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October 14, 2022

NUCOR Melt Shop

Subject: October 2022 vibration survey

Below is a summary report for the Melt Shop monthly vibration survey that was performed on 10/11/22. Most of the machines surveyed were found to be in good condition except for the following:

QualiTest® uses a four-step rating system for defects.

Class I: Defect is present, but effect on reliability is not clear; no immediate action is required. Continue to normally monitor.

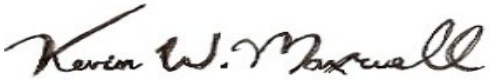
Class II: Defect (s) present that may cause problem in long term (2-6 months). Repair during normal maintenance scheduling. Continue to monitor.

Class III; Defect (s) present that may cause failure in short term (less than 2 months). This should be addressed as soon as practical, with a high maintenance priority. Increase monitoring frequency.

Class IV; Defect (s) present that makes continued reliability unpredictable, and possibility of secondary damage is high. Repairs should be made ASAP. An unscheduled shutdown should be considered for repairs

As always, it has been a pleasure to serve NUCOR Steel Flowood-Jackson, MS. If there are any comments or questions, do not hesitate to contact us.

Sincerely,



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Defects

West Caster Mold Water Pump

2 x rpm vibration is present in in motor and pump. This indicates angular misalignment. Motor and pump may also have some internal wear. Perform a precision alignment with less than .003" offset and angularity (rim and face). Ensure there is no soft foot present in the motor. Rated as a **CLASS II** defect.

East Caster Mold Water Pump

Pump is still showing some signs of internal wear. Coupling is also showing signs of wear likely due to misalignment. Perform a precision alignment with less than .002" offset and angularity. Ensure there is no soft foot present. Rated as a **CLASS II** defect.

Cooling Tower #3 Supply Pump

Pump was down this survey; however, the following still applies: The pump appears to have cavitation which is causing a high noise floor in the spectrum. This is also making the ODE pump bearing have high acceleration. This could also be a bearing issues, but the noise floor is masking the data somewhat. Pump impeller or other pump internals could also be worn which could be causing this vibration. Pump needs to be inspected as time allows. Rated as a **CLASS II** defect.

Cooling Tower Pump #5

Pump was recently replaced; however, data still shows high 1 x rpm axial vibration in the pump. Pump impeller/shaft could be out of balance or pump has cocked bearing or some other internal misalignment. Inspect as time allows. Rated as a **CLASS II** defect.

Cooling Tower #6 Supply Pump

The pump vibration data is still indicating that there is bearing wear, and possibly cavitation in the pump. Inspect ODE pump bearing SOON. Ensure the pump has no inlet restrictions and is operating in the correct part of the curve. Impeller may have excessive wear. Rated as a **CLASS II** defect.

2nd Deck Hyd. Pumps

North and south pumps have some high vibrations. Pumps have significant hydraulic passing frequencies with some high 1 x rpm vibration in pump verticals. Maybe a loading issue or flow issue. But may also be some internal wear of pumps. Ensure filters aren't clogged and pumps are operating at normal flow. Rated as **CLASS II** defects.

Caster ID Baghouse Fan

Motor inboard vertical and DE fan waveform data still shows an impacting or knock type vibration. DE fan bearing data is showing some bearing defect frequencies particularly the inner race and ball pass frequencies. Vibration signatures changed on both motor DE and fan DE between May and June data while motor was changed out sometime between. De fan bearing may have also had some work done during that time. For now, it is recommended to change DE fan bearing and pull back coupling flanges on motor shaft and fan shaft inspecting coupling gear hubs. Rated as a **CLASS II** defect.

Spray Chamber Exhaust Fan

Motor and fan have high fan speed vibration. Outboard fan bearing is showing signs of defects/wear. Inspect fan bearings especially the ODE fan bearing for defects and proper lubrication as soon as practical. This unit is very likely operating near a critical speed and is resonant which is likely influencing the high vibration in the motor and fan. Fan also has some imbalance likely caused by build-up. Because of the high vibration amplitudes, this is rated as a **CLASS III** defect.

South Caster Hyd. Pump

Pump had high 1 x rpm vibration this month. Could be a loading issue with pump. For now, ensure pump is operating at normal pressures. Coupling may need to be inspected as well .Rated as a **CLASS II** defect.

South Caster Oscillator

This unit has visible axial movement of the input of the gear drive. You can see the movement at the coupling gap. Data of the gear drive does show some gear noise and this unit seems to be knocking worse than the other two drives. Inspect unit as scheduling allows. Rated as a **CLASS II** defect.

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                Abbreviated Last Measurement Summary
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          Database:  nucorja9.rbm
          Station:   Melt Shop

MEASUREMENT POINT             OVERALL LEVEL        HFD / VHFD
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WCMWP      - WEST CASTER MOLD WATER PUMP    (11-Oct-22)
                              OVERALL LEVEL     1K-20KHz
       MOH                     .395 In/Sec       .701 G-s
       MIH                     .321 In/Sec      1.275 G-s
       MIA                     .369 In/Sec       .906 G-s
       PIA                     .393 In/Sec      1.100 G-s
       PIH                     .220 In/Sec      1.389 G-s
       POH                     .260 In/Sec      1.573 G-s

MCMWP      - MID CASTER MOLD WATER PUMP     (11-Oct-22)
                              OVERALL LEVEL     1K-20KHz
       MOH                     .098 In/Sec       .830 G-s
       MIH                     .150 In/Sec       .530 G-s
       MIA                     .244 In/Sec       .501 G-s
       PIA                     .275 In/Sec      1.340 G-s
       PIH                     .165 In/Sec      1.242 G-s
       POH                     .230 In/Sec      1.247 G-s

