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April 14, 2023

NUCOR Melt Shop

Subject: April 2023 vibration survey

Below is a summary report for the Melt Shop monthly vibration survey that was performed on 04/12/23. 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.

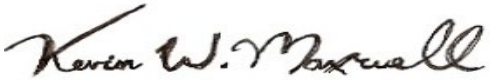
Class II: Defect (s) present that may cause problem in long term (2-6 months). Repair during normal maintenance scheduling. Continue to monitor.

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,



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Defects

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 Pump #5

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

This issue seems to have subsided some. Previously, the middle and south pumps have had some high vibrations. Pumps have had significant hydraulic passing frequencies with some high 1 x rpm vibration in pump verticals. We are monitoring this closely. Rated as **CLASS I** defects.

Caster ID Baghouse Fan

Motor DE and fan DE waveform data still shows an impacting or knock type vibration. Waveform data shows the fan DE having the more pronounced impacting. 1 x rpm fan vibration has also had another increase in amplitude. A trim balance or fan cleaning is recommended during next extended outage. It is also recommended to pull back coupling flange on fan shaft and inspect coupling gear hub as scheduling allows. Rated as a **CLASS II** defect.

Furnace Reverse Air Fan

There does appear to be an impact occurring again in the DE fan bearing. Spectral data of the DE fan bearing mainly shows random noise with very little distinct peaks. Motor also 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 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

Equipment was not in service this survey; however, the following likely still applies: 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

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Database: nucorja9.rbm
Station: Melt Shop

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD
WCMWP - WEST CASTER MOLD WATER PUMP (11-Apr-23)		
	OVERALL LEVEL	1K-20KHz
MOH	.058 In/Sec	.174 G-s
MIH	.066 In/Sec	.260 G-s
MIA	.050 In/Sec	.109 G-s
PIA	.210 In/Sec	.596 G-s
PIH	.116 In/Sec	.786 G-s
POH	.128 In/Sec	.615 G-s
MCMWP - MID CASTER MOLD WATER PUMP (11-Apr-23)		
	OVERALL LEVEL	1K-20KHz
MOH	.165 In/Sec	.865 G-s
MIH	.179 In/Sec	.591 G-s
MIA	.155 In/Sec	.653 G-s
PIA	.261 In/Sec	1.481 G-s
PIH	.227 In/Sec	2.023 G-s
POH	.229 In/Sec	2.095 G-s
EBOSTRP - EAST Booster PUMP (12-Apr-23)		
	OVERALL LEVEL	1K-20KHz
MOH	.045 In/Sec	.278 G-s
MIH	.050 In/Sec	.220 G-s
MIA	.029 In/Sec	.092 G-s
PIA	.074 In/Sec	.068 G-s
PIH	.119 In/Sec	.103 G-s
POH	.056 In/Sec	.148 G-s
ECSWP 1LFT - EAST CASTER SPRAY WP 1 LEFT (12-Apr-23)		
	OVERALL LEVEL	1K-20KHz
MOH	.117 In/Sec	.259 G-s
MIH	.063 In/Sec	.240 G-s
MIA	.069 In/Sec	.238 G-s
MCSWP 2LFT - MID CASTER SPRAY WP 2 LEFT (12-Apr-23)		
	OVERALL LEVEL	1K-20KHz
MOH	.108 In/Sec	.529 G-s
MIH	.122 In/Sec	.867 G-s
MCSWP 3RT - MID CASTER SPRAY WP 3 RIGHT (12-Apr-23)		
	OVERALL LEVEL	1K-20KHz
MOH	.112 In/Sec	.619 G-s
MIH	.095 In/Sec	.691 G-s
MIA	.161 In/Sec	.366 G-s
MSERVOHYDP - MIDDLE SERVO Hyd PUMP (12-Apr-23)		
	OVERALL LEVEL	1K-20KHz
MOH	.144 In/Sec	.229 G-s
MIH	.036 In/Sec	.215 G-s
PIV	.210 In/Sec	.767 G-s
WSERVOHYDP - WEST SERVO Hyd PUMP (12-Apr-23)		
	OVERALL LEVEL	1K-20KHz
MOH	.061 In/Sec	.235 G-s
MIH	.068 In/Sec	.341 G-s
PIV	.099 In/Sec	1.017 G-s
SERVOHRECP - SERVO Hyd RECIRC PUMP (12-Apr-23)		
	OVERALL LEVEL	1K-20KHz
MOH	.123 In/Sec	.154 G-s
MIH	.115 In/Sec	.445 G-s
PIV	.223 In/Sec	1.286 G-s

N2DECKHYDP - North 2ND DECK Hyd PUMP (12-Apr-23)

	OVERALL LEVEL	1K-20KHz
MOH	.058 In/Sec	.492 G-s
MIH	.072 In/Sec	.393 G-s
PIV	.211 In/Sec	1.139 G-s

2DEKRECIP - 2ND DECK L&S Hyd RECIRC PUM (12-Apr-23)

	OVERALL LEVEL	1K-20KHz
MOH	.096 In/Sec	.453 G-s
MIH	.086 In/Sec	.629 G-s
PIV	.260 In/Sec	1.975 G-s

M2DECKHYDP - MIDDLE 2ND DECK Hyd PUMP (12-Apr-23)

	OVERALL LEVEL	1K-20KHz
MOH	.084 In/Sec	.315 G-s
MIH	.100 In/Sec	.757 G-s
PIV	.365 In/Sec	1.861 G-s

