EMP ENGINEERING SERVICES INC.

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To:
From: **D. Smithman**
Subject: **Progress Report – Motor & Generator Issues**
Date: **June 6, 2008**

This is a progress report concerning major motor & generator work underway or being considered for the ABC Company. Changes are in *italics*.

1. MG SET SHAFTING FAILURE
    a. Vendor: XYZ Company
    b. Summary: The motor shaft on the south Finishing Mill MG Set failed. This also damaged the north motor pedestal/bearing and the north generator.
    c. Status: Work is complete and all materials except for the pedestal have been delivered. <u>This is the only outstanding item on this job.</u>

2. MG #1 GENERATOR SWAP
    a. Vendor: TBD
    b. Summary: The MG Set generators all have low megger readings. The insulation is over 50 years old and well past its life time. There are 2 newly rewound generators, one in the Motor Room and one at RST Company. They are to be installed in MG #1 and the MG #1 generators moved to MG #3 for storage and eventual rewind. This is planned for the October 2008 outage.
    c. Status: An RFQ has been issued. *Responses need to be evaluated*.

3. F10 ARMATURE CHANGE AND REPAIR
    a. Vendor: TBD
    b. Summary: The coupling has slipped, the inside string band is broken and the slot wedges have been damaged. The armature should be changed and this one sent out for repair. Repair will probably be wash & bake, clean up the coupling/keyway and pull the commutator to fix the string band. The coupling will probably need to be repaired too.
    c. Status: This needs to be done in 5 turns using round-the-clock coverage for the on-site work. A new RFQ will be issued.

4. BEARING INVENTORY SYSTEM
    a. Vendor: None – In house
    b. Summary: Several recent incidents demonstrated the need to have better control of spare bearings used in large motors in the HSM. They have been re-located to a single area (the Annex) and measuring equipment requested to determine the sizes. This is important because micrometers from both the HSM Roll Shop and the ERS were defective and there was no way to determine bearing or journal sizes during recent work on F10.
    c. Status: The bearings have been re-located and micrometers requested.

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5. RR STUB SHAFT BOLT CHANGE
    a. Vendor: N/A
    b. Summary: The bolts that hold the stub shaft on to armature on the Reversing Rougher motors have been shown to be subject to fatigue failure and should be replaced every 5 years. They should be replaced now to establish a baseline.
    c. Status: Develop an RFQ to procure and install bolts during the October 2008 outage.

6. STAND 11 MOTOR REWIND
    a. Vendor: TBD
    b. Summary: The motor insulation resistance is much less than 0.1 Megohm and dry-ice cleaning had to be stopped because the insulation was coming off in flakes. The motor needs a complete rewind and the spare should be installed.
    c. Status: Quotes were solicited and a recommendation to use Keystone for removal, repair and installation after repair was made on February 28, 2007 but was never performed due to scheduling difficulties. It will be re-bid due to significant changes in copper prices.

7. RECIRC PUMP MOTOR #3 CHANGE
    a. Vendor: TBD
    b. Summary: There pump has experienced several hard-to-explain failures. The most likely causes are either alignment or soft-foot. A motor change with greater than normal attention to these areas is to be performed.
    c. Status: *The pump and motor have been changed.*

8. 5 TRIMMER TENSION REEL MOTOR
    a. Vendor: MNO Company
    b. Summary: The armature failed due to poor workmanship in the last rewind. The failure caused a fire and burnt one field coil. Mismatched field coils were identified and the brush arms were missing on the spare and had to be cannibalized from the in-service motor.
    c. Status: *MNO Company has the motor and has begun repairs. Some covers are missing and MNO Company is preparing a price to fabricate new ones.*

9. RR MOTOR THRUST BEARINGS
    a. Vendor: XYZ Company
    b. Summary: The bottom drive thrust bearings were damaged by thrusting caused by a bad spindle knuckle. That problem has been repaired but the damaged bearings still need to be replaced.
    c. Status: Keystone is repairing the bearings and will install them.

10. SPARE MOTOR ACQUISITION
    a. Vendor: TBD
    b. Summary: Required spare motors have been identified based on quantities installed and spares on hand.
    c. Status: Quotes for new and/or reconditioned motors are being solicited.

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11. OTHER STUFF – In addition to these projects, there are several other areas that need attention.
    a. Some of the things that needed to be moved got moved last week but there is still more stuff marked 'MOVE TO 56 MOTOR ROOM' in the south end of the Annex. Could somebody move this?
    b. The spare Skin Pass Mill Tension Reel Motor (BS# TD09) frame halves are still rotting in the 56 Motor Room at column 16 since being moved there over one year ago. Could somebody please move them back to the Annex at column 55? The armature and covers are still there.
    c. Handling procedures for large armatures are being reviewed. The current lifting beam for the RR armatures shouldn't be used on the inboard armatures. I'm pricing new beams and exploring what hardware is available on site.
    d. The stub shaft bolts on the Reversing Rougher armatures are subject to fatigue failure. They should be replaced. Most of these bolts have been replaced on the top east motor and a new fastener was designed and purchased in 1995 but never installed. Calculations show that the alternating stress in the bolts is above the endurance limit so that fatigue failures are likely. Early indications are that the replacement bolts will fair no better. Since bigger bolts aren't an option without a redesign, the solution may become changing the bolts every 5 years.
    e. The spare F10 motor, HO29, has mismatched frame halves. A repair plan needs to be developed. A letter outlining options has been submitted.
    f. *The Exciter MG Set has two problems that should be repaired together if it is going to be in service for the foreseeable future. Both generator commutator should be turned and undercut. This could be done in place.*
        i. *The generator exciter commutator is in poor condition resulting in high selectivity of the brushes (most of the current is going through just a few of the brushes).*
        ii. *The motor exciter generator has a bad high bar and is arcing.*

