Taprogge

KLAREN TECHNOLOGY

Efficiency in Energy and Water

Self-cleaning Heat Exchanger Technology

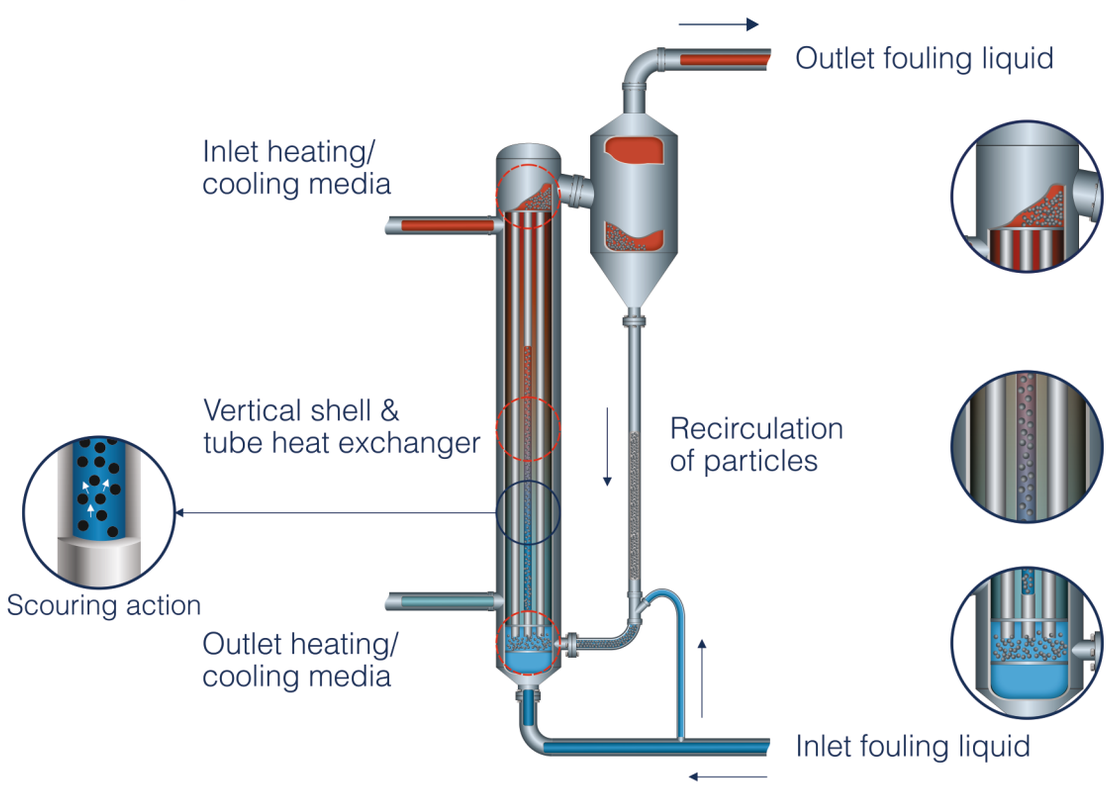
Say NO to fouling with the KLAREN self-cleaning heat exchanger technology

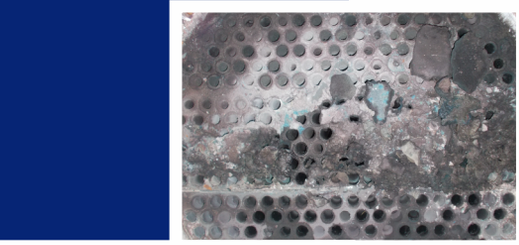
With the KLAREN Technology we provide self- cleaning heat exchanger solutions for operation up to zero-fouling. In the self-cleaning heat exchanger a fluidized bed of cleaning particles is used at the tube side where the fouling liquid flows through. The solid particles create a scouring effect on the tube wall surface which removes the developing fouling layer.

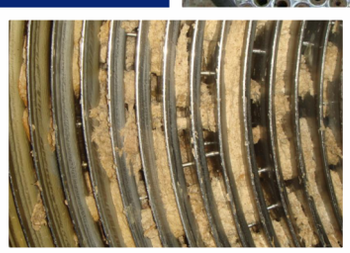
Fouling of heat exchangers can be solved when installing self-cleaning fluidized bed heat exchangers which design satisfy the condition:
Rate of removal of fouling deposits by the scouring action of the fluidized particles exceeds the rate of precipitation of fouling deposits.

