

CASE STUDY

Increase Turbine Efficiency and Solve Hydrogen Seal Varnish Issues

Fluitec's Boost VR+ helps increase fluid solubility

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REDUCED OIL SEAL TEMP

15°C



CLIENT: Power Generation

COUNTRY: USA

APPLICATION: Steam Turbine

DELIVERABLES: Remove varnish, increase efficiency, and reduce oil temperature.

SOLUTION: Fluitec Boost VR+™

PROBLEM

The power generation plant noticed problems when their hydrogen seal oil had a much lower flow rate than expected. Instead of the normal 8-gpm flow, the oil was flowing at 1-gpm. Thermocouples added to seal drain lines measured outlet temperatures as high as 94°C indicating even higher oil temperatures in the seal area itself.

SOLUTION

Fluitec's Boost VR+™ (Varnish Removal) is a safer and less expensive way of removing varnish and deposits from the lube system. Boost VR+ uses patent pending varnish and deposit mitigation technology, that can safely be used in oil wetted systems and maintains high levels of success of increased efficiency with hydrogen seals.

RESULTS

- Removed varnish from seals
- Increased turbine efficiency
- Increased oil and seal life
- Returned flow rates to normal operating conditions
- Reduced seal and oil temperatures by over 15°C



DEEPER DIVE

A large frame gas turbine had used spring hydrogen seals. Looking to increase efficiency, they installed bolted hydrogen seals. The plant first noticed problems 8 months later when their hydrogen seal oil had a much lower flow rate than expected. Instead of the normal 8-gpm flow, the oil was flowing at 1-gpm. Thermocouples added to seal drain lines measured outlet temperatures as high as 200 F indicating even higher oil temperatures in the seal area itself.

The plant performed multiple tests in an attempt to verify the problem, including a “bucket-test” to verify flow rates and installation of ultrasonic Doppler flow meters on feed lines. Several months after identifying the problem, the plant worked with their OEM to replace the seals.

The new bolted hydrogen seals were carefully installed with the following clearances:

Turbine End Seal Clearances

Air Seal: .012"

Gas Seal: .009"

Collector End Seal Clearances

Air Seal: .012"

Gas Seal: .011"

Six months after the installation of the new seals, flow rates dropped and the same problem re-emerged. The plant inspected the seals and found Incipient Varnish covering the surfaces.

Before switching back to the older spring seal design, the plant decided to use Boost VR+ to increase the solubility of the oil for a positive impact on the varnish deposits. One week after the introduction of Boost VR+, the flow rates improved. The plant had the ability to inspect the seals one month later and found the seals to be clean and the layer of varnish removed.

This solution allowed the plant to continue using the more efficient bolted hydrogen seal design. The plant is continuing to carefully monitor seal oil flow rates and turbine oil analysis as a monitoring step.