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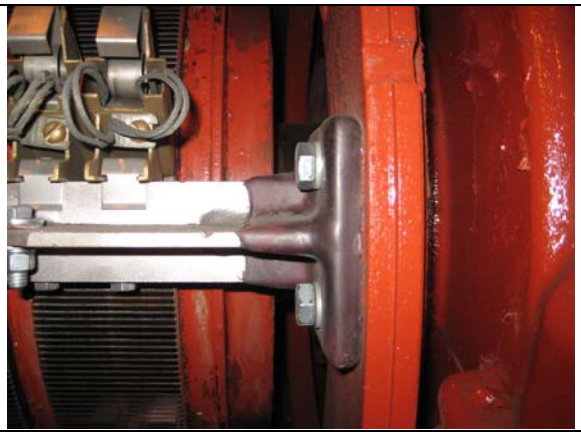
Subject: 5TS TENSION REEL MOTOR REPAIR-BRUSH ARM ISOLATION

Comments: The GE design for this motor included a hardened rubber coating on the brush arms that provided electrical isolation. Several of these arms were missing from the spare motor and had to be scavenged from the failed motor. Replacements were very expensive due to the rubber coating so the isolation was re-designed by Hannon and new arms were fabricated. The isolation consists of a micarta backing plate, micarta bushings over the threads and micarta washers under the nuts.

	
ORIGINAL DESIGN	NEW DESIGN

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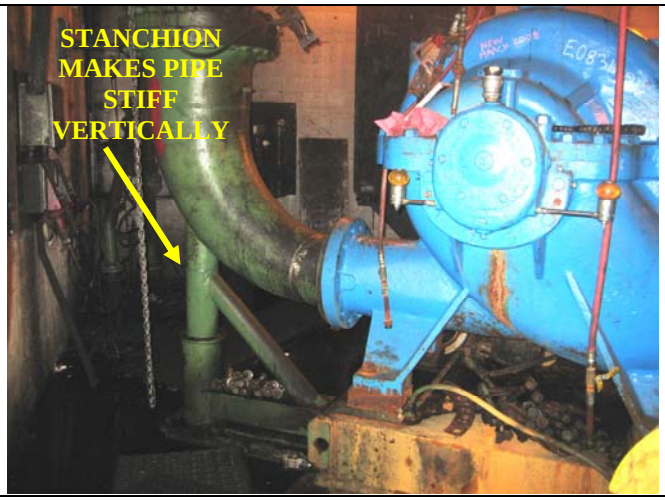
SUBJECT: Recirc Pump #3

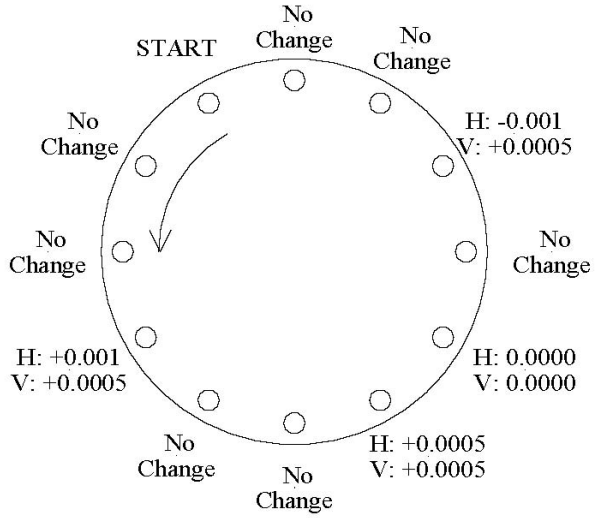
COMMENTS: The suction flange bolts were removed and the pipe misalignment inspected as the pump was being changed. Misalignment was 1/8 to 3/16 inches radially and axially. The pump shaft motion relative to the motor shaft was measured as the flange bolts were loosened. There was significant motion although the amount is about the same as misalignment tolerances. The cumulative affect of this, thermal expansion and alignment tolerance may be enough to cause some trouble but this isn't definitive proof. RAM is concerned with internal distortion but the bearing supports are stiff enough relative to their supports that this doesn't seem likely.



RECIRC SUCTION PIPE

RADIAL MISALIGNMENT

AXIAL MISALIGNMENT



SHAFT MOTION AS SUCTION FLANGE BOLTS WERE LOOSENED