S2DECKHYDP - SOUTH 2ND DECK Hyd PUMP (12-Apr-23)

	OVERALL LEVEL	1K-20KHz
MOH	.248 In/Sec	.625 G-s
MIH	.270 In/Sec	.991 G-s
PIV	.164 In/Sec	2.287 G-s

1SUPLYP - #1 Supply Pump (12-Apr-23)

	OVERALL LEVEL	1K-20KHz
MOH	.074 In/Sec	.213 G-s
MIH	.085 In/Sec	.139 G-s
MIA	.089 In/Sec	.137 G-s
PIA	.317 In/Sec	.564 G-s
PIH	.230 In/Sec	.686 G-s
POH	.199 In/Sec	.751 G-s

2SUPLYP - #2 Supply Pump (12-Apr-23)

	OVERALL LEVEL	1K-20KHz
MOH	.063 In/Sec	.829 G-s
MIH	.067 In/Sec	.706 G-s
MIA	.096 In/Sec	.192 G-s
PIA	.187 In/Sec	.488 G-s
PIH	.204 In/Sec	.699 G-s
POH	.261 In/Sec	2.127 G-s

3SUPLYP - #3 Supply Pump (12-Apr-23)

	OVERALL LEVEL	1K-20KHz
MOH	.078 In/Sec	.912 G-s
MIH	.077 In/Sec	1.089 G-s
MIA	.068 In/Sec	.352 G-s
PIA	.186 In/Sec	.223 G-s
PIH	.142 In/Sec	.424 G-s
POH	.186 In/Sec	.751 G-s

6SUPLYP - #6 Supply Pump (12-Apr-23)

	OVERALL LEVEL	1K-20KHz
MOH	.074 In/Sec	.136 G-s
MIH	.090 In/Sec	.209 G-s
MIA	.163 In/Sec	.495 G-s
PIA	.192 In/Sec	.512 G-s
PIH	.262 In/Sec	2.117 G-s

CBRA - CASTER BAGHOUSE REVERSE AIR (12-Apr-23)

	OVERALL LEVEL	1K-20KHz
MOH	.015 In/Sec	.084 G-s
MIH	.019 In/Sec	.077 G-s
MIA	.014 In/Sec	.082 G-s
FIH	.016 In/Sec	.304 G-s
FOH	.022 In/Sec	.082 G-s

CBID - CASTER BAGHOUSE ID FAN (12-Apr-23)

	OVERALL LEVEL	1K-20KHz

MOH	.131 In/Sec	.093 G-s
MOV	.085 In/Sec	.163 G-s
MIH	.142 In/Sec	.298 G-s
MIV	.122 In/Sec	.493 G-s
MIA	.071 In/Sec	.372 G-s
FIA	.270 In/Sec	1.181 G-s
FIH	.256 In/Sec	1.891 G-s
FIV	.187 In/Sec	1.622 G-s
FOH	.307 In/Sec	.659 G-s
FOV	.076 In/Sec	.709 G-s
FOA	.149 In/Sec	.511 G-s

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

	OVERALL LEVEL	1K-20KHz
MOH	.065 In/Sec	.363 G-s
MIH	.067 In/Sec	.363 G-s
MIA	.034 In/Sec	.261 G-s
FIA	.062 In/Sec	.237 G-s
FIH	.056 In/Sec	.163 G-s
FOH	.042 In/Sec	.206 G-s
FIV	.044 In/Sec	.309 G-s

EFBHF - East Furnace Bag House Fan (12-Apr-23)

	OVERALL LEVEL	1K-20KHz
MOH	.083 In/Sec	.279 G-s
MIH	.088 In/Sec	.847 G-s
MIA	.064 In/Sec	.824 G-s
FIA	.068 In/Sec	1.072 G-s
FIH	.085 In/Sec	.824 G-s
FOH	.139 In/Sec	1.521 G-s

WFBHF - WEST Furnace Bag House Fan (12-Apr-23)

	OVERALL LEVEL	1K-20KHz
MOH	.070 In/Sec	.517 G-s
MIH	.088 In/Sec	.503 G-s
MIA	.101 In/Sec	.482 G-s
FIA	.057 In/Sec	.636 G-s
FIH	.102 In/Sec	1.295 G-s
FOH	.096 In/Sec	.776 G-s

NCHYDP - North CASTER Hyd PUMP (12-Apr-23)

	OVERALL LEVEL	1K-20KHz
MOH	.144 In/Sec	.346 G-s
MIH	.154 In/Sec	.890 G-s
PIH	.128 In/Sec	1.191 G-s

SCHYDP - SOUTH CASTER Hyd PUMP (12-Apr-23)

	OVERALL LEVEL	1K-20KHz
MOH	.102 In/Sec	.287 G-s
MIH	.056 In/Sec	.438 G-s
PIH	.127 In/Sec	.762 G-s

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

	OVERALL LEVEL	1K-20KHz
MOH	.581 In/Sec	.052 G-s
MIH	.762 In/Sec	.309 G-s
MIA	.682 In/Sec	.187 G-s
FIH	.665 In/Sec	.219 G-s
FOH	.797 In/Sec	.921 G-s

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

	OVERALL LEVEL	1K-20KHz
MOH	.077 In/Sec	.169 G-s
MIH	.035 In/Sec	.155 G-s
PIV	.098 In/Sec	1.350 G-s

Clarification Of Vibration Units:

Acc --> G-s RMS

Vel --> In/Sec PK