To: Engineering Management

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Date: April 1, 1997

Subject: Technical Summary – March, 1997 Recirculation Pump Inspections

Introduction:
The following is a summary of the apparently significant observations, and the conclusions drawn from them, for the “A” and “B” Recirculation Pumps since the start of power reduction on 3/28/97.

Observations:
There were no major changes in vibration characteristics on “A” Pump during power reduction. It was secured first, at hot shutdown conditions. There was no shift in the motor to motor stand joint of the “A” Pump during shutdown. Also, no support restraint binding was found. The “B” Pump had an exaggerated vibration response to changing plant conditions during shutdown, reaching 30 mils maximum shaft vibration prior to shutdown.

NOTE: Mechanical center alignment is performed with RCP motor rotor centered in the upper and lower motor frames (brackets). Magnetic center alignment is performed with the motor rotor centered in the stator which ensures a concentric rotor to stator air gap.

• The “A” Pump mechanical center parallel offset was .019 in TIR (.016 mils out of tolerance). The magnetic center parallel offset was .018 in. TIR. Angular offset was in tolerance at .000 in TIR.
• The “A” Pump motor bearing inspection revealed significant damage to one lower guide bearing jackscrew (load carrying member) but no other significant findings.
• The “B” Pump motor bearing inspection revealed no significant findings.
• The “A” Pump motor uncoupled run vibration improved following maintenance. Overall magnitude decreased, spectral data improved conditions, and phase angle changes were noted.

Conclusion:
Further review of the vibration transient of the “A” Pump on 2/8/97 revealed that the initiating event was the start of the “C” Pump. Previously, it was believed that no plant configuration change was occurring at the time. This information supports the theory that the root cause for exaggerated vibration response to off normal operation conditions seen in the “A” and “B” Pumps is common between the machines. A distinction between the operating characteristics of the two machines still exists, however. The “B” pump vibration returned to normal levels with the plant at stable four pump operation while the “A” Pump transient (2/8/97) resulted in sustained high vibration.
Of the five apparent root causes determined through run time vibration analysis, the field data seems to support two, misalignment and lower motor bearing damage (or significant wear).

The most significant finding in field inspections was noted in the as-found mechanical and magnetic center alignment data. In the “A” case, the as-found alignment was found significantly out of tolerance using both methods. However, in the “B” case, only the magnetic center alignment was found significantly out of tolerance. This information would seem to suggest that, if misalignment is a root cause or contributing factor, it is in the magnetic center misalignment.

Another significant finding was the extreme wear seen on the “A” Pump lower motor bearing jackscrew. The jackscrew has a spherical contact surface which mates with the thrust pad on the back of the guide shoe. When this surface becomes flattened, as in the “A” case, the bearing loses some function. If the affected bearing becomes heavily loaded, it may lock in place, causing sustained high vibration. The extreme as-found magnetic center misalignment seen on the “A” Pump would have loaded the damaged bearing. This information suggests that the bearing wear found in the “A” Pump motor, combined with the misalignment, could account for the sustained high vibration seen on this machine.