Date: January 25, 2021

From: Lionel Weseen, Senior Maintenance Supervisor

Subject: 1570 dragline electrical system

Unit: BE (CAT) 1570 dragline, S/N 136019 Year 1978

Original electrics were GE

2 MG sets

3000 HP synchronous motors, 1045 GE generators (2 shunt field) 4 each Hoist and Drag with GE 824 motors. Swing has 4 GE641 generators with 4 820 vertical motors. Propel uses 4 motors electrically synchronized using the drag generators through a transfer switch.

Synch motors are 6.9KV complete with updated Allan-Bradley vacuum contactors

2 Auxiliary transformers 6.9kv to 480 vac 750 KVA. Eaton MCC (Installed 2008). Transformers have been upgraded from 2 banks of 3 oil filled transformers to 2 3 phase dry type transformers.

MG set soft starts using a generator as a motor to bring the set up to speed and then energizing the synch motor stator. Synch motor field control is currently set up to control voltage swing. Rotor supply is with Siemens converters (DCS upgrade). There are 2 separate drives, one for each rotor, vs the original shared exciter.

There is a separate isolator for a separate 6.9 to 240/120 lighting transformer. This was added to allow high voltage isolation and still have the lights and convivence receptacles energized.

Lighting has been upgraded on the boom and inside the house

Lighting panels have been upgraded

All controls are done through Allan-Bradly Controllogix PLC's with DCS programming.

Operator interface is done through Allan Bradley 'Panelview' HMI touch screens

The seat and master switches have been updated to joysticks (replaced foot pedals with joystick)

Generators and motors have been overhauled on a regular basis and have recent brush box and spring changes. The schedule was staggered to avoid too much work at one time, so life is varied across the equipment

Armature Drives are all Siemens convertors programmed by DCS with isolating transformers

Motor field control is variable through a static motor field package of Siemens converters with separate Eaton MCC and isolation transformers.

Control improvements include:

- Boom protection (anti-tightline)
- Cold weather derating to help with boom structure and commutation in cold weather
- Boom air pressure monitoring for cracks automation thru the panalview
- Many DCS innovations to help maintenance troubleshoot.
- Auto-lube system controlled by PLC and monitored by Panelview in cab and remotely in the house

Pegasus dragline monitoring system

Trail cable voltage is 6.9KV (8KV equipment)

Protection relays have been upgraded to Startco MPS and MPU relays

Annunciation is through the panalview which provides superior operator information.

Drum cameras and rear cameras tied into a monitor in the cab to help the operator