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August 23rd, 2023

NUCOR Melt Shop

Subject: August 2023 vibration survey

Below is a summary report for the Melt Shop monthly vibration survey that was performed on 08/21/23. 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,

ISO Certified Vibration Analyst, Category III

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Defects

Middle Caster Mold Water Pump

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

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 #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.

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.

Caster ID Baghouse Fan

Motor DE and fan DE waveform data still shows an impacting or knock type vibration. DE motor vibration is slightly lower while the fan DE remains higher in amplitude. Waveform data shows the fan DE having the more pronounced impacting. 1-20 Khz high frequency magnitude trend shows DE fan to be lower this survey (still higher than average). Spectral data shows increased rpm harmonics and bearing frequencies. The DE fan bearing needs a visual inspection soon. The bearing may have defects/wear. 1 x rpm fan vibration is also higher especially at the ODE bearing. A trim balance or fan cleaning is recommended during next extended outage. Rated as a **CLASS III** defect.

Furnace Reverse Air Fan

The impacting seen in fan bearings was present again this survey. At the very least, the fan wheel and internal fan housing should be checked. Motor appears to have some early signs of bearing defects. According to trend data, the motor bearing issue is minor at this time. We will monitor this issue closely. Rated as a **CLASS II** defect.

Spray Chamber Exhaust Fan

Motor vibration is very excessive. Motor and fan have high fan speed vibration with motor having a much higher amplitude of vibration. 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 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.

Abbreviated Last Measurement Summary

Database: nucorja9.rbm
Station: Melt Shop

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD
WCMWP - WEST CASTER MOLD WATER PUMP (21-Aug-23)		
	OVERALL LEVEL	1K-20KHz
MOH	.111 In/Sec	.065 G-s
MIH	.137 In/Sec	.209 G-s
MIA	.185 In/Sec	.190 G-s
PIA	.289 In/Sec	.547 G-s
PIH	.231 In/Sec	.412 G-s
POH	.173 In/Sec	.559 G-s
ECMWP - EAST CASTER MOLD WATER PUMP (21-Aug-23)		
	OVERALL LEVEL	1K-20KHz
MOH	.062 In/Sec	.259 G-s
MIH	.096 In/Sec	.299 G-s
MIA	.042 In/Sec	.181 G-s
PIA	.137 In/Sec	2.095 G-s
PIH	.176 In/Sec	1.714 G-s
POH	.183 In/Sec	1.699 G-s
WBOSTRP - WEST Booster PUMP (21-Aug-23)		
	OVERALL LEVEL	1K-20KHz
MOH	.050 In/Sec	.245 G-s
MIH	.060 In/Sec	.319 G-s
MIA	.038 In/Sec	.283 G-s
PIA	.164 In/Sec	1.269 G-s
PIH	.191 In/Sec	2.076 G-s
POH	.383 In/Sec	3.765 G-s
ECSWP 1LFT - EAST CASTER SPRAY WP 1 LEFT (21-Aug-23)		
	OVERALL LEVEL	1K-20KHz
MOH	.190 In/Sec	.205 G-s
MIH	.069 In/Sec	.260 G-s
MIA	.088 In/Sec	.213 G-s
MCSWP 2LFT - MID CASTER SPRAY WP 2 LEFT (21-Aug-23)		
	OVERALL LEVEL	1K-20KHz
MOH	.127 In/Sec	.602 G-s
MIH	.101 In/Sec	.511 G-s
MIA	.128 In/Sec	.194 G-s
WCSWP 4RT - WEST CASTER SPRAY WP 4 RIGH (21-Aug-23)		
	OVERALL LEVEL	1K-20KHz
MOH	.112 In/Sec	.634 G-s
MIH	.093 In/Sec	.738 G-s
MIA	.096 In/Sec	.182 G-s
ESERVOHYDP - EAST SERVO Hyd PUMP (21-Aug-23)		
	OVERALL LEVEL	1K-20KHz
MOH	.027 In/Sec	.145 G-s
MIH	.063 In/Sec	.196 G-s
PIV	.174 In/Sec	.833 G-s
MSERVOHYDP - MIDDLE SERVO Hyd PUMP (21-Aug-23)		
	OVERALL LEVEL	1K-20KHz
MOH	.121 In/Sec	.226 G-s
MIH	.049 In/Sec	.170 G-s
PIV	.167 In/Sec	.447 G-s
SERVOHRECP - SERVO Hyd RECIRC PUMP (21-Aug-23)		
	OVERALL LEVEL	1K-20KHz
MOH	.113 In/Sec	.193 G-s

