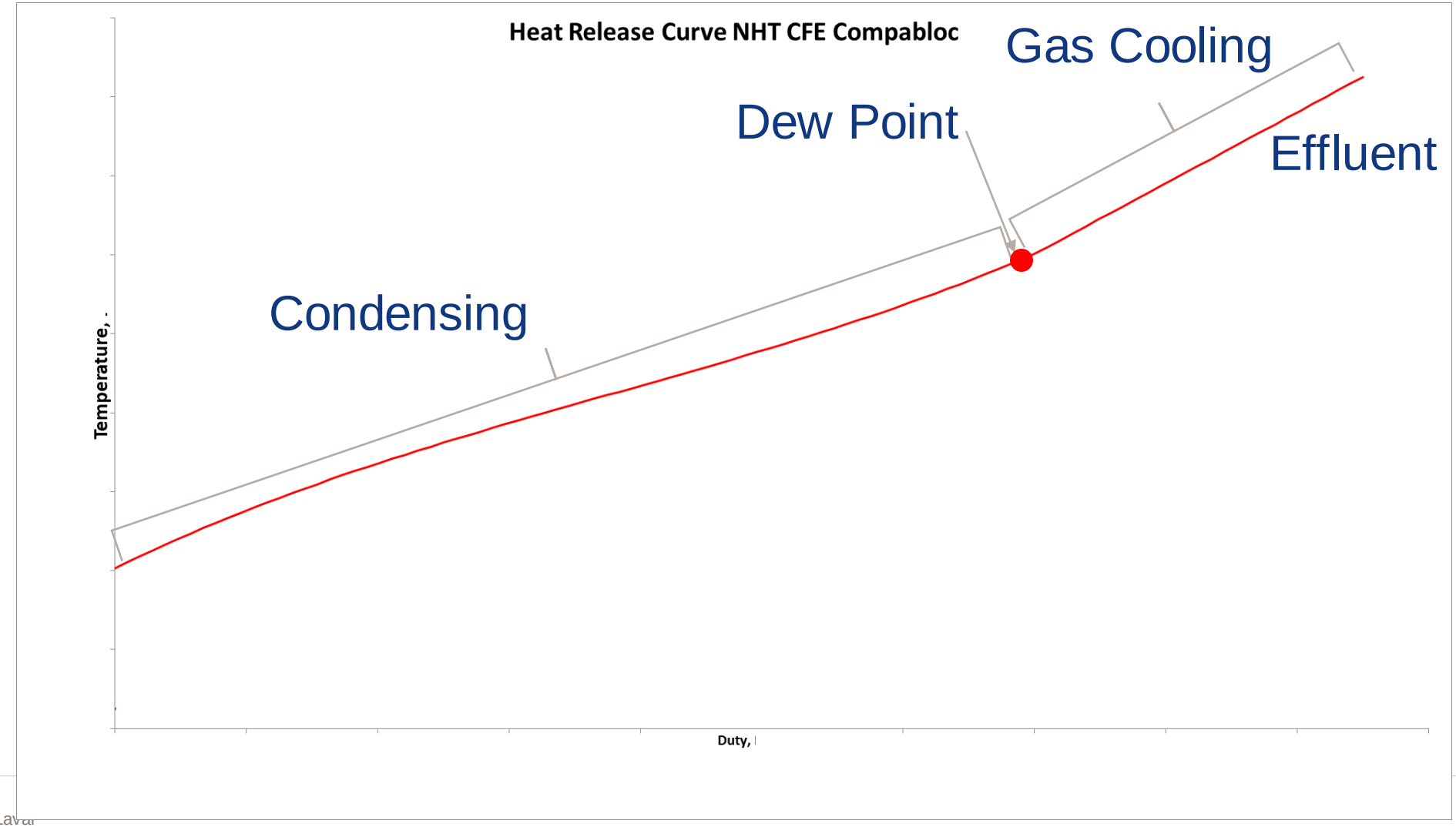
Thermal Design

– Heat Release Curve



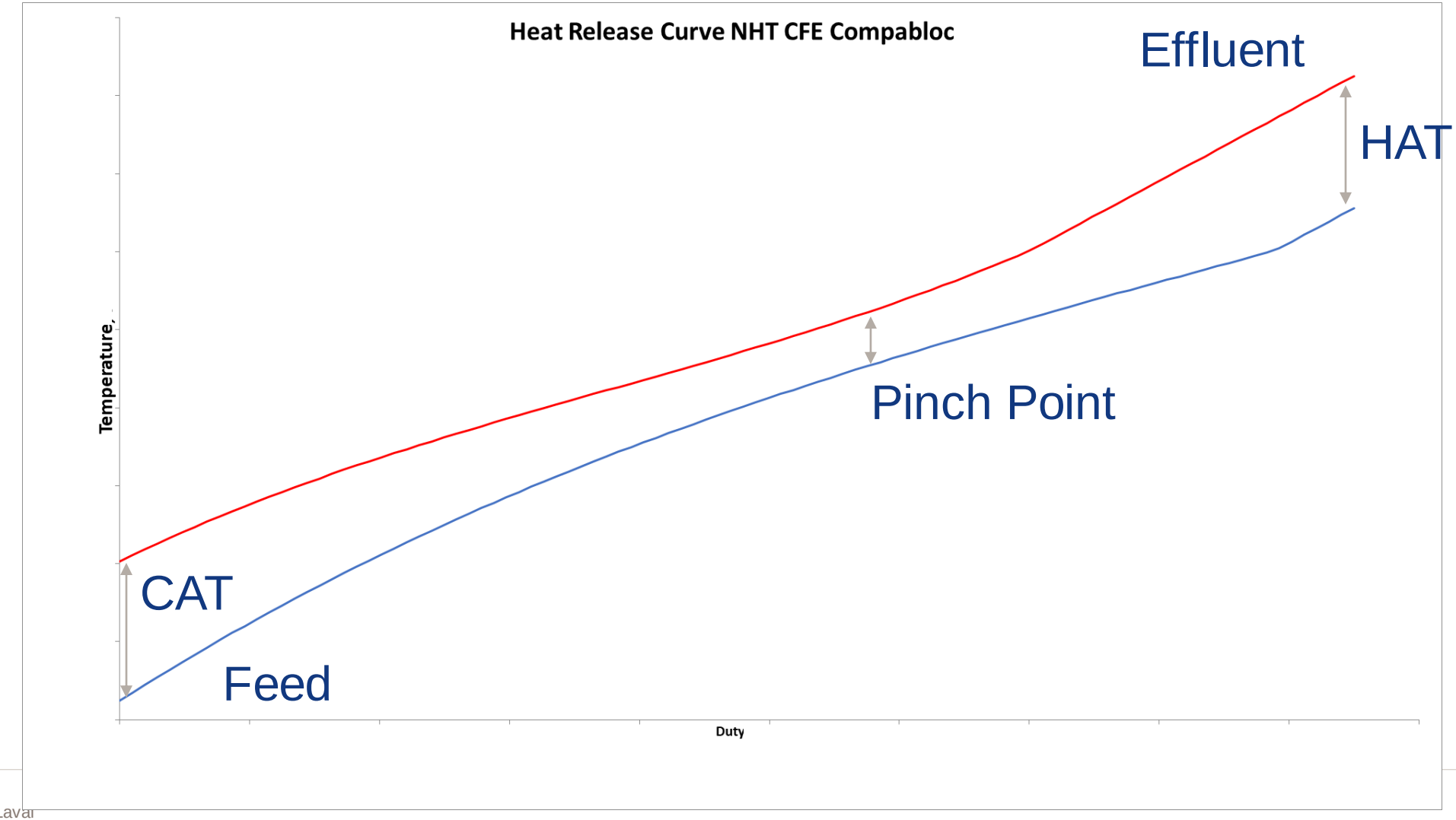
Thermal Design

