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June 26th, 2023

NUCOR Melt Shop

Subject: June 2023 vibration survey

Below is a summary report for the Melt Shop monthly vibration survey that was performed on 06/20/23. 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

East Caster Mold Water Pump

Pump was down this survey; however, the following still applies: Pump is still showing some signs of internal wear. Couplings may also have 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

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 has elevated 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.

2nd Deck Hyd. Pumps

The middle and south pumps have increased vibration again. Pumps have 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. DE motor vibration is slightly lower while the fan DE is slightly higher in amplitude. Waveform data shows the fan DE having the more pronounced impacting. 1 x rpm fan vibration is about the same as last survey but higher than average. A trim balance or fan cleaning is recommended during next extended outage. DE fan bearing needs a visual inspection soon. It is also recommended to pull back coupling flange on fan shaft and inspect fan coupling gear hub as scheduling allows. Rated as a **CLASS II** defect for now but getting very close to CLASS III because of the impacting of the DE fan bearing.

Furnace Reverse Air Fan

The impacting seen in fan bearings was not present this survey. Motor does appear 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 I** 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 during 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	(21-Jun-23)	
		OVERALL LEVEL	1K-20KHz
MOH		.054 In/Sec	.123 G-s
MIH		.085 In/Sec	.207 G-s
MIA		.125 In/Sec	.167 G-s
PIA		.256 In/Sec	.300 G-s
PIH		.186 In/Sec	.390 G-s
POH		.193 In/Sec	.475 G-s
MCMWP	- MID CASTER MOLD WATER PUMP	(21-Jun-23)	
		OVERALL LEVEL	1K-20KHz
MOH		.146 In/Sec	.560 G-s
MIH		.151 In/Sec	.514 G-s
MIA		.249 In/Sec	.409 G-s
PIA		.164 In/Sec	1.056 G-s
PIH		.190 In/Sec	1.878 G-s
POH		.175 In/Sec	1.732 G-s
EBOSTRP	- EAST Booster PUMP	(21-Jun-23)	
		OVERALL LEVEL	1K-20KHz
MOH		.053 In/Sec	.362 G-s
MIH		.057 In/Sec	.243 G-s
MIA		.031 In/Sec	.193 G-s
PIA		.076 In/Sec	.042 G-s
PIH		.064 In/Sec	.107 G-s
POH		.069 In/Sec	.156 G-s
ECSWP 1LFT	- EAST CASTER SPRAY WP 1 LEFT	(21-Jun-23)	
		OVERALL LEVEL	1K-20KHz
MOH		.141 In/Sec	.286 G-s
MIH		.071 In/Sec	.318 G-s
MIA		.069 In/Sec	.181 G-s
MCSWP 2LFT	- MID CASTER SPRAY WP 2 LEFT	(21-Jun-23)	
		OVERALL LEVEL	1K-20KHz
MOH		.057 In/Sec	.032 G-s
MIH		.097 In/Sec	.096 G-s
MIA		.099 In/Sec	.021 G-s
MCSWP 3RT	- MID CASTER SPRAY WP 3 RIGHT	(21-Jun-23)	
		OVERALL LEVEL	1K-20KHz
MOH		.140 In/Sec	1.139 G-s
MIH		.114 In/Sec	.499 G-s
MIA		.087 In/Sec	.311 G-s
WCSWP 4RT	- WEST CASTER SPRAY WP 4 RIGH	(21-Jun-23)	
		OVERALL LEVEL	1K-20KHz
MOH		.131 In/Sec	.797 G-s
MIH		.101 In/Sec	.710 G-s
MIA		.117 In/Sec	.597 G-s
ESERVOHYDP	- EAST SERVO Hyd PUMP	(21-Jun-23)	
		OVERALL LEVEL	1K-20KHz
MOH		.021 In/Sec	.110 G-s
MIH		.035 In/Sec	.155 G-s

PIV	.123 In/Sec	.507 G-s	

MSERVOHYDP - MIDDLE SERVO Hyd PUMP (21-Jun-23)

	OVERALL LEVEL	1K-20KHz
MOH	.197 In/Sec	.227 G-s
MIH	.056 In/Sec	.202 G-s
PIV	.168 In/Sec	.685 G-s

SERVOHRECP - SERVO Hyd RECIRC PUMP (21-Jun-23)

	OVERALL LEVEL	1K-20KHz
MOH	.097 In/Sec	.175 G-s
MIH	.127 In/Sec	1.157 G-s
PIV	.251 In/Sec	3.739 G-s

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

	OVERALL LEVEL	1K-20KHz
MOH	.172 In/Sec	1.116 G-s
MIH	.231 In/Sec	1.501 G-s
PIV	.345 In/Sec	2.527 G-s

M2DECKHYDP - MIDDLE 2ND DECK Hyd PUMP (21-Jun-23)

	OVERALL LEVEL	1K-20KHz
MOH	.136 In/Sec	.727 G-s
MIH	.300 In/Sec	.907 G-s
PIV	1.049 In/Sec	5.391 G-s

