

Almeria Thermal Power Plant, Spain



The introduction of Howden's VN seal system to the air preheaters brought an immediate drop in leakage level from 26% to 5%. Over the subsequent eight years, the level has been maintained at an average of 5.75%.

Retrofit incorporating Howden VN sealing system brings long-term leakage control and significantly reduces the unit heat rate and operating costs.

The challenge

Almeria Thermal Power Plant uses two 550 MW coal fired generating units. When the newer of the two was installed the air preheaters were fitted with Howden VN seals that gave reliable leakage control with minimal maintenance.

An opportunity to upgrade the older unit arose when leakage drift rose to crisis levels. The size 32 air preheaters in the unit were equipped with actuated sector plates that relied on sensors and articulated elements – a system that worked well initially but is unsuitable for the corrosive and erosive conditions in which it was installed.

In a relatively short time, it stopped working and the leakage rose to very high levels – too high for proper operation of the generating unit. As a consequence, the power consumption of both the FD and ID fans also rose to unacceptable levels and the associated increase in the unit heat rate was further exacerbated by the effects of hot end leakage. The excessive leakage and the associated overburdening of the ID fan can also play a part in reducing the unit's output.

The solution

Howden recommended and installed a VN sealing system similar to the one that was giving good service in the newer Almeria generating unit. The VN system uses fixed sector plates and double sealing and has proven its value in over 1000 installations worldwide.

The fixed plates require no actuation mechanism and the increased hot end seal gaps are compensated for by an increased number of radial walls so that there are two radial seals forming a labyrinth under the sector plate at all times.

Figure 1: Historical leakage in unit 1 air heaters of Almeria Thermal Power Station

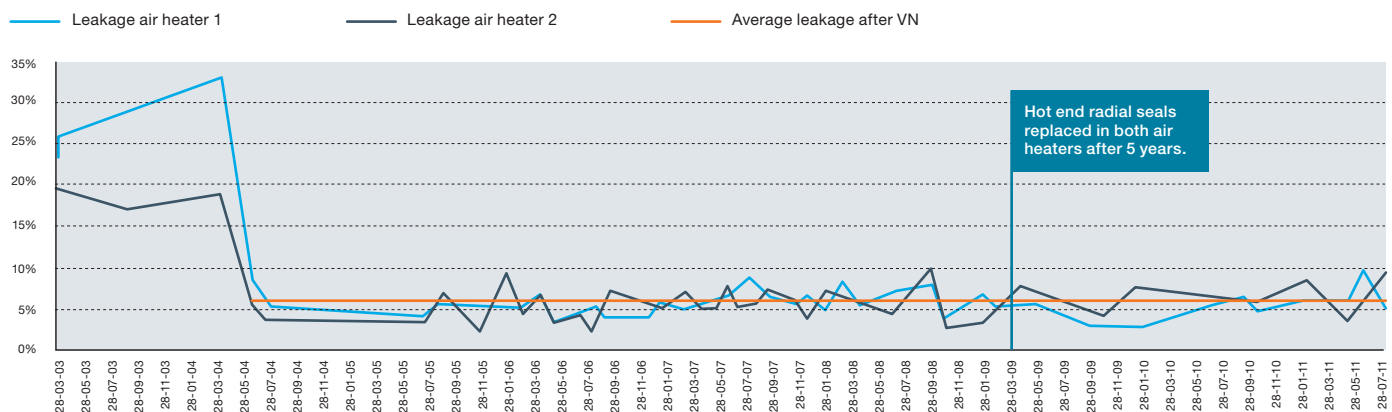




Figure 2: Double sealing by increasing the number of radial walls

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The introduction of the VN system into the Almeria Power Station has considerably reduced leakage, increased availability and reduced maintenance costs. The radial seals gave problem-free service for five years before any replacement was required.

The double sealing principle

In an air preheater, radial leakage typically accounts for around 70% of the total leakage. The Howden VN double seal system, which has been operating successfully for more than 30 years in both new installations and retrofit projects, substantially reduces these losses. Double sealing can usually be achieved by increasing the number of radial walls (Figure 2) or by widening the sector plate (Figure 3). The result in both cases is that there are two or more radial seals under the sector plate at all times and the seal leakage is reduced by a factor of $1/\sqrt{2}$.

The advantages of a fixed sector plate

Sealing systems that depend on articulated parts that are moved by actuators and controlled by sensors are extremely vulnerable in hazardous environments.

Factors such as erosion from ash and corrosive atmospheres greatly impair their durability, and significant maintenance is required to keep them working at acceptable levels of availability.

By eliminating the need for moving parts, the fixed sector plate offers a far more reliable long-term control of leakage (Figure 4). Thermal capping of the rotor is accommodated by the parabolic design of the bottom sector plate, which offers maximum adaptability to the radial seals (Figure 5).

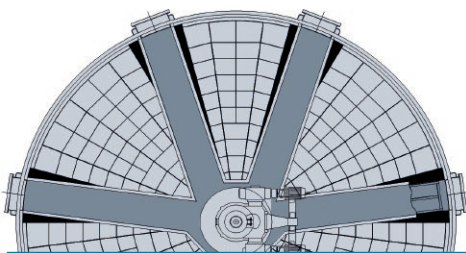
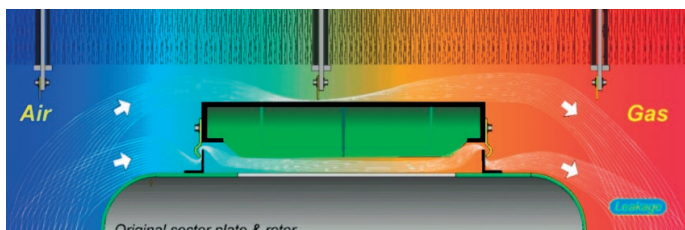
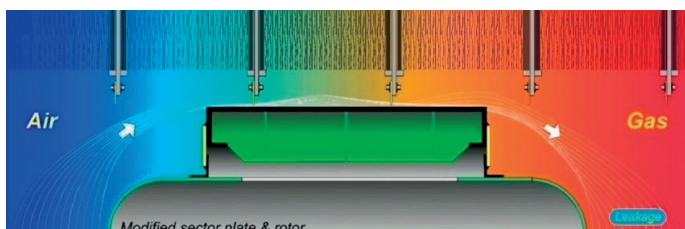


Figure 3: Double sealing by enlarging the sector plate

Figure 4: Elimination of leaks between sector plate and support beam



Before VN



After VN

Figure 5: Maximum adaptability of rotor thermal expansion to sector plate

