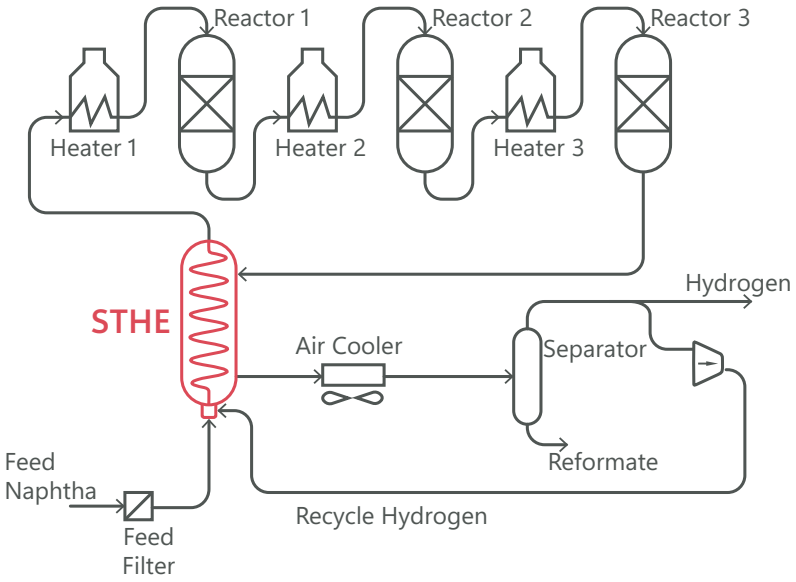
ZPJE

Creating Value for Our Customers

Zhenhai Petrochemical Jianan Engineering Co.,Ltd.
镇海石化建安工程股份有限公司

# STHE Technology in Catalytic Reforming

Catalytic reforming uses catalytic reactions to transform heavy low-octane naphthas into high-octane reformate, which is a major blending product for gasoline.The hydrotreated naphtha mixed with the recycled hydrogen is preheated into a feed-effluent heat exchanger and further heated into a fired heater before entering the first reactor. This mixed feed is treated into a serie of reactors before coming back on the effluent side of the heat exchanger to recover a part of its heat. The complete reaction being endothermic, the reforming loop requires a lot of heat input through the fired heaters, so the efficiency of the heat recovery in the feed-effluent heat exchanger is crucial to the whole unit efficiency. This is where ZPJE proposes large, robust and efficient feed-effluent spiral tube heat exchangers (STHE) to optimize the unit. Even for the largest unit capacities, only one exchanger is required.




# STHE Benefits

STHE technology brings many advantages in Catalytic Reforming :

## Efficiency :

On the tube side, the Helix-pattern flow in the tubes creates a secondary flow consisting of a pair of vortices enhancing the heat transfer coefficient at the peripheral of the tubes. On the shell side, the pulse-surge collision flow regime brings high turbulence increasing the coefficient outside the tubes.
This allows for an achievable **hot approach temperature** of less than **30°C**.

## Leakage :

**High quality tubes fabrication and proprietary designed internals**, severe welding procedures and state-of-the-art fabrication workshop make ZPJE exchangers strong, robust and **reliable**.

## Fouling :

On the shell side, the high turbulence created by the pulge-surge collision flow pattern and the absence of stagnant zone greatly reduces the possibility of fouling. On the tube side, the helix-pattern flow creates a secondary flow which increases the shear force. This effect, added to the very low surface roughness, gives an **anti-fouling** and **self cleaning** design.

## Robustness:

There are **no mechanical limitations** in temperature rise and fall, making STHE technology highly reliable under process condition fluctuation. It allows for very **low constraints** on start-up/shutdown procedures, and emergency situations.

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# Case Study

Example of a 20,000 bpsd CCR unit equipped with 2 texas tower exchangers :

| | ZPJE | S/T |
|---|---|---|
| Number of exchanger | 1 | 2 |
| Hot Approach Temperature | 30 °C | 60 °C |
| Energy Saved | 3.52 Gcal/h | |
| | | |
| Operation Savings | | |
| Fuel Savings (*) | 1,300 k€/year | |
| Emission savings (**) | 600 k€/year | |
| Total Savings | 1,900 k€/year | |

(*) Considering Fuel Gas @300€/ton. (**) Considering emission savings in Europe. May vary upon installation area.

# ZPJE Experience

STHE as Feed/Effluent in Reforming :

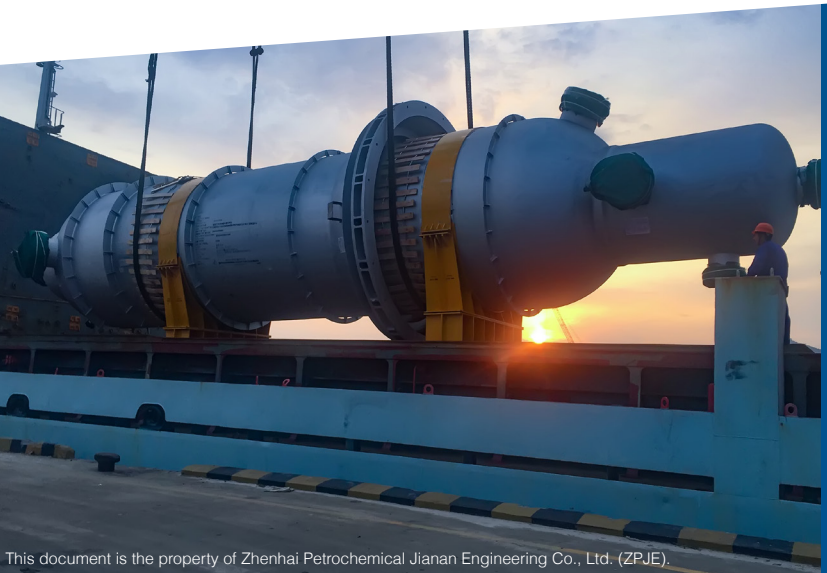
**105** references

**15** years in Operation in CCR unit

**88** in Operation

**>150,000** Days of cumulative operation

**>125** MMTA total installed Capacity





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