Major Southeastern U.S. electric utility's GE® 7F gas-turbine fleet – Allweiler® NSSV centrifugal pumps replace the competition



Problem:

A major Southeastern U.S. electric utility was experiencing excessive maintenance requirements on pumps initially supplied by a competitor for the lubrication (lube) oil system on its General Electric® (GE®) 7F gas-turbine fleet. Premature failing of the pumps' bearings was determined to be the root cause. The result was lost plant operating revenue and additional maintenance costs, due to the pumps' unscheduled major maintenance requirement every 8,000 operating hours (OH).

Solution:

CIRCOR Americas worked closely with the original system manufacturer to replace the competitor's lube oil pumps with Allweiler® NSSV centrifugal pumps, to alleviate the recurring problem. This allowed the maintenance interval to be extended to 25,000 OH (an increase of more than three times), to match the scheduled maintenance interval for base-loaded GE 7F gas turbines.

Results:

CIRCOR Americas has delivered 40 "plug-and-play" replacement lube oil pumps that have extended the required maintenance interval by three times, saving the utility company more than $15,000 per year per pump. In fact, the cost of replacing the pumps yielded a payback in less than one year.

Facing recurring maintenance challenges

The major Southeastern electric utility first came to the original system manufacturer and service provider of the lube oil system with an ongoing maintenance issue on a competitor's lube oil pumps, which had initially been installed with its fleet of GE 7F gas-turbine power plants. About the same time, CIRCOR Americas sales representatives began discussing the problem with the system manufacturer and offered the utility company a solution: Replace the competitor's pumps with Allweiler NSSV centrifugal pumps.

With the competitor's pumps in place, the utility company was faced with a recurring maintenance requirement of replacing the bearings every 8,000 OH on each of the system's four lube oil pumps. That meant bearing replacement about once per year for a base-loaded plant, possibly between the gas turbine's scheduled maintenance outage interval. This labor-intensive process involved removal of the pump from inside the lube oil skid tank, disassembling the pump and rebuilding it with a replacement set of bearings. The frequent maintenance requirement was having a negative impact on the utility company's operational performance and budget.

Time-consuming repairs

Since the pumps are located inside the lube oil reservoir, the change-out is a time-consuming process. It was estimated that two to three hours would be required to remove the roof enclosure, disconnect the piping, strap and unbolt the pump and then lift it out. The rebuild of the original pump could be completed on site in an estimated five hours; however, depending on the availability and skill of the utility company's on-site maintenance team, the pump may have required rebuilding at the original equipment manufacturer's (OEM's) facility. After completing the rebuild or the return from factory service, another two to three hours would be required to reinstall the rebuilt pump. Not all four pumps would be repaired at the same time. If one were repaired every 4,000 OH, then all four would be repaired within two years for each gas turbine at the plant, if staggered service and repair were allowed. After the maintenance staff experienced a few rebuilds, they expressed their concern over the problem to the utility company's management.

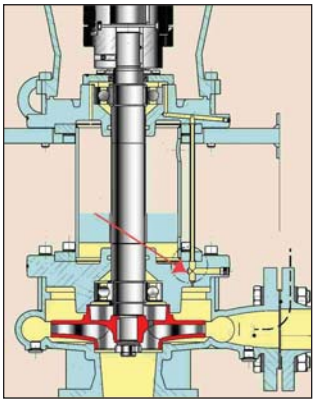
Extended maintenance intervals

By the competitor's design, the lube oil system utilized centrifugal pumps with an upper thrust bearing located above the oil line of the tank. The lower sleeve bearing was self-lubricated (below the oil line), but the upper thrust bearing was a greased bearing (above the oil line). Minor maintenance, such as replacing and repacking grease, had to be performed on-line every 1,500 OH, or about five times a year, and major maintenance was necessary every 8,000 OH, or about once a year, while the unit was shut down.

Replacing the competitor's pumps with Allweiler NSSV centrifugal pumps decreased the required minor maintenance from five times per year to once per year, a five-fold reduction, and major maintenance interval from 8,000 OH to a suggested 25,000 OH, a three-fold reduction. Instead of major maintenance once per year, the in-service



duration was extended to three years. Also, the CIRCOR maintenance interval matched the scheduled maintenance interval on the gas turbine, which eliminated additional unscheduled outages and the downtime costs associated with lost plant revenue, maintenance-staff time and replacement parts. The NSSV pumps continually flush, cool and lubricate the bearings, significantly reducing wear and extending the maintenance interval. By working with the original system manufacturer and choosing the NSSV, CIRCOR has ensured that only the pumps get replaced; the original motors are remounted to the replacement pumps, further minimizing the effort and costs associated with the retrofit.



A "plug-and-play" solution

The fit, form and function of the CIRCOR solution have proven to be excellent. The Allweiler NSSV pumps were literally bolt-in replacements for the competitor's units. In addition, the improved design utilizes an internal lubed bearing with zero maintenance and extended bearing life, plus an array of other features and benefits, including:

- Oil-lubricated upper bearing (no grease requirements)
- Internally fed design
- Low-pressure (0.2 bar, 3 psi) feed
- Pickup for feed behind impeller (Centrifugal force reduces chances of contamination in upper-bearing feed line.)
- Feed line pressurized as soon as pump begins to spin
- Flow-control orifice 0.078" (2mm) in diameter
- Flow rate to upper thrust bearing through orifice of approximately 1 GPM at 66 ft/s (45 mph), which should preclude any significant varnish accumulation

Evaluating potential replacements

Before deciding on the Allweiler NSSV pumps, the utility company undertook a cost-benefit analysis with the help of CIRCOR Americas. CIRCOR Americas prepared a comparative presentation that explained the differences between the pumps, including the performance and maintenance characteristics, and provided a quote for the new pumps. From this information and the utility company's own internal evaluation, the conclusion was reached that replacing the existing lube oil pumps was more cost-effective than continuing with the maintenance issues of the pumps originally installed.



Time and dollar savings

Due to the frequency and the amount of time the utility company's maintenance personnel were required to spend servicing the original pumps, CIRCOR was able to provide replacement pumps that eliminated the former maintenance troubles the company had been experiencing with its original design.

About CIRCOR International

CIRCOR International is a world leader in the development, engineering, manufacturing, distribution, service and support of pumping and fluid-handling systems. Specializing in positive-displacement and centrifugal technologies, its products support a wide range of industries, from power generation and oil & gas to commercial and Navy marine to a broad range of industrial applications. Through its Allweiler, Houttuin™, Imo® Lubrication Systems Company, Portland Valve, Tushaco®, Warren® and Zenith® products, CIRCOR delivers pumping solutions in the most demanding applications. CIRCOR International has its headquarters in Richmond, Virginia, USA.

About CIRCOR Americas

CIRCOR Americas serves as the sales and marketing solution provider of CIRCOR International and the CIRCOR brands through-out the Americas. It is based in Monroe, North Carolina, USA.

"Our team worked with a major Southeastern U.S. electric utility and the original lube oil system manufacturer to provide a cost-effective solution to eliminate the electric utility's reliability and maintenance-cost issues associated with a competitor's lube oil pumps. Our solution has proven to be effective."

– Keith Schafer, vice president of sales and marketing for CIRCOR Americas

About Allweiler AG

Allweiler is Germany's oldest pump manufacturer and the world's market leader in the production of lube oil pumps and systems. The NSSV internally lubricated upper thrust bearing design has been Allweiler's standard design for centrifugal lube oil pumps since 1998. Imo has a large installed base of the NSSV design; approximately 2,400 pumps since 1998 are in operation in gas-turbine lube oil systems. Allweiler's main office is located in Radolfzell, Germany.

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