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Alabama Power Company: Case History Root Cause Analysis Gets to the Bottom of It

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Power Magazine, Sep/Oct 2001

Recently Alabama Power Co, Parrish, Ala, experienced a process interruption of its Unit 10 electric fire pump, ostensibly because of an outboard bearing failure. When investigated further, the utility realized that the pump had failed five times in a six-month period, and each time it was the outboard bearing that had failed. So instead of simply replacing the bearing and putting the pump back in service, this time asset managers put together a root-cause analysis (RCA) team, using the "PROACT" approach by Reliability Center Inc, Hopewell, Va.

The RCA team was comprised of Paul Cooner, pump mechanic; Chris Curow, maintenance team leader; Harold Dobbins, condition-based maintenance specialist; and Ronny Johnston, maintenance planner. After reviewing how the Proact process worked, the team developed a logic tree to graphically represent the cause-and-effect relationships that could have led to the event. Next, the hypotheses that could be eliminated based on hard facts were ruled out, and team assignments were made for the remaining hypotheses that still required investigation.

The investigations started by reviewing the fundamentals, including a detailed bearing description from design documents, which indicated that the outboard bearing was a thrust type. Another review of fundamentals explained how to distinguish a roller bearing from a thrust bearing.

Later, when team members retrieved the failed bearing and inspected it closely, they realized that the old bearing was not a thrust bearing after all. Plant mechanics, it turned out, had been replacing the failed bearings with the exact same type they had removed from the pump after the previous failure. But the original bearing must have been the wrong type.

Digging deeper, the RCA team discovered that the computer-based maintenance management system (CMMS) listed only one bearing for the Unit 10 electric fire pump--a roller type--but its description in the CMMS did not specify that this was to be the inboard bearing. A quick check of inventory in the storeroom found that the correct thrust-type bearing for the outboard bearing was on hand, but because it was not listed in the CMMS for this pump, it had never been installed.

When the trail of errors was finally understood, the correct thrust-type bearing was installed outboard, and the Unit 10 electric fire pump was returned to service. The story doesn't end there, however, because the fire pump immediately showed high vibration, and had to be shut down.

The RCA team was called back together to do some more digging. A pump specialist with Alabama Power Co's parent, Southern Company, happened to be on site and was quickly consulted. After the team listed the potential causes of the high vibration, the pump specialist reviewed with them the proper procedures for assembling this type of pump, and common trouble spots to look for.

At this point, the RCA team identified shaft run-out as a possibility, because the shaft had been welded on when a new sleeve had been installed. The packing gland had not fit as well as it should have during assembly, team members reported, so this was added to the list of possible causes. It was also decided that the impeller run-out should be checked, and it was noted that the impeller was not perfectly centered in the casing.

The coupling was thought to have been set up without the motor being at magnetic center. To accomplish this, a spacer would have had to be installed. A team member identified this as the first thing to check, and indeed this

was found to be one of the root causes. A spacer was installed, the coupling was set up properly, and the Unit 10 electric fire pump has operated flawlessly ever since.

For more information about this case history and others please contact RCI at 804-458-0645 or info@reliability.com.

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