Howden Heaters Contact Seals

Rotary heat exchanger leakage reduction







Figure 1: Contact test rig



Figure 2: Steam sootblowing test rig



Figure 3: Seal sample batch

Howden has carried out extensive development aimed at increasing the sealing performance of rotary heat exchangers. The result is a solution that minimises the direct leakage gaps between the hot end of the rotor and the sectorplates, which separate the air and gas flows.

The constant flexing of most contact seals as they contact the sectorplates, coupled with steam sootblowing forces and pressure differentials between the air and gas, quickly fatigues the thin flexible seals.

Leakage rapidly increases and they have to be replaced with standard seals.

Howden sought to address this issue through the design of a seal that would offer longer term performance to minimise ongoing costs and downtime due to seal repalcement.

An extensive development programme was initiated to optimise contact seals for suitable applications A test rig was designed and built to assess the accelerated contact fatigue life of flexible seals when repeatedly contacting the sectorplates, see Figure 1.

Various materials, thickness, seal extension and the amount of overlap were all tested with remote monitoring and data logging of results.

A sootblowing test rig was also designed and located within a power station. This enabled the assessment of the various seal's resistance to supersonic steam jets, see Figures 2 & 3.



Figure 4: FEA contact stress



Figure 5: Pressure differential stress results

From theory to operational success

Finite Element Analysis and classic theoretical calculations were also carried out to assess the seal resistance capabilities to repeated contact with sectorplates (Figure 4) and cyclic loading from air/gas or gas/gas pressure differentials (Figure 5).

The conclusion of all of this theoretical work along with the practical test rig testing and prototype testing within operating heaters; was that contact seals are ideally suitable for closing small even gaps.

This is the type of leakage gap that exists when Howden's actuated parabolic sectorplates are installed. The enhanced combination provides a radical reduction in the hot end radial leakage.

Benefits would be typically around a 20% overall leakage reduction relative to standard actuated sectorplates without contact seals.

Following the prototype installations, the contact seals have since been installed in almost 40 rotary heaters with operators taking advantage of lower leakage and greater duration of performance.

Key applications

In large rotary heaters, when combined with hot end parabolic sectorplates, which provide small even gaps, Howden contact seals are effective in reducing the direct leakage.

In package heaters, where rotor turndown is minimal and leakage gaps are small and even, Howden contact seals are also effective in reducing the direct leakage.



Major leakage reductions particularly when combined with parabolic sectorplates



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