Transmission & Bearing Corp.

Technical Notes by Dr. Mel

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Emergency Lube Oil Systems

Is your machinery protected?

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Do your bearings look like this?

This bearing did not have benefit of a working emergency lube oil system.

All rotating machinery trains have lube oil systems.

Almost all have emergency lube oil systems of some nature.

- Is the emergency lube oil system on YOUR equipment adequate?
- How do you know that it is adequate without a real life test?
- How do you design bearings to minimize secondary damage to other components of the equipment in the case of loss of lube oil?

Design of an emergency lube oil system:
The emergency lube oil flow must start immediately on loss of main lube oil flow and the flow must continue until after the equipment has come to rest and has cooled down so that the heat in the rotor will not melt the babbitt in the bearings. Two systems are either an oil pump or a head tank. The most common methods of powering the pump are a DC motor or a steam turbine.

Emergency Lube Oil System Using DC Powered Motor and Battery:
The most common method of providing emergency lube oil to rotating equipment uses a DC powered system, particularly when large flow rates of oil are required for one to eight hours of run-down and cool-down time.

In a DC system, the emergency pump provides a reduced flow adequate to keep all of the bearings lubricated and cooled during the required time. There are varieties of DC motors, DC switchgear, and batteries from which to choose.

The preferred way of setting up the DC equipment for this specific application is to make sure that it is a "run or burn" arrangement. This is not common because almost all manufacturers of components want to build components with overload protection and easy ways to use the equipment. In a power plant setting, this DC equipment is the last method available before the main equipment rolls down without oil, so a different approach is required. If the DC motor gets hot and the overloads shut it down, then the equipment being protected is damaged. If the switchgear resistance steps fail, and the motor never gets to full speed, the equipment being protected is damaged.

Small steam turbines:
Small steam turbines are used but they have limitations. Typically, they sit idle for years, and upon command the steam inlet valves are expected to open wide. Many are rusted and will not open. Small steam turbines have many of the characteristics of large steam turbines: the shafts get hot, the journals expand. In large turbines, there is adequate lube oil flow to keep the shaft cool so that the journals do not expand much. In small turbines that would be used to drive lube oil pumps, the steam heat can damage the un-cooled grease lubricated bearings, and condensate from the steam over time damages the bearings. Another limitation is that when the AC power stops, the boiler water pumps stop, and the boiler steam pressure drops. In a total blackout, the steam pressure can drop much more quickly than anticipated, minimizing the time that the steam turbines can drive the lube oil pumps to cool the journals and bearings of the equipment being protected.

Emergency Lube Oil System Using Head Tank:
For small equipment, a head tank may be ideal. It is a passive device. It must be elevated sufficiently so that there is adequate pressure to provide the oil flow necessary to cool the bearings during and after the run down. The head tank must be sufficiently large to hold an adequate amount of oil for a once through flow arrangement to cool the bearings for the entire time necessary.

The piping, cooling, filtration, control valves for flow and pressure, as well as the instrumentation for emergency lube oil usually are treated differently from their counterparts in the main lube oil system, simply because they are for emergency use only and reliability is of the utmost criticality. Each system should be designed to suit the specific needs.

TRI Designs and Supplies Emergency Lube Oil Systems.

TRI has designed and installed many emergency lube oil systems in power plants in the US and Canada. All are successful. TRI will be pleased to design new systems or to evaluate and retrofit existing systems that have experienced problems.

In addition, TRI designs bearing systems, which have the capability to withstand short intervals of loss of lube oil without damage.

Contact TRI for consultation & supply for your situation.

TRI product & service info is available at www.turboresearch.com .
We make "house calls" Emergency tel: 610-283-9077.

TRI "objectives": Design and supply new rotating equipment systems.
Resolve your maintenance and upgrade problems.

This Technical Note was written by Dr. Melbourne F. Giberson, P.E., President of TRI Transmission & Bearing Corp., Turbo Research, Inc. The objectives of Technical Notes are to disseminate information and experience on understanding problems and how to solve them. We attempt to send this Technical Note only to those people for whom the information might be useful. Over the years, many people have asked to be added to the distribution list (see our website). Occasionally, a few individuals inform us that they do not wish to receive the information. Should you desire not to receive future Technical Notes, please advise TRI by info@turboresearch.com or click visit the removal page on the TRI web site MFG 10/2003