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September 29, 2023

NUCOR Melt Shop

Subject: September 2023 vibration survey

Below is a summary report for the Melt Shop monthly vibration survey that was performed on 09/26/23. 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.

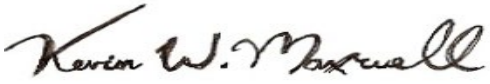
Class II: Defect (s) present that may cause problem in long term (2-6 months). Repair during normal maintenance scheduling. Continue to monitor.

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

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.

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

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.

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.

Caster ID Baghouse Fan

Work done on this fan appears to have helped some. The overall vibration of the motor and fan is lower this survey. 1 x rpm has decreased, and the knocking type vibration has calmed some. Fan inboard vertical still shows some impacting and motor also has a faint sign of impacting. We are monitoring this closely. Rated as a **CLASS I** defect.

Furnace Reverse Air Fan

The impacting vibration in fan bearings was present again this survey. At the very least, the fan wheel and internal fan housing and cone should be checked. We will continue to monitor this issue closely. Rated as a **CLASS II** 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 vibration is very excessive. Motor base may be cracked and broken. 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. Fan bearings are also showing signs of defects and wear due to the high vibration. Because of the high vibration amplitudes, this is rated as a **CLASS IV** 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   (26-Sep-23)
                              OVERALL LEVEL     1K-20KHz
       MOH                     .040 In/Sec       .160 G-s
       MIH                     .052 In/Sec       .247 G-s
       MIA                     .107 In/Sec       .232 G-s
       PIA                     .141 In/Sec       .514 G-s
       PIH                     .081 In/Sec       .542 G-s
       POH                     .144 In/Sec       .543 G-s

ECMWP      - EAST CASTER MOLD WATER PUMP   (26-Sep-23)
                              OVERALL LEVEL     1K-20KHz
       MOH                     .037 In/Sec       .302 G-s
       MIH                     .047 In/Sec       .322 G-s
       MIA                     .032 In/Sec       .213 G-s
       PIA                     .210 In/Sec      2.459 G-s
       PIH                     .132 In/Sec      1.744 G-s
       POH                     .198 In/Sec      1.479 G-s

EBOSTRP    - EAST Booster PUMP             (26-Sep-23)
                              OVERALL LEVEL     1K-20KHz
       MOH                     .038 In/Sec       .124 G-s
       MIH                     .040 In/Sec       .202 G-s
       MIA                     .026 In/Sec       .125 G-s
       PIA                     .108 In/Sec       .086 G-s
       PIH                     .088 In/Sec       .135 G-s
       POH                     .058 In/Sec       .177 G-s

ECSWP 1LFT - EAST CASTER SPRAY WP 1 LEFT   (26-Sep-23)
                              OVERALL LEVEL     1K-20KHz
       MOH                     .082 In/Sec       .174 G-s
       MIH                     .067 In/Sec       .303 G-s
       MIA                     .075 In/Sec       .160 G-s

MCSWP 2LFT - MID CASTER SPRAY WP 2 LEFT    (26-Sep-23)
                              OVERALL LEVEL     1K-20KHz
       MOH                     .126 In/Sec       .474 G-s
       MIH                     .089 In/Sec       .435 G-s
       MIA                     .074 In/Sec       .162 G-s

WCSWP 4RT  - WEST CASTER SPRAY WP 4 RIGH   (26-Sep-23)
                              OVERALL LEVEL     1K-20KHz
       MOH                     .091 In/Sec       .439 G-s
       MIH                     .073 In/Sