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December 15, 2023

NUCOR Melt Shop

Subject: December 2023 vibration survey

Below is a summary report for the Melt Shop monthly vibration survey that was performed on 12/11/23. 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,

Kevin W. Maxwell

ISO Certified Vibration Analyst, Category III

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Defects

Middle Caster Mold Water Pump
Vibration data shows issues in the pump. Data suggests looseness/wear of the pump bearings/fits. Impeller and other pump internals may also have wear. The pump will likely need attention soon. Rated as a **CLASS II** defect.

Servo Hyd. Recirc. Pump
The pump still has higher than average vibration. Spectral data shows harmonics of hydraulic vane frequency. This may be due to internal pump wear and or flow issue. Rated as a **CLASS II** defect.

Middle 2nd Deck Hyd. Pump
Pump was down this survey; however, the following still applies: The hyd. Pump has had a significant increase in vibration. Data shows vibration to be 1 x rpm with overall amplitude over 1.4 ips. Check coupling and ensure pump is operating properly. Rated a **CLASS III** defect.

North 2nd Deck Hyd. Pump
Spectral data shows harmonics of hydraulic vane frequency. This may be due to internal pump wear and or flow issue. Rated as a **CLASS II** defect.

Cooling Tower Pump #5
Pump was down this survey; however, the following still applies: Data still shows high 1 x rpm axial vibration in the pump. Pump impeller/shaft could be out of balance or bent. Pump could also have cocked bearing or some other internal misalignment. Inspect as time allows. Rated as a **CLASS II** defect.

Cooling Tower Pump #4
Pump data shows some signs of bearing defects/wear in the ODE pump bearing. Inspect pump as scheduling allows. Rated as a **CLASS II** defect.

Cooling Tower #6 Supply Pump
The pump vibration data still indicates 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.

Caster ID Baghouse Fan
ODE fan bearing spectral data is showing some non-synchronous peaks present with a high noise floor. These are indications of bearing issues such as defects and wear. Motor and fan inboard vertical data also still shows some impacting. It is recommended to inspect/replace ODE fan bearing and inspect gear couplings as time allows. We will continue to monitor this closely. Rated as a **CLASS II** defect.

Furnace Reverse Air Fan
The impacting vibration in fan bearings was not present this survey. Last month, the fan shaft appeared to have visible movement especially at the outboard (ODE) fan bearing. We will continue to monitor this issue closely. Rated as a **CLASS I** defect.

West Furnace Baghouse Fan
It appears that the drive motor has been changed since last survey. New data shows an increase in 2 x rpm vibration. This usually is an indication of an alignment and or coupling issue. Vibration is not at an alarm level yet, so this is a **CLASS I** defect.

Spray Chamber Exhaust Fan

Motor and fan both have increased vibration. Belts could be slipping which is allowing the motor to operate at speeds near a resonance which causing high 1 x fan rpm vibration in the unit. Inspect belt tension soon. Rated as a **CLASS II** defect.

North 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   (11-Dec-23)
                              OVERALL LEVEL     1K-20KHz
       MOH                     .042 In/Sec       .141 G-s
       MIH                     .059 In/Sec       .227 G-s
       MIA                     .061 In/Sec       .141 G-s
       PIA                     .139 In/Sec       .573 G-s
       PIH                     .095 In/Sec       .572 G-s
       POH                     .138 In/Sec       .448 G-s

MCMWP      - MID CASTER MOLD WATER PUMP    (11-Dec-23)
                              OVERALL LEVEL     1K-20KHz
       MOH                     .121 In/Sec       .328 G-s
       MIH                     .142 In/Sec       .499 G-s
       MIA                     .219 In/Sec       .459 G-s
       PIA                     .336 In/Sec      2.335 G-s
       PIH                     .197 In/Sec      2.330 G-s
       POH                     .227 In/Sec      2.791 G-s

EBOSTRP    - EAST Booster PUMP             (11-Dec-23)
                              OVERALL LEVEL     1K-20KHz
       MOH                     .042 In/Sec       .242 G-s
       MIH                     .045 In/Sec       .272 G-s
       MIA                     .054 In/Sec       .149 G-s
       PIA                     .183 In/Sec       .089 G-s
       PIH                     .076 In/Sec       .088 G-s
       POH                     .062 In/Sec       .144 G-s

ECSWP 1LFT - EAST CASTER SPRAY WP 1 LEFT   (11-Dec-23)
                              OVERALL LEVEL     1K-20KHz
       MOH                     .331 In/Sec       .235 G-s
       MIH                     .067 In/Sec       .253 G-s
       MIA                     .148 In/Sec       .048 G-s

MCSWP 2LFT - MID CASTER SPRAY WP 2 LEFT    (11-Dec-23)
                              OVERALL LEVEL     1K-20KHz
       MOH                     .175 In/Sec       .706 G-s
       MIH                     .100 In/Sec       .557 G-s
       MIA                     .085 In/Sec       .193 G-s

MCSWP 3RT  - MID CASTER SPRAY WP 3 RIGHT   (11-Dec-23)
                              OVERALL LEVEL     1K-20KHz
       MOH                     .398 In/Sec       .614 G-s
       MIH                     .136 In/Sec       .181 G-s
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MIA	.098 In/Sec	.310 G-s	

ESERVOHYDP - EAST SERVO Hyd PUMP (11-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.023 In/Sec	.146 G-s
MIH	.050 In/Sec	.149 G-s
PIV	.157 In/Sec	.543 G-s

WSERVOHYDP - WEST SERVO Hyd PUMP (11-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.180 In/Sec	.329 G-s
MIH	.118 In/Sec	.870 G-s
PIV	.166 In/Sec	1.266 G-s

SERVOHRECP - SERVO Hyd RECIRC PUMP (11-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.115 In/Sec	.085 G-s
MIH	.103 In/Sec	1.090 G-s
PIV	.258 In/Sec	2.042 G-s

N2DECKHYDP - North 2ND DECK Hyd PUMP (11-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.080 In/Sec	.707 G-s
MIH	.084 In/Sec	.744 G-s
PIV	.252 In/Sec	5.448 G-s

2DEKRECIP - 2ND DECK L&S Hyd RECIRC PUM (11-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.085 In/Sec	.770 G-s
MIH	.117 In/Sec	.606 G-s
PIV	.267 In/Sec	2.789 G-s

S2DECKHYDP - SOUTH 2ND DECK Hyd PUMP (11-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.118 In/Sec	.578 G-s
MIH	.122 In/Sec	1.081 G-s
PIV	.217 In/Sec	3.770 G-s

1SUPLYP - #1 Supply Pump (11-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.062 In/Sec	.158 G-s
MIH	.071 In/Sec	.143 G-s
MIA	.078 In/Sec	.119 G-s
PIA	.351 In/Sec	.396 G-s
PIH	.233 In/Sec	.337 G-s
POH	.198 In/Sec	.392 G-s

2SUPLYP - #2 Supply Pump (11-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.057 In/Sec	.338 G-s
MIH	.051 In/Sec	.383 G-s
MIA	.072 In/Sec	.167 G-s
PIA	.160 In/Sec	.093 G-s
PIH	.185 In/Sec	.431 G-s

3SUPLYP - #3 Supply Pump (11-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.063 In/Sec	.802 G-s
MIH	.067 In/Sec	.817 G-s
MIA	.064 In/Sec	.435 G-s
PIA	.154 In/Sec	.251 G-s
PIH	.121 In/Sec	.270 G-s
POH	.169 In/Sec	1.064 G-s

4SUPLYP - #4 Supply Pump (11-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.041 In/Sec	.645 G-s
MIH	.048 In/Sec	.540 G-s
MIA	.054 In/Sec	.386 G-s
PIA	.174 In/Sec	.381 G-s

	PIH	.146 In/Sec	.570 G-s
	POH	.278 In/Sec	2.174 G-s

CBRA - CASTER BAGHOUSE REVERSE AIR (11-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.017 In/Sec	.115 G-s
MIH	.020 In/Sec	.273 G-s
MIA	.014 In/Sec	.102 G-s
FIH	.013 In/Sec	.145 G-s
FOH	.046 In/Sec	.071 G-s

CBID - CASTER BAGHOUSE ID FAN (11-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.088 In/Sec	.083 G-s
MOV	.041 In/Sec	.135 G-s
MIH	.067 In/Sec	.120 G-s
MIV	.066 In/Sec	.244 G-s
MIA	.035 In/Sec	.123 G-s
FIA	.122 In/Sec	1.187 G-s
FIH	.089 In/Sec	1.681 G-s
FIV	.086 In/Sec	1.135 G-s
FOH	.117 In/Sec	2.406 G-s
FOV	.062 In/Sec	2.858 G-s
FOA	.076 In/Sec	3.034 G-s

FRAF - Furnace REVERSE AIR Fan (11-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.060 In/Sec	.362 G-s
MIH	.047 In/Sec	.521 G-s
MIA	.029 In/Sec	.445 G-s
FIA	.048 In/Sec	.513 G-s
FIH	.057 In/Sec	.751 G-s
FOH	.038 In/Sec	.401 G-s
FOV	.035 In/Sec	.598 G-s

EFBHF - East Furnace Bag House Fan (11-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.049 In/Sec	.575 G-s
MIH	.066 In/Sec	.588 G-s
MIA	.029 In/Sec	.414 G-s
FIA	.076 In/Sec	.951 G-s
FIH	.087 In/Sec	1.169 G-s
FOH	.086 In/Sec	.521 G-s

WFBHF - WEST Furnace Bag House Fan (11-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.135 In/Sec	.261 G-s
MIH	.175 In/Sec	.222 G-s
MIA	.076 In/Sec	.431 G-s
FIA	.090 In/Sec	.816 G-s
FIH	.098 In/Sec	1.141 G-s
FOH	.112 In/Sec	.658 G-s

NCHYDP - North CASTER Hyd PUMP (11-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.101 In/Sec	.443 G-s
MIH	.096 In/Sec	.626 G-s
PIH	.296 In/Sec	.778 G-s

MIDCHYDP - MIDDLE CASTER Hyd PUMP (11-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.072 In/Sec	.340 G-s
MIH	.125 In/Sec	.351 G-s
PIH	.279 In/Sec	.716 G-s

SCEXFAN - SPRAY CHAMBER EXHAUST Fan (12-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.883 In/Sec	.066 G-s
MIH	.848 In/Sec	.067 G-s
MIA	.366 In/Sec	.043 G-s

	FIA	.409 In/Sec	.173 G-s
	FIH	.525 In/Sec	.172 G-s
	FOH	.597 In/Sec	.420 G-s

ENARCOHYDP - EAST NARCO Hyd PUMP (12-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.060 In/Sec	.053 G-s
MIH	.049 In/Sec	.082 G-s
PIV	.098 In/Sec	.227 G-s

NC OCILLA - North Caster Oscillator (12-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.149 In/Sec	.054 G-s
MIH	.160 In/Sec	.155 G-s
MIA	.121 In/Sec	.087 G-s
GIA	.089 In/Sec	.028 G-s
GIH	.116 In/Sec	.210 G-s
GOH	.106 In/Sec	.475 G-s

MC OCILLA - Middle Caster Oscillator (12-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.232 In/Sec	.065 G-s
MIH	.130 In/Sec	.029 G-s
MIA	.084 In/Sec	.052 G-s
GIA	.078 In/Sec	.025 G-s
GIH	.092 In/Sec	.075 G-s
GOH	.098 In/Sec	.101 G-s

SC OCILLA - South Caster Oscillator (12-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.065 In/Sec	.267 G-s
MIH	.056 In/Sec	.076 G-s
MIA	.044 In/Sec	.053 G-s
GIA	.049 In/Sec	.024 G-s
GIH	.041 In/Sec	.195 G-s
GOH	.044 In/Sec	.075 G-s

Clarification Of Vibration Units:

Acc --> G-s RMS

Vel --> In/Sec PK