	MIH	.104 In/Sec	.851 G-s
	PIV	.172 In/Sec	1.307 G-s

N2DECKHYDP - North 2ND DECK Hyd PUMP (21-Aug-23)

	OVERALL LEVEL	1K-20KHz
MOH	.065 In/Sec	.269 G-s
MIH	.093 In/Sec	.468 G-s
PIV	.364 In/Sec	1.598 G-s

2DEKRECIP - 2ND DECK L&S Hyd RECIRC PUM (21-Aug-23)

	OVERALL LEVEL	1K-20KHz
MOH	.098 In/Sec	.234 G-s
MIH	.096 In/Sec	.300 G-s
PIV	.267 In/Sec	1.700 G-s

S2DECKHYDP - SOUTH 2ND DECK Hyd PUMP (21-Aug-23)

	OVERALL LEVEL	1K-20KHz
MOH	.300 In/Sec	.618 G-s
MIH	.296 In/Sec	.690 G-s
PIV	.356 In/Sec	4.928 G-s

1SUPLYP - #1 Supply Pump (21-Aug-23)

	OVERALL LEVEL	1K-20KHz
MOH	.067 In/Sec	.222 G-s
MIH	.089 In/Sec	.109 G-s
MIA	.108 In/Sec	.106 G-s
PIA	.258 In/Sec	.295 G-s
PIH	.250 In/Sec	.392 G-s
POH	.198 In/Sec	.376 G-s

2SUPLYP - #2 Supply Pump (21-Aug-23)

	OVERALL LEVEL	1K-20KHz
MOH	.058 In/Sec	.288 G-s
MIH	.083 In/Sec	.490 G-s
MIA	.150 In/Sec	.312 G-s
PIA	.177 In/Sec	.553 G-s
PIH	.206 In/Sec	.596 G-s
POH	.262 In/Sec	1.337 G-s

3SUPLYP - #3 Supply Pump (21-Aug-23)

	OVERALL LEVEL	1K-20KHz
MOH	.069 In/Sec	.966 G-s
MIH	.068 In/Sec	.724 G-s
MIA	.071 In/Sec	.509 G-s
PIA	.189 In/Sec	.237 G-s
PIH	.184 In/Sec	.416 G-s
POH	.227 In/Sec	.774 G-s

6SUPLYP - #6 Supply Pump (21-Aug-23)

	OVERALL LEVEL	1K-20KHz
MOH	.118 In/Sec	.144 G-s
MIH	.133 In/Sec	.151 G-s
MIA	.128 In/Sec	.090 G-s
PIA	.117 In/Sec	.319 G-s
PIH	.226 In/Sec	.443 G-s
POH	.279 In/Sec	2.098 G-s

CBRA - CASTER BAGHOUSE REVERSE AIR (21-Aug-23)

	OVERALL LEVEL	1K-20KHz
MOH	.024 In/Sec	.086 G-s
MIH	.033 In/Sec	.142 G-s
MIA	.023 In/Sec	.078 G-s
FIH	.030 In/Sec	.509 G-s
FOH	.047 In/Sec	.018 G-s

CBID - CASTER BAGHOUSE ID FAN (21-Aug-23)

	OVERALL LEVEL	1K-20KHz
MOH	.089 In/Sec	.099 G-s
MOV	.072 In/Sec	.158 G-s
MIH	.112 In/Sec	.226 G-s

MIV	.121 In/Sec	.747 G-s
MIA	.075 In/Sec	.282 G-s
FIA	.194 In/Sec	1.106 G-s
FIH	.294 In/Sec	2.363 G-s
FIV	.175 In/Sec	1.608 G-s
FOH	.308 In/Sec	1.265 G-s
FOV	.081 In/Sec	1.070 G-s
FOA	.153 In/Sec	.859 G-s