WBOSTRP    - WEST Booster PUMP              (11-Oct-22)
                              OVERALL LEVEL     1K-20KHz
       MOH                     .047 In/Sec       .328 G-s
       MIH                     .038 In/Sec       .254 G-s
       MIA                     .030 In/Sec       .218 G-s
       PIA                     .077 In/Sec       .482 G-s
       PIH                     .105 In/Sec       .451 G-s
       POH                     .190 In/Sec      1.174 G-s

ECSWP 1LFT - EAST CASTER SPRAY WP 1 LEFT    (11-Oct-22)
                              OVERALL LEVEL     1K-20KHz
       MOH                     .091 In/Sec       .243 G-s
       MIH                     .075 In/Sec       .323 G-s
       MIA                     .077 In/Sec       .173 G-s

MCSWP 2LFT - MID CASTER SPRAY WP 2 LEFT     (11-Oct-22)
                              OVERALL LEVEL     1K-20KHz
       MOH                     .118 In/Sec       .348 G-s
       MIH                     .084 In/Sec       .562 G-s
       MIA                     .099 In/Sec       .388 G-s

MCSWP 3RT  - MID CASTER SPRAY WP 3 RIGHT    (11-Oct-22)
                              OVERALL LEVEL     1K-20KHz
       MOH                     .163 In/Sec       .639 G-s
       MIH                     .116 In/Sec      1.210 G-s
       MIA                     .101 In/Sec       .354 G-s
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ESERVOHYDP - EAST SERVO Hyd PUMP (11-Oct-22)

	OVERALL LEVEL	1K-20KHz
MOH	.025 In/Sec	.140 G-s
MIH	.065 In/Sec	.138 G-s
PIV	.128 In/Sec	.461 G-s

MSERVOHYDP - MIDDLE SERVO Hyd PUMP (11-Oct-22)

	OVERALL LEVEL	1K-20KHz
MOH	.141 In/Sec	.256 G-s
MIH	.095 In/Sec	.167 G-s
PIV	.161 In/Sec	.614 G-s

N2DECKHYDP - North 2ND DECK Hyd PUMP (11-Oct-22)

	OVERALL LEVEL	1K-20KHz
MOH	.160 In/Sec	1.207 G-s
MIH	.160 In/Sec	2.573 G-s
PIV	.702 In/Sec	10.84 G-s

2DEKRECIP - 2ND DECK L&S Hyd RECIRC PUM (11-Oct-22)

	OVERALL LEVEL	1K-20KHz
MOH	.224 In/Sec	1.478 G-s
MIH	.143 In/Sec	1.101 G-s
PIV	.377 In/Sec	4.302 G-s

S2DECKHYDP - SOUTH 2ND DECK Hyd PUMP (11-Oct-22)

	OVERALL LEVEL	1K-20KHz
MOH	.307 In/Sec	.441 G-s
MIH	.331 In/Sec	8.021 G-s
PIV	.813 In/Sec	5.373 G-s

1SUPLYP - #1 Supply Pump (11-Oct-22)

	OVERALL LEVEL	1K-20KHz
MOH	.057 In/Sec	.253 G-s
MIH	.065 In/Sec	.204 G-s
MIA	.071 In/Sec	.122 G-s
PIA	.267 In/Sec	1.218 G-s
PIH	.205 In/Sec	.819 G-s
POH	.187 In/Sec	1.093 G-s

4SUPLYP - #4 Supply Pump (11-Oct-22)

	OVERALL LEVEL	1K-20KHz
MOH	.055 In/Sec	.707 G-s
MIH	.056 In/Sec	.780 G-s
MIA	.081 In/Sec	.291 G-s
PIA	.180 In/Sec	.590 G-s
PIH	.145 In/Sec	.611 G-s
POH	.176 In/Sec	.638 G-s

5SUPLYP - #5 Supply Pump (11-Oct-22)

	OVERALL LEVEL	1K-20KHz
MOH	.044 In/Sec	.598 G-s
MIH	.070 In/Sec	.880 G-s
MIA	.148 In/Sec	.314 G-s
PIA	.624 In/Sec	.616 G-s
PIH	.220 In/Sec	.976 G-s
POH	.353 In/Sec	.762 G-s

6SUPLYP - #6 Supply Pump (11-Oct-22)

	OVERALL LEVEL	1K-20KHz
MOH	.042 In/Sec	.159 G-s
MIH	.059 In/Sec	.184 G-s
MIA	.073 In/Sec	.176 G-s
PIA	.153 In/Sec	.605 G-s
PIH	.175 In/Sec	.740 G-s
POH	.220 In/Sec	1.439 G-s

CBID - CASTER BAGHOUSE ID FAN (12-Oct-22)

	OVERALL LEVEL	1K-20KHz
MOH	.100 In/Sec	.225 G-s

MOV	.067 In/Sec	.197 G-s
MIH	.119 In/Sec	.317 G-s
MIV	.095 In/Sec	.397 G-s
MIA	.069 In/Sec	.222 G-s
FIA	.161 In/Sec	1.614 G-s
FIH	.212 In/Sec	3.209 G-s
FIV	.129 In/Sec	2.395 G-s
FOH	.244 In/Sec	1.770 G-s
FOV	.051 In/Sec	1.274 G-s
FOA	.087 In/Sec	1.739 G-s

Clarification Of Vibration Units:

Acc --> G-s RMS

Vel --> In/Sec PK