



## Improving reliability, increasing efficiency.

A leading refinery in the UK was having trouble with seal leakage from existing carbon box technology on their 150#, 600# steam turbines. Based on prior experience the refinery approached AESSEAL® for an alternative solution.

With no standard solution available, AESSEAL® initiated a development program in order to design a practical solution for the customer. The challenge for AESSEAL® was to:

- Replace the existing carbon box seal
- Utilize standard seal faces (ensuring modularity) with gas lift technology
- Incorporate high temperature polymers
- Utilize a graphite wedge shaft seal
- Incorporate into a compact cartridge design that installs to the existing envelope and pcd
- Cope with high rotational speeds, as well as slow roll and wet steam

Working with the customer on the design and subsequent test program, AESSEAL® developed a solution for the application. After completion the customer witnessed in-house testing, the seal was installed to a known “bad actor” on site for a three month trial. After two months of successful operation the customer waived the rest of the trial and placed orders to install identical seals on two more steam turbines, with a view to converting all the steam turbines on site.



Steam loss is a major problem in a refinery as it incurs considerable costs. A significant benefit of the new seal is that it has eliminated steam leaks; this represents a significant saving for the customer because:

- The refinery has approximately 150 steam turbines, meaning that the loss of steam has a major impact on the profitability of the business.
- There is a Health and Safety issue as the steam reduces visibility, causing a potential problem when working on or around the turbine.
- There is an environmental impact caused by the burning of extra fuels.
- Steam leakage also contaminates the lubrication of the bearings, causing them to fail prematurely.



Cost of steam loss from a single turbine:-

Average rate of steam loss from turbine: 200 lb/hr or 0.0907 T/hr

Turbine runs 24/7, 365 days a year: 8,760 hrs total  $0.0907 \times 8760 = 794.53$  tons of steam lost per year

Cost of steam @ £17.84 / 794.53 x £17.84 = £14,174.45

So, the total cost of lost steam per steam turbine per year is approximately £15,000. The potential saving to the refinery with all the 150 steam turbines fitted with steam turbine mechanical seals is  $£15,000 \times 150 = £2.25$  million per year.

Benefits of steam turbine mechanical seal technology in this refinery:

- Increased turbine reliability
- Reduced turbine maintenance costs
- Reduced bearing contamination
- Extends life as non-contacting technology
- Elimination of shaft wear – generated by the carbon seal
- Greatly reduces steam loss and increases efficiency

Without Steam Turbine Seal



With Steam Turbine Seal



**‘These Steam Turbine seals are so good you should be looking at rolling them out to refineries worldwide’** – Refinery Workshop Manager

Industry: Oil & Gas  
Product: Steam Turbine Mechanical Seal  
Application: Steam Turbine  
Savings: £2,250,000 / year  
Reference N.O: CH01446



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