FRAF - Furnace REVERSE AIR Fan (21-Aug-23)

	OVERALL LEVEL	1K-20KHz
MOH	.082 In/Sec	.169 G-s
MIH	.098 In/Sec	.127 G-s
MIA	.059 In/Sec	.169 G-s
FIA	.151 In/Sec	.723 G-s
FIH	.172 In/Sec	.703 G-s
FOH	.108 In/Sec	.131 G-s

EFBHF - East Furnace Bag House Fan (21-Aug-23)

	OVERALL LEVEL	1K-20KHz
MOH	.056 In/Sec	.453 G-s
MIH	.089 In/Sec	1.230 G-s
MIA	.031 In/Sec	.120 G-s
FIA	.106 In/Sec	.652 G-s
FIH	.100 In/Sec	.673 G-s
FOH	.103 In/Sec	1.053 G-s

WFBHF - WEST Furnace Bag House Fan (21-Aug-23)

	OVERALL LEVEL	1K-20KHz
MOH	.076 In/Sec	.096 G-s
MIH	.091 In/Sec	.298 G-s
MIA	.091 In/Sec	.758 G-s
FIA	.097 In/Sec	1.129 G-s
FIH	.116 In/Sec	1.475 G-s
FOH	.130 In/Sec	.937 G-s

NCHYDP - North CASTER Hyd PUMP (21-Aug-23)

	OVERALL LEVEL	1K-20KHz
MOH	.157 In/Sec	.439 G-s
MIH	.147 In/Sec	.493 G-s
PIH	.396 In/Sec	.589 G-s

MIDCHYDP - MIDDLE CASTER Hyd PUMP (21-Aug-23)

	OVERALL LEVEL	1K-20KHz
MOH	.143 In/Sec	.492 G-s
MIH	.085 In/Sec	.414 G-s
PIH	.380 In/Sec	.462 G-s

SCEXFAN - SPRAY CHAMBER EXHAUST Fan (21-Aug-23)

	OVERALL LEVEL	1K-20KHz
MOH	.885 In/Sec	.211 G-s
MIH	1.105 In/Sec	.131 G-s
MIA	.692 In/Sec	.110 G-s
FIA	.353 In/Sec	.242 G-s
FIH	.381 In/Sec	.855 G-s
FOH	.492 In/Sec	.879 G-s

WNARCOHYDP - WEST NARCO Hyd PUMP (21-Aug-23)

	OVERALL LEVEL	1K-20KHz
MOH	.040 In/Sec	.318 G-s
MIH	.040 In/Sec	.056 G-s
PIV	.075 In/Sec	.672 G-s

NC OCILLA - North Caster Oscillator (21-Aug-23)

	OVERALL LEVEL	1K-20KHz
MOH	.201 In/Sec	.958 G-s
MIH	.155 In/Sec	.631 G-s
MIA	.120 In/Sec	.592 G-s
GIA	.183 In/Sec	.121 G-s
GIH	.172 In/Sec	.463 G-s

	GOH	.165 In/Sec	1.286 G-s

MC OCILLA - Middle Caster Oscillator (21-Aug-23)

	OVERALL LEVEL	1K-20KHz
MOH	.184 In/Sec	.914 G-s
MIH	.152 In/Sec	.447 G-s
MIA	.142 In/Sec	.438 G-s
GIA	.109 In/Sec	.048 G-s
GIH	.126 In/Sec	.649 G-s
GOH	.141 In/Sec	.627 G-s

SC OCILLA - South Caster Oscillator (21-Aug-23)

	OVERALL LEVEL	1K-20KHz
MOH	.147 In/Sec	.441 G-s
MIH	.126 In/Sec	.209 G-s
MIA	.114 In/Sec	.171 G-s
GIA	.109 In/Sec	.432 G-s
GIH	.136 In/Sec	.420 G-s
GOH	.147 In/Sec	.638 G-s

Clarification Of Vibration Units:

Acc	-->	G-s	RMS
Vel	-->	In/Sec	PK