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

	OVERALL LEVEL	1K-20KHz
MOH	.273 In/Sec	.703 G-s
MIH	.411 In/Sec	1.997 G-s
PIV	.380 In/Sec	4.897 G-s

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

	OVERALL LEVEL	1K-20KHz
MOH	.072 In/Sec	.270 G-s
MIH	.090 In/Sec	.204 G-s
MIA	.080 In/Sec	.152 G-s
PIA	.308 In/Sec	.515 G-s
PIH	.229 In/Sec	.361 G-s
POH	.186 In/Sec	.654 G-s

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

	OVERALL LEVEL	1K-20KHz
MOH	.070 In/Sec	.899 G-s
MIH	.074 In/Sec	.911 G-s
MIA	.079 In/Sec	.637 G-s
PIA	.176 In/Sec	.181 G-s
PIH	.157 In/Sec	.393 G-s
POH	.192 In/Sec	.929 G-s

5SUPLYP - #5 Supply Pump (21-Jun-23)

	OVERALL LEVEL	1K-20KHz
MOH	.078 In/Sec	1.036 G-s
MIH	.078 In/Sec	.447 G-s
MIA	.115 In/Sec	.324 G-s
PIA	.349 In/Sec	.119 G-s
PIH	.197 In/Sec	1.212 G-s
POH	.306 In/Sec	.902 G-s

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

	OVERALL LEVEL	1K-20KHz
MOH	.054 In/Sec	.226 G-s
MIH	.066 In/Sec	.215 G-s
MIA	.076 In/Sec	.139 G-s
PIA	.154 In/Sec	.541 G-s
PIH	.162 In/Sec	.621 G-s
POH	.227 In/Sec	1.080 G-s

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

	OVERALL LEVEL	1K-20KHz

MOH	.034 In/Sec	.198 G-s
MIH	.042 In/Sec	.155 G-s
MIA	.032 In/Sec	.205 G-s
FIH	.037 In/Sec	.509 G-s
FOH	.066 In/Sec	.093 G-s

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

	OVERALL LEVEL	1K-20KHz
MOH	.105 In/Sec	.088 G-s
MOV	.071 In/Sec	.108 G-s
MIH	.114 In/Sec	.355 G-s
MIV	.118 In/Sec	.513 G-s
MIA	.069 In/Sec	.218 G-s
FIA	.233 In/Sec	.658 G-s
FIH	.302 In/Sec	2.076 G-s
FIV	.182 In/Sec	1.627 G-s
FOH	.287 In/Sec	.895 G-s
FOV	.084 In/Sec	.638 G-s
FOA	.122 In/Sec	.936 G-s

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

	OVERALL LEVEL	1K-20KHz
MOH	.023 In/Sec	.225 G-s
MIH	.023 In/Sec	.638 G-s
MIA	.018 In/Sec	.145 G-s
FIA	.040 In/Sec	.501 G-s
FIH	.019 In/Sec	.599 G-s
FOH	.018 In/Sec	.498 G-s

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

	OVERALL LEVEL	1K-20KHz
MOH	.061 In/Sec	.182 G-s
MIH	.082 In/Sec	.692 G-s
MIA	.038 In/Sec	.493 G-s
FIA	.062 In/Sec	1.024 G-s
FIH	.103 In/Sec	.937 G-s
FOH	.090 In/Sec	1.099 G-s

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

	OVERALL LEVEL	1K-20KHz
MOH	.056 In/Sec	.644 G-s
MIH	.075 In/Sec	.475 G-s
MIA	.128 In/Sec	.522 G-s
FIA	.069 In/Sec	.739 G-s
FIH	.084 In/Sec	1.264 G-s
FOH	.096 In/Sec	1.216 G-s

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

	OVERALL LEVEL	1K-20KHz
MOH	.056 In/Sec	.421 G-s
MIH	.042 In/Sec	.477 G-s
PIH	.080 In/Sec	.722 G-s

SCHYDP - SOUTH CASTER Hyd PUMP (21-Jun-23)

	OVERALL LEVEL	1K-20KHz
MOH	.082 In/Sec	.320 G-s
MIH	.070 In/Sec	.482 G-s
PIH	.096 In/Sec	.609 G-s

SCEXFAN - SPRAY CHAMBER EXHAUST Fan (22-Jun-23)

	OVERALL LEVEL	1K-20KHz
MOH	.796 In/Sec	.032 G-s
MIH	.512 In/Sec	.169 G-s
MIA	.485 In/Sec	.081 G-s
FIA	.429 In/Sec	.261 G-s
FIH	.683 In/Sec	.239 G-s
FOH	.628 In/Sec	.655 G-s

WNARCOHYDP - WEST NARCO Hyd PUMP (22-Jun-23)

	OVERALL LEVEL	1K-20KHz

MOH	.027 In/Sec	.079 G-s
MIH	.029 In/Sec	.118 G-s
PIV	.089 In/Sec	.364 G-s

Clarification Of Vibration Units:

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