– Heat Release Curve



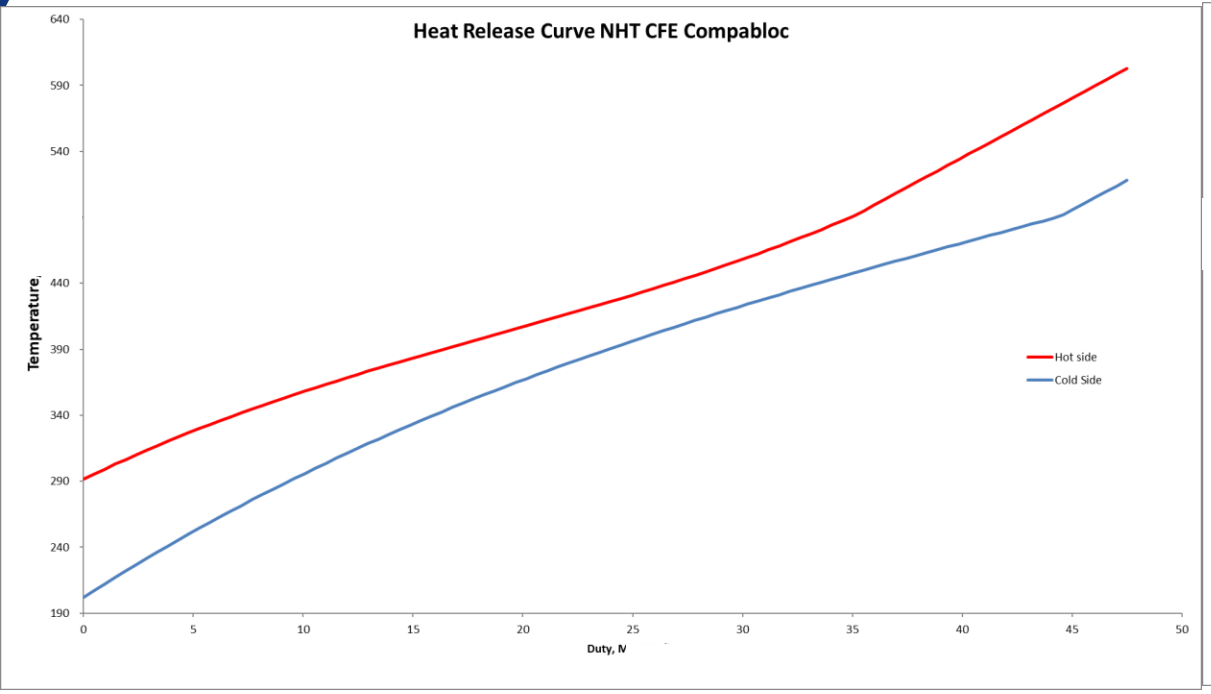
Thermal Design

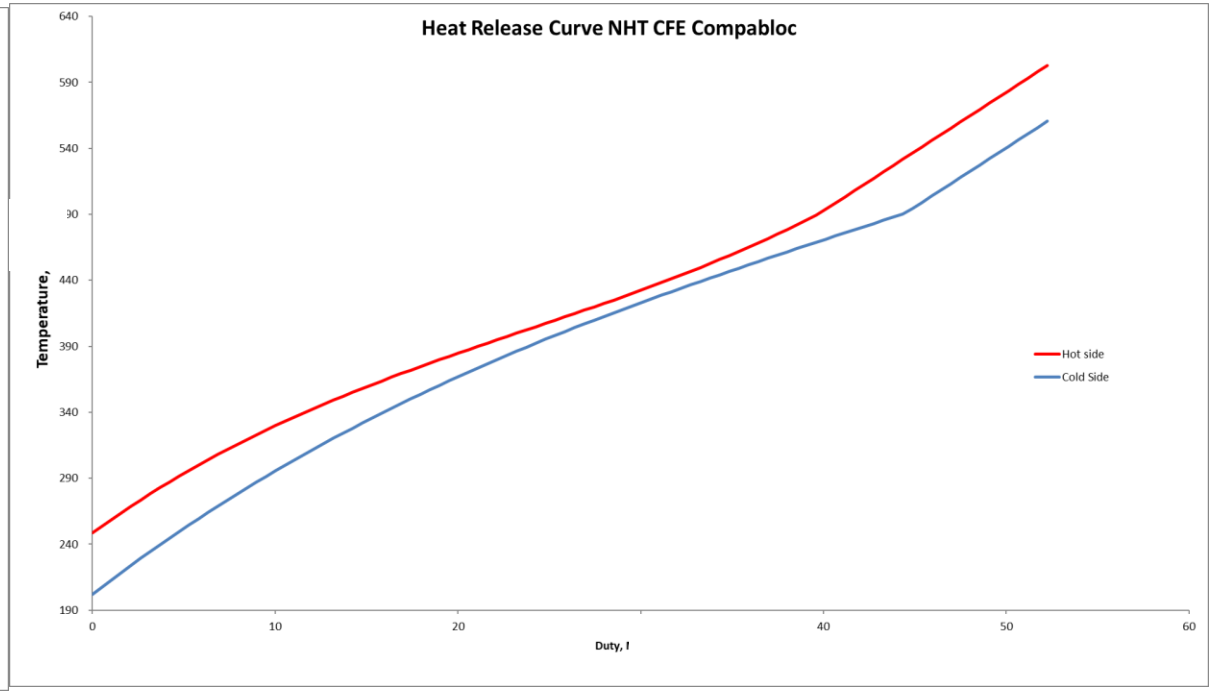
– Heat Release Curve



Thermal Design

– Pinch Point





	Duty (MW)	HAT (°C)	CAT (°C)	Pinch (°C)	Area
Curve 1	14	47	50	19	1X
Curve 2	15.4	23	26	7	> 2X

