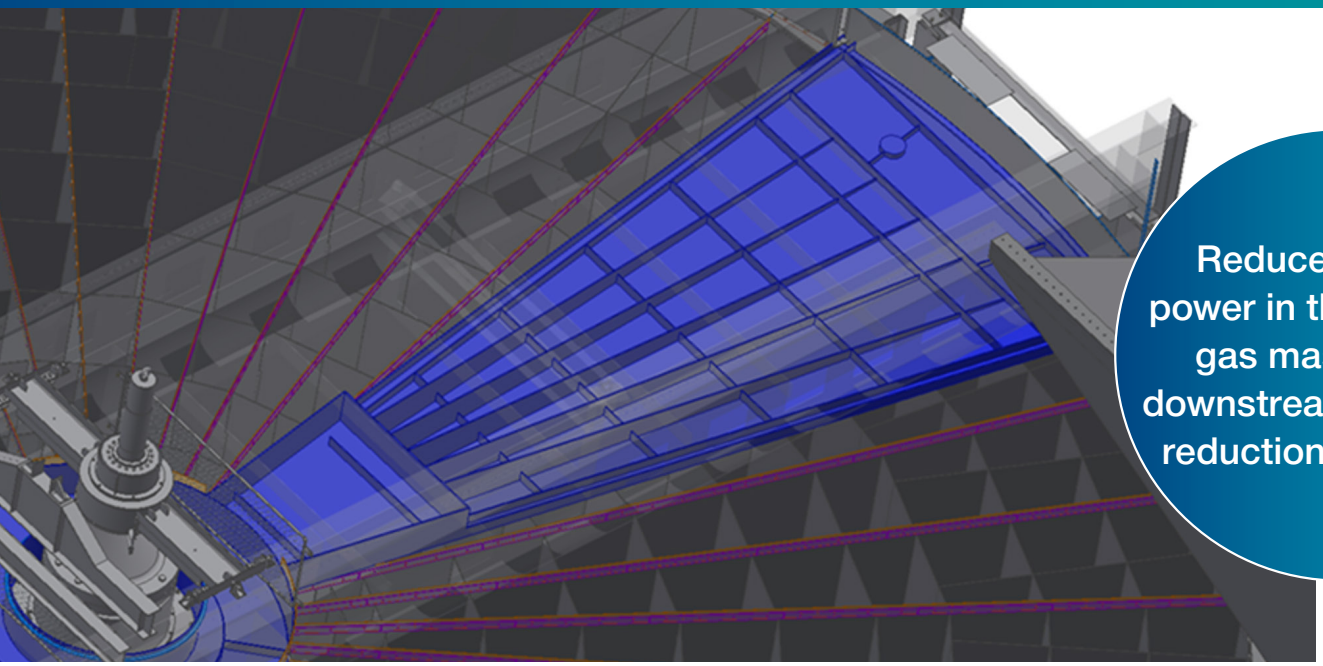
Howden Heaters Parabolic Sectorplates

Rotary heat exchanger leakage reduction

Howden
A Chart Industries Company



Reduce draft fan power in the plant and gas mass flow to downstream emissions reduction equipment

Key features

Simple concept providing significant Hot End Leakage reduction (patent pending)

Custom designed for each particular rotary heater size and duty

Existing system of differential temperature control and electric actuators currently applied

Greatly improved primary seals between the moving sectorplates and the static structure

Since small even gaps result from having parabolic sectorplates, the solution can be complemented with new Howden Contact Seals

Operating air preheaters and gas/gas heaters demands ever lower leakage levels. Howden's continuous innovation process has developed parabolic sectorplates in response.

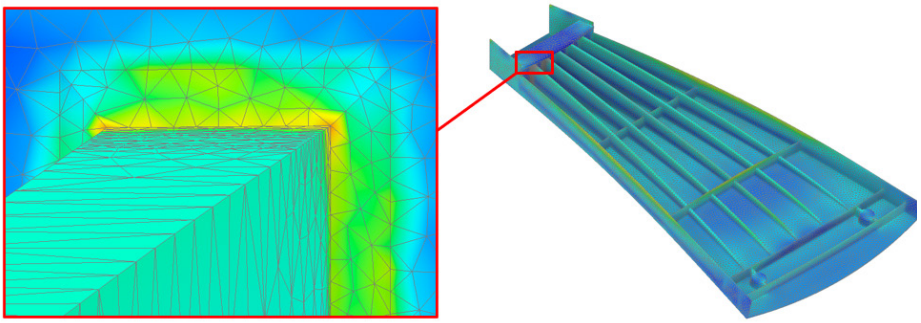
Hot-End Sectorplates are structurally designed with variable stiffness to deform parabolically, when actuated, to match the shape of the deformed operating rotor, thereby minimising the hot end leakage gap

Design algorithms have been developed to automate the optimised design for each individual contract to minimize the number of stiffeners and the variable stiffener depth and thickness.

The main image above shows the model of a large sectorplate (size 35.5 i.e. 21m diameter rotor).

Typically, the maximum deviation of the deflected sectorplate from the capped rotor, at any point radially, is less than 0.5mm.

To ensure that sufficient sectorplate life is achieved, a fatigue analysis involving the assessment of hot-spot stresses was carried out on the range of sectorplates.



FEA and fatigue analysis of Parabolic Sectorplate

Monitoring for precision leakage control

The prinicipal of operation in comparison with a standard sectorplate is shown in Figure 1.

Thermocouples in the gas ducts continuously monitor the differential temperatures and this information is then used to determine how much the electric actuators should push the sectorplate down at the periphery.

There is feedback control of the actuator's actual movement and also a fail-safe retract in the event of multiple failures of thermocouples or high drive motor amps.

This method of control has been successfully used for over ten years in standard actuated sectorplates. Control can be either from a dedicated PLC or directly from the DCS as shown in Figure 2.

The primary seals between the moving sectorplates and the static structure have also been greatly improved. Whilst these sectorplates are applicable in new-build Howden rotary heaters they would also be suitable for retrofit to older heaters by other OEMs with worn sectorplates and unreliable sensor controlled systems. The annual savings and paybacks can be readily quantified for the aftermarket situation.

Achieving the optimal solution

The parabolic sectorplate solution can be further enhanced by combining it with Howden Contact Seals. Contact seals work best when closing relatively small even leakage gaps – exactly what we have with parabolic sectorplates, and this combination can close off virtually all of the hot end radial leakage.

Experience

To date, parabolic sectorplates have been fitted to over 30 new or existing air preheaters at 13 different sites.

All are operating successfully and achieving the client's guaranteed leakage levels.

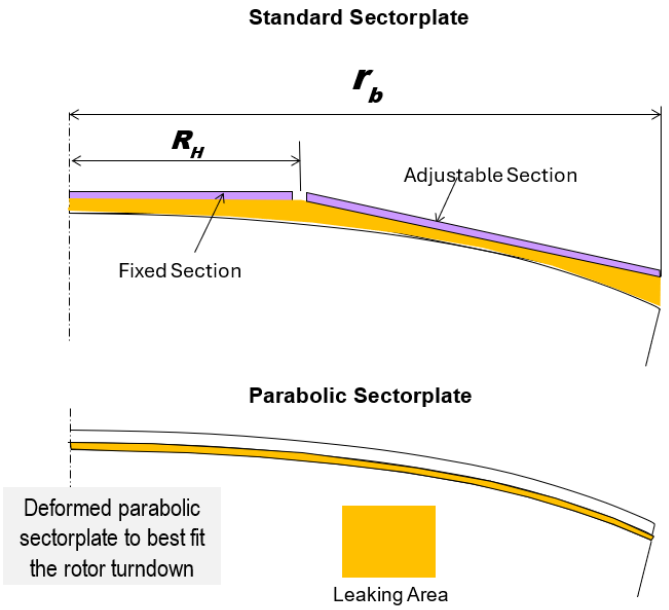


Figure 1: Parabolic Sectorplate Concept

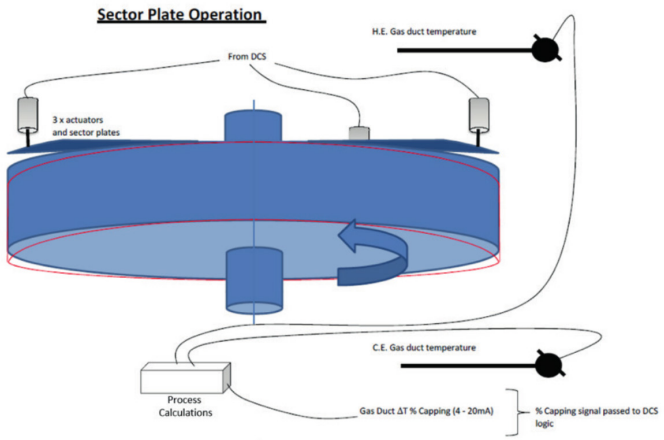


Figure 2: Sectorplate operation and control

Major leakage reductions for new applications or retrofitted to operational heaters

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