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August 30, 2021

NUCOR Melt Shop

Subject: August 2021 vibration survey

Below is a summary report for the Melt Shop monthly vibration survey that was performed on 8/27/21. 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.

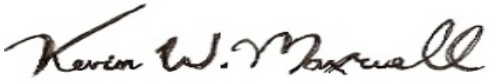
Class II: Defect (s) present that may cause problem in long term (2-6 months). Repair during normal maintenance scheduling. Continue to monitor.

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

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

East Caster Mold Water Pump

Pump was down this survey; however, the following still applies: 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.

West Caster Spray Water Pump

Motor data shows defects are present in the motor bearings. Motor will likely need attention in the next couple of months. We will monitor this closely. Rated as a **CLASS II** defect for now.

Cooling Tower #2 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 may 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 #3 Supply Pump

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 #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. Rated as a **CLASS II** defect.

Caster ID Baghouse Fan

Fan inboard axial has several sidebands peaks around 2 x outer race defect frequency. With this bearing being a split race bearing, this may indicate an internal issue of the bearing. Drive end split race bearing should be internally inspected soon. Rated as a **CLASS II** defect.

East Furnace Bag House Fan

Vibration of the motor is starting to show definite electrical vibration peaks in the motor spectra. We need more information on this motor to determine what the issue may be. We need number of stator slots and number rotor bars to help identify the harmonic peaks in the spectra. For now, this is rated as a **CLASS I** defect.

Spray Chamber Exhaust Fan

Motor and fan still 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. Because of the high vibration amplitudes, this is rated as a **CLASS III** 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
              Route No.  1:  MELT SHOP

       MEASUREMENT POINT             OVERALL LEVEL       HFD / VHFD
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       WCMWP      - WEST CASTER MOLD WATER PUMP   (26-Aug-21)
                                     OVERALL LEVEL     1K-20KHz
              MOH                     .119 In/Sec       .605 G-s
              MIH                     .135 In/Sec      1.079 G-s
              MIA                     .166 In/Sec       .969 G-s
              PIA                     .381 In/Sec      1.476 G-s
              PIH                     .163 In/Sec       .953 G-s
              POH                     .176 In/Sec      1.132 G-s

       MCMWP      - MID CASTER MOLD WATER PUMP    (26-Aug-21)
                                     OVERALL LEVEL     1K-20KHz
              MOH                     .111 In/Sec       .436 G-s
              MIH                     .108 In/Sec       .556 G-s
              MIA                     .202 In/Sec       .539 G-s
              PIA                     .162 In/Sec      1.219 G-s
              PIH                     .143 In/Sec      1.102 G-s
              POH                     .125 In/Sec      1.036 G-s

       WBOSTRP    - WEST Booster PUMP             (26-Aug-21)
                                     OVERALL LEVEL     1K-20KHz
              MOH                     .037 In/Sec       .253 G-s
              MIH                     .037 In/Sec       .385 G-s
              MIA                     .031 In/Sec       .217 G-s
              PIA                     .073 In/Sec       .557 G-s
              PIH                     .082 In/Sec       .276 G-s
              POH                     .109 In/Sec       .661 G-s

       ECSWP 1LFT - EAST CASTER SPRAY WP 1 LEFT   (26-Aug-21)
                                     OVERALL LEVEL     1K-20KHz
              MOH                     .181 In/Sec       .540 G-s
              MIH                     .108 In/Sec       .748 G-s
              MIA                     .105 In/Sec       .608 G-s

       MCSWP 2LFT - MID CASTER SPRAY WP 2 LEFT    (26-Aug-21)
                                     OVERALL LEVEL     1K-20KHz
              MOH                     .154 In/Sec       .243 G-s
              MIH                     .079 In/Sec       .463 G-s
              MIA                     .105 In/Sec       .317 G-s

       WCSWP 4RT  - WEST CASTER SPRAY WP 4 RIGH   (26-Aug-21)
                                     OVERALL LEVEL     1K-20KHz
              MOH                     .127 In/Sec       .463 G-s
              MIH                     .094 In/Sec       .882 G-s
              MIA                     .125 In/Sec       .696 G-s

       ESERVOHYDP - EAST SERVO Hyd PUMP           (26-Aug-21)
                                     OVERALL LEVEL     1K-20KHz
              MOH                     .033 In/Sec       .150 G-s
              MIH                     .057 In/Sec       .230 G-s
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PIV		.173 In/Sec	.571 G-s

WSERVOHYDP - WEST SERVO Hyd PUMP (26-Aug-21)

	OVERALL LEVEL	1K-20KHz
MOH	.081 In/Sec	.150 G-s
MIH	.074 In/Sec	.263 G-s
PIV	.172 In/Sec	.888 G-s

SERVOHRECP - SERVO Hyd RECIRC PUMP (26-Aug-21)

	OVERALL LEVEL	1K-20KHz
MOH	.078 In/Sec	.139 G-s
MIH	.085 In/Sec	.700 G-s
PIV	.145 In/Sec	1.027 G-s

N2DECKHYDP - North 2ND DECK Hyd PUMP (26-Aug-21)

	OVERALL LEVEL	1K-20KHz
MOH	.043 In/Sec	.499 G-s
MIH	.121 In/Sec	.243 G-s
PIV	.271 In/Sec	.689 G-s

