

**Undertaking 79**

**Page 82, line 11 to Page 84, line 20**

***Re: FM Global Documents***

**Undertake to provide all FM Global documents that address -- or the excerpts of those documents that address the DC pump and its testing.**

A review of the FM Global Equipment Hazards Risk Reports from 2010 to 2015 have revealed several instances of commentary related to the DC lube oil pump and its testing. It is to be noted, however, that these comments have been raised after the January 11, 2013 event. Please see Undertaking 79 Attachment 1.

## 07-10-002 continued

<b>Technical Detail</b>	<ul style="list-style-type: none"> <li>• Float current - Float current must remain fairly constant. Increase in float current of 50% to 400% indicates the possibility of thermal runaway in VRLA batteries (vented batteries will not experience thermal runaway because of the large volume of electrolyte acting as a heat sink).</li> <li>• Internal resistance - Internal cell resistances must not vary by more than 25 between identical cells.</li> <li>• Inter-cell connections - Inter-cell connection resistances must not vary by more than 50 of the lowest value.</li> <li>• Capacity discharge test - When deterioration in capacity is noticed, increase the frequency of testing to once every six months. Replace the battery when its measured capacity approaches 80% of rated capacity.</li> </ul> <p>UPS batteries are adequately maintained and supervised by a battery monitoring system that supervises cell voltage and impedance. Annual load tests are done by the maintenance firm and the batteries are replaced every five years.</p>
<b>Loss Expectancies</b>	<p>Acting on this item would reduce the probability or severity of loss.</p> <p>Exposure to Loss if Completed is <span style="float: right;">Minimal PD</span> approximately: <span style="float: right;">Minimal BI</span></p>
<b>Status</b>	<p>According to Mr. Jeff Vincent, battery maintenance is currently being examined by the Corporate Asset Maintenance review team for the strategy to be put in place for the capacity discharge test. The interim maintenance is being revised to conform better to IEEE Standard 450. Note that this engineer accepted replacing the quarterly and annual inspections with one six month complete inspection.</p>

## 13-05-001

**Improve the existing automatic startup requirements for the station service diesel generator.**

As a result of the recent lack of lubrication for the Unit No. 1 bearing following a severe winter storm, the current diesel emergency generator feeding the station service bus should have its automatic startup voltage requirement reviewed to start under a depressed voltage on the station service bus. This will help ensure faster startup and reliability of the alternating current (AC) standby lube oil pumps during the worst meteorological conditions.

<b>Loss Expectancies</b>	<p>Acting on this item would reduce the probability or severity of loss.</p> <p>Exposure to Loss if Completed is <span style="float: right;">Minimal PD</span> approximately: <span style="float: right;">Minimal BI</span></p>
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## 13-05-001 continued

<b>Status</b>	Manager, Thermal Generation Mr. Terry LeDrew indicated that the Transmission Group personnel will participate in an inquiry with the thermal group to ensure improvement of the current protection systems to prevent recurrence.
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## 13-05-002

**Improve the weekly testing procedure for AC and DC lube oil pumps.**

The current weekly testing procedure for the AC standby and DC lube oil pumps should be improved to specify the intent of this test and the header lube oil pressure acceptable range.

In addition, training on this new procedure should be given to the operators.

<b>Technical Detail</b>	The Operation Department already provided lube oil pressure graphs in the control room to allow the operators to see the pressure rise upon startup of these pumps. The check sheet has also been revised to include the noted pressure and confirmation that oil is flowing in the sight glasses on the outlet of the turbine bearings to ensure oil flow is present. In addition, the header lube oil pressure is now noted upon startup of each pump prior to a unit startup to ensure functionality and to serve as a reference for future startups.	
<b>Loss Expectancies</b>	Acting on this item would reduce the probability or severity of loss. Exposure to Loss if Completed is approximately:	Minimal PD Minimal BI
<b>Status</b>	Mr. Gerard Cochrane indicated that the current procedure will be revised as soon as the expected pressure ranges are obtained from corporate asset management.	

## 13-05-003

**Verify if other critical devices are being tested.**

An enquiry should be made regarding periodic testing of other critical protection devices to verify if there is a need to revise the testing procedure in terms of intent (hazard to be prevented) and required data display for plant operators. Verify the need for training on these testing procedures. Ensure that set points are present on check sheets.

<b>Loss Expectancies</b>	Acting on this item would reduce the probability or severity of loss. Exposure to Loss if Completed is approximately:	Minimal PD Minimal BI
<b>Status</b>	This was discussed with operation personnel and will be completed.	

**13-05-004 Continue simulation tests with AC standby and DC lube oil pumps.**

<b>Loss Expectancies</b>	Acting on this item would reduce the probability or severity of loss. Exposure to Loss if Completed is approximately:	Minimal PD Minimal BI
<b>Status</b>	Mr. Wayne Rice indicated that these tests will be pursued to ensure complete determination of the cause for the lack of lubrication on Unit No. 1 on January 11, 2013.	

**13-05-005 Enhance overhaul activities for the DC lube oil pump and motor at major overhaul.**

During major overhauls of steam turbines, ensure comprehensive inspection, dismantle and performance testing of DC lube oil pumps and motors and integrity of check valves.

<b>Loss Expectancies</b>	Acting on this item would reduce the probability or severity of loss. Exposure to Loss if Completed is approximately:	Minimal PD Minimal BI
<b>Status</b>	This will be incorporated into the maintenance plans.	

**13-05-006 Implement a testing program for the air system safety valves.**

Instrument air and service air safety valves throughout the mill should be lift tested or pressure tested yearly or overhauled/replaced every five years if testing is not possible.

<b>Technical Detail</b>	<p>Note: Pressure tests include either pressurizing the vessel, within its design pressure, up to the opening of the safety valve or calibration using a device such as an electronic valve test (EVT). Any pressure-relieving device should be overhauled or replaced if problems are found during testing.</p> <p>Testing of safety valves by manual operation may result in subsequent leakage of the valves because of damaged seats caused by foreign material trapped under the disk. Such leakage may necessitate a shutdown of the pressure vessel to work on the safety valves. However, there is only one positive way to determine if a safety valve is in operating condition - try it, either by raising the pressure or by manually operating the lifting gear. Before lifting by hand, make sure the boiler pressure is no less than 75% of the lift pressure. This precaution will prevent the valve stem from bending and ensure the valve will snap closed when released.</p> <p>The dates and the test results are to be recorded for review.</p>	
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