The operating principle of the self-cleaning fluidized bed heat exchangers is based on the circulation of cleaning particles through the tubes of a vertical shell and tube heat exchanger. The particles are fluidized by the upward flow of liquid, where they create the mild scouring effect on the wall of the heat exchanger tubes, thereby removing any deposit at an early stage of fouling formation. After the tube bundle the particles disengage from the liquid in the separator and are returned to the inlet channel through an external downcomer, and the cycle is repeated. To control the amount of particles fed to the inlet, a part of the inlet flow to the heat exchanger is used to push the cleaning particles from the down comer into the inlet channel of the heat exchanger.

A clean tube wall if: Rate of removal > Rate of deposition







Fouling means:

- Loss of energy
- Production loss or reduced operation capacity
- Oversizing and / or redundancy of equipment
- Higher maintenance costs
- Hazardous waste streams from cleaning

The self-cleaning fluidized bed heat exchanger is a cost-effective alternative to conventional heat exchangers which suffer from severe fouling in a couple of months, weeks, days or even hours. With the self-cleaning heat exchanger any type of fouling deposits can be effectively handled, whether hard or soft, originating from biological, crystallization, chemical or particulate fouling mechanism, or a combination of these. A wide variety of fluids can be handled ranging from aqueous solutions, to oils and slurries.

Different types of particles are used

Chopped Metal Wire

Ceramic

Glass

Zero-fouling when Rate of removal of deposits > Rate of precipitation of deposits

Rate of removal
Influenced by:

- Type of particle (density and hardness)
- Size of the particle
- The volume fraction of the particles in the tubes (porosity of fluidized bed)

Rate of precipitation
Influenced by:

- The solubility characteristics of the precipitate
- Temperature difference between shell and tube
- Wall temperature inside the tube

KLAREN Technology can be applied in many types of industries and applications






- Heat exchangers for high density and viscous slurries in the mining industry
- Forced circulation reboilers in the chemical industry
- Evaporators for wastewater treatment like concentration of RO-reject water, produced water, vinasse, stillage or black-liquor
- Ice Slurry Generator for HVAC systems
- Heat exchangers for geothermal brines
- Heat exchangers susceptible to crystallization, polymerization or particulate fouling
- Direct seawater coolers for large industrial installations and offshore platforms
- Heat exchangers for white-water and black-liquor in the pulp industry
- Heat exchangers in thermal desalination of brackish water and seawater
- Preheaters for crude oil

Examples Industrial Applications

Revamp of forced circulation evaporator wastewater stream Dyes Producer - India

- 900 m3/h feed, Evaporator
- Concentration of wastewater from dyes process
- Length 6 m; 373 tubes
- Evaporation capacity total plant is kept at 100%

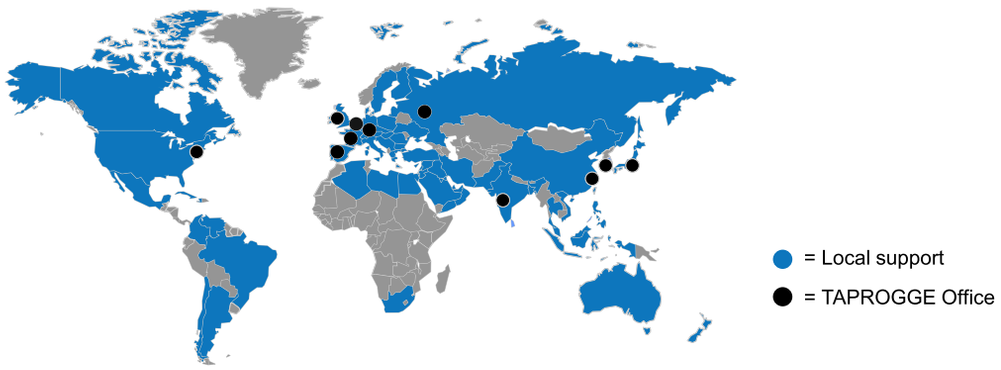
Cooling of quench water - USA

- 4 x 700 m3/h Quench Water Coolers
- Reduction heat transfer surface from 24000 m2 to 5000 m2
- Reduction of number of cleanings from 12 to 0 per year
- Reduction in required pumping power from 2000 kW to 850 kW

Production of a proprietary chemical - USA

- 160 m3/h process liquid heated with steam
- 73 m2 heat transfer surface
- Reduction of number of cleanings from 70 to 0 cleanings per year
- 25 years in operation / 160,000 operating hours

Worldwide Support Network



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