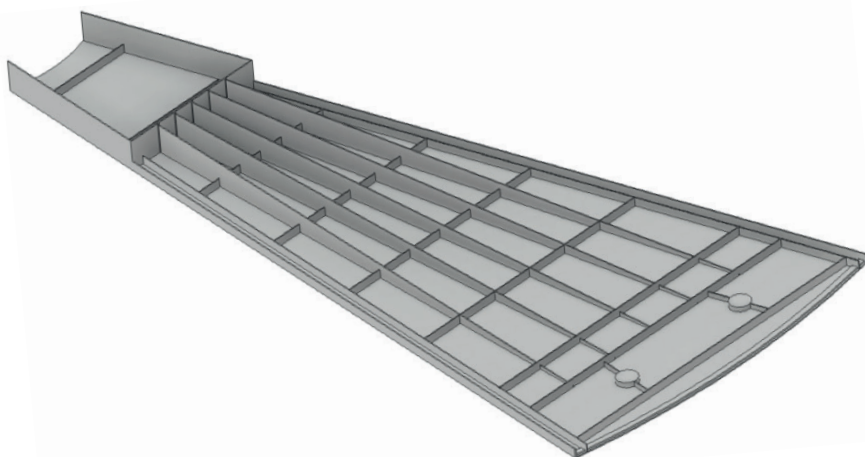


Howden Parabolic Sectorplates

The latest Rotary Heater leakage reduction method



Hot End Sectorplates 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.

Through continued innovation Howden have recognized the market for ever lower leakage levels and developed parabolic sectorplates (patent pending).

Howden parabolic sectorplates not only reduce draft fan power in the plant but also reduce the gas mass flow to downstream emissions reduction equipment.

The concept of these new hot end sectorplates is simply to structurally deform into the same parabolic shape as that of the operating rotor to minimize the direct leakage gaps, as shown in Figure 1.

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.

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.

The parabolic sectorplate solution can be further enhanced by combining it with new Howden Contact Seals. Contact seals only work 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.

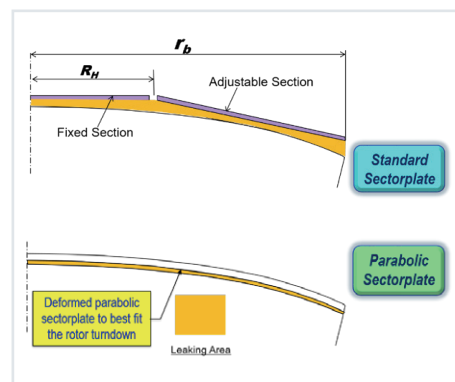
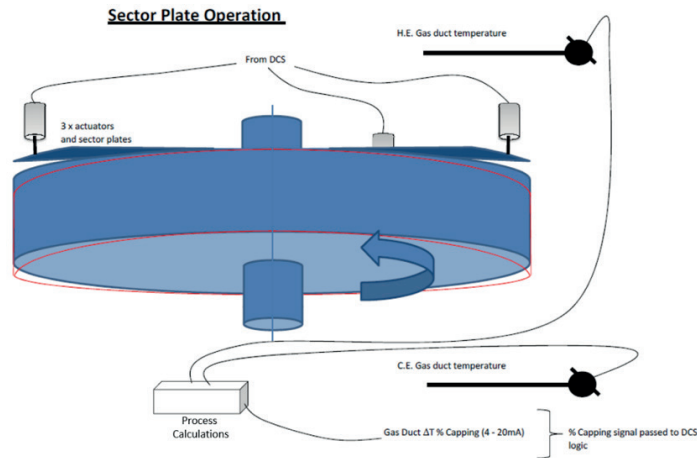


Figure 1: Parabolic Sectorplate Concept



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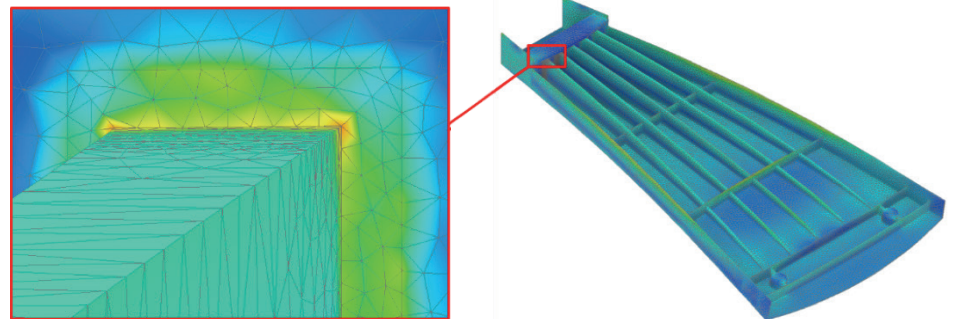
Figure 2: Sectorplate operation and control

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

Fatigue Analysis

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.

Commercialisation of Parabolic Sectorplates in China

To date, parabolic sectorplates have now been retrofitted in 14 air preheaters at 6 different sites. All operating successfully and achieving the client's guaranteed leakage levels.

Site	Unit	Heater size	Quantity	Delivery time
Chizhou Jiuhua	1	28.5 VI(T) 1880-SM	2	May 2016
Ningxia Shizuishan	3B	28.5 VNT 1960	1	June 2018
Xinjiang Hesheng	1 + 2	29.5 VI(T) 2185	4	July 2018
Wangtan	1 + 2	32 VI(T) 2184-SMRC	4	June 2018
Pingdingshan	2A	33 VNT 2100	1	May 2019
Houshi	6	32 VIT 2235 (2540)	2	Feb 2020

Optimised Parabolic Sectorplates provide major leakage reductions