

Quench Water Cooler Performance Improvement



Industry: Chemical
Application: Quench Water Cooler
Location: USA
Year of installation: 1998

Fouling Issue/Frequency

In the conventional heat exchanger, fouling reduced the heat transfer (k-value) from 100 to 25% in 4 to 6 weeks.

Solution/Approach

A test with the self-cleaning heat exchanger technology was done to prove the performance. After this test, 4 self-cleaning heat exchangers, applying recirculation of cleaning particles with fluid velocity of 0.45 m/s and a heat transfer surface of 1,250 m² each, were installed. A large storage vessel maintains a constant liquid flow into the self-cleaning heat exchangers. After 3 years of operation, the plant went bankrupt and stopped the production of acetylene.



Results

- No cleanings per year required compared to the 12 cleanings per year with the conventional heat exchangers.
- Heat transfer increased due to the cleaning particles from 1600 W/m²K to 3000 W/m²K with a 10% volume fraction of the particles in the tubes
- Heat exchange surface reduced from 24,000 m² with conventional heat exchangers to 5,000m² with the self-cleaning configuration.
- Pumping power reduced from 2100kW to 850kW due to lower liquid velocity

Heat exchanger specifications




| | |
|-----------------|------------------------|
| Number of tubes | 703 per heat exchanger |
| ID Tubes | 28.5 mm |
| Length Tubes | 16 mm |
| Particle Type | Stainless Steel |
| Particle Size | 1.6 mm |

| Process Conditions | Tubes Side | | Shell Side | |
|--------------------------|------------|------------------------------|------------|---------------|
| | Medium | Quench Water Acetylene Plant | | Cooling Water |
| Pressure | 6 barg | | 6 barg | |
| Temperature (°C) | In | Out | In | Out |
| | 80 | 37 | 32 | 46 |
| Flow (m ³ /h) | 4x700 | | 4x2100 | |



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