2DEKRECIP - 2ND DECK L&S Hyd RECIRC PUM (26-Aug-21)

	OVERALL LEVEL	1K-20KHz
MOH	.084 In/Sec	.350 G-s
MIH	.093 In/Sec	.772 G-s
PIV	.288 In/Sec	2.185 G-s

S2DECKHYDP - SOUTH 2ND DECK Hyd PUMP (26-Aug-21)

	OVERALL LEVEL	1K-20KHz
MOH	.098 In/Sec	.724 G-s
MIH	.061 In/Sec	.458 G-s
PIV	.136 In/Sec	.783 G-s

1SUPLYP - #1 Supply Pump (26-Aug-21)

	OVERALL LEVEL	1K-20KHz
MOH	.058 In/Sec	.221 G-s
MIH	.072 In/Sec	.164 G-s
MIA	.071 In/Sec	.097 G-s
PIA	.225 In/Sec	1.175 G-s
PIH	.186 In/Sec	.698 G-s
POH	.197 In/Sec	.561 G-s

3SUPLYP - #3 Supply Pump (26-Aug-21)

	OVERALL LEVEL	1K-20KHz
MOH	.053 In/Sec	.369 G-s
MIH	.077 In/Sec	1.071 G-s
MIA	.069 In/Sec	.507 G-s
PIA	.208 In/Sec	.289 G-s
PIH	.146 In/Sec	.516 G-s
POH	.257 In/Sec	1.716 G-s

4SUPLYP - #4 Supply Pump (26-Aug-21)

	OVERALL LEVEL	1K-20KHz
MOH	.058 In/Sec	.238 G-s
MIH	.062 In/Sec	.802 G-s
MIA	.089 In/Sec	.292 G-s
PIA	.209 In/Sec	.594 G-s
PIH	.180 In/Sec	.744 G-s
POH	.196 In/Sec	.768 G-s

6SUPLYP - #6 Supply Pump (26-Aug-21)

	OVERALL LEVEL	1K-20KHz
MOH	.049 In/Sec	.212 G-s
MIH	.069 In/Sec	.212 G-s
MIA	.080 In/Sec	.169 G-s
PIA	.181 In/Sec	.862 G-s
PIH	.208 In/Sec	.626 G-s
POH	.220 In/Sec	1.495 G-s

CBRA - CASTER BAGHOUSE REVERSE AIR (27-Aug-21)

	OVERALL LEVEL	1K-20KHz

MOH	.075 In/Sec	.236 G-s
MIH	.071 In/Sec	.209 G-s
MIA	.036 In/Sec	.071 G-s
FIH	.061 In/Sec	.240 G-s
FOH	.139 In/Sec	.180 G-s

CBID - CASTER BAGHOUSE ID FAN (27-Aug-21)

	OVERALL LEVEL	1K-20KHz
MOH	.063 In/Sec	.059 G-s
MOV	.044 In/Sec	.090 G-s
MIH	.068 In/Sec	.099 G-s
MIV	.047 In/Sec	.183 G-s
MIA	.035 In/Sec	.205 G-s
FIA	.267 In/Sec	1.738 G-s
FIH	.120 In/Sec	1.833 G-s
FIV	.080 In/Sec	1.073 G-s
FOH	.136 In/Sec	.568 G-s
FOV	.027 In/Sec	.412 G-s
FOA	.087 In/Sec	.441 G-s

FRAF - Furnace REVERSE AIR Fan (27-Aug-21)

	OVERALL LEVEL	1K-20KHz
MOH	.049 In/Sec	.178 G-s
MIH	.050 In/Sec	.672 G-s
MIA	.045 In/Sec	.168 G-s
FIA	.036 In/Sec	.276 G-s
FIH	.046 In/Sec	.685 G-s
FOH	.032 In/Sec	.391 G-s

EFBHF - East Furnace Bag House Fan (27-Aug-21)

	OVERALL LEVEL	1K-20KHz
MOH	.056 In/Sec	.372 G-s
MIH	.083 In/Sec	1.004 G-s
MIA	.050 In/Sec	.682 G-s
FIA	.074 In/Sec	.502 G-s
FIH	.099 In/Sec	.582 G-s
FOH	.091 In/Sec	.836 G-s

WFBHF - WEST Furnace Bag House Fan (27-Aug-21)

	OVERALL LEVEL	1K-20KHz
MOH	.081 In/Sec	.556 G-s
MIH	.113 In/Sec	.324 G-s
MIA	.129 In/Sec	.471 G-s
FIA	.127 In/Sec	.858 G-s
FIH	.138 In/Sec	1.331 G-s
FOH	.101 In/Sec	.721 G-s

SCEXFAN - SPRAY CHAMBER EXHAUST Fan (27-Aug-21)

	OVERALL LEVEL	1K-20KHz
MOH	2.407 In/Sec	.874 G-s
MIH	2.743 In/Sec	.575 G-s
MIA	1.782 In/Sec	.510 G-s
FIH	.892 In/Sec	.400 G-s
FOH	.834 In/Sec	.845 G-s

Clarification Of Vibration Units:

Acc --> G-s RMS

Vel --> In/Sec PK