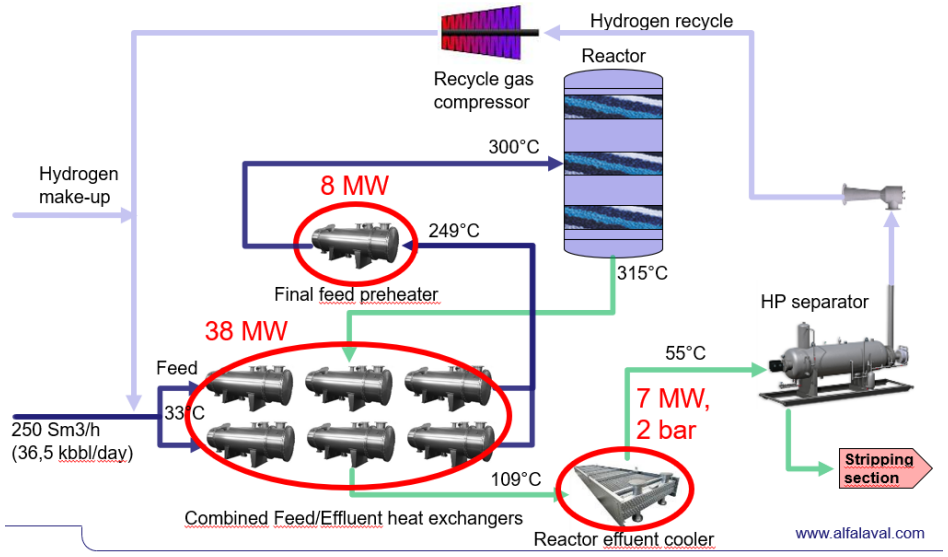
Case Stories

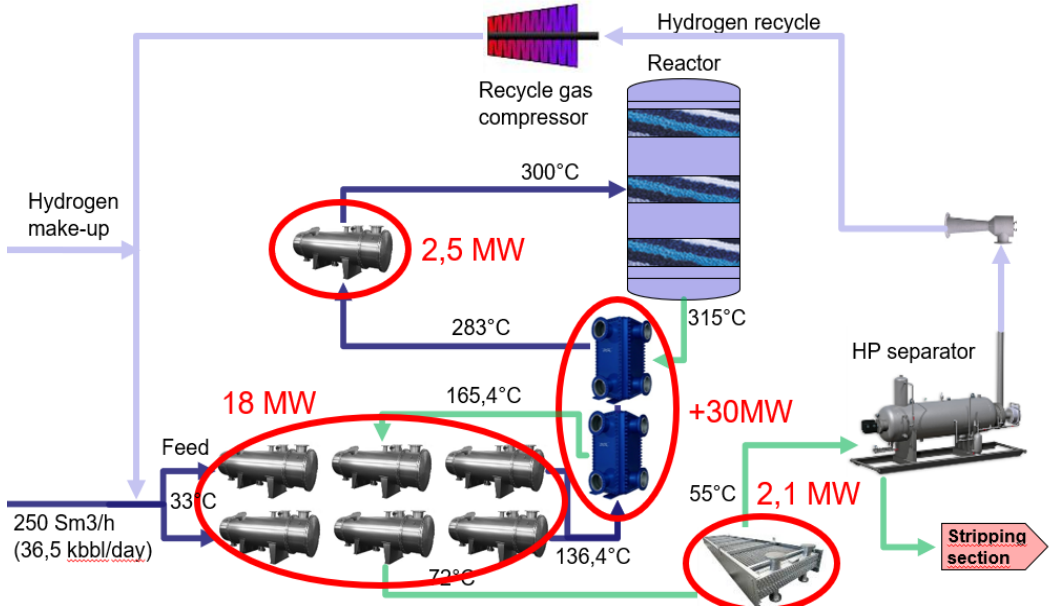
Case Story 1: Refinery in Europe

Debottleneck NHT & heat Integration improvement

CFE heat exchanger	Hot approach temperature	Internal pinch temperature
S&T (Cold End) + Compabloc (Hot End)	30˚C	11˚C

10MW savings & <12 months payback time!

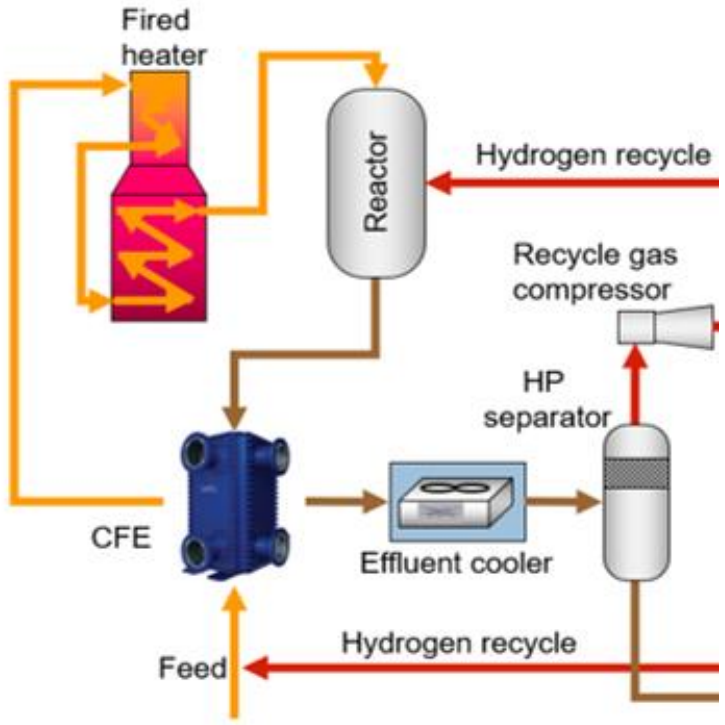




Case Story 2: Canadian Refinery

Debottleneck to Increase Throughput

Capacity increase in CRACKED Naphtha Hydrotreater → HDS Heater capacity limitation → Permitted Emission Cap reached → No Space to add exchangers. How to Debottleneck?



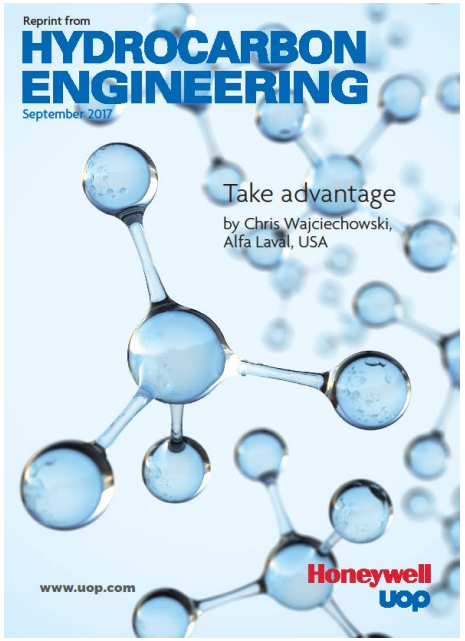
20% Capacity Increase & <12 months payback time!

Alfa Laval design support at an early stage → - Low pressure drop design - Metallurgy upgrade - Dry Point fouling risk - Future cap add. 20% - H2 service - Special CP design → Compabloc installed on hot end of S&T train

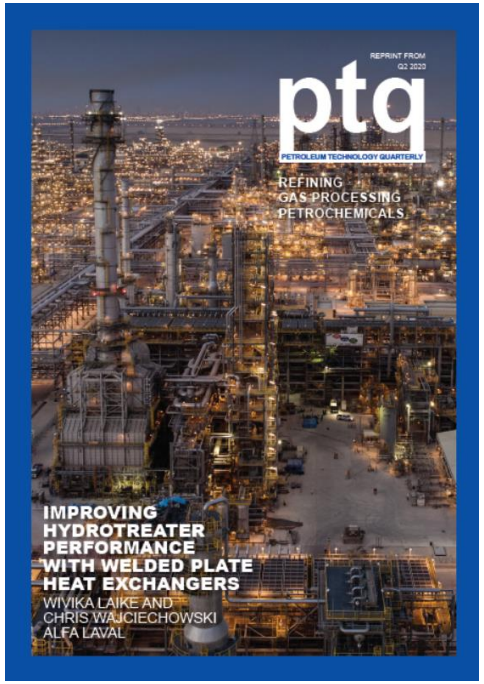
Project goals realized

Summary

- Several design challenges to Naphtha Hydrotreater preheating exists
- By using CP technology the heat recovery in the CFE can be increased by 10% or more
- This means reduced load on your reactor heater and effluent cooler, enabling large energy savings or opportunities to increase capacity!



Q3 2017 Publication



Q2 2020 Publication

Thank you for attending!

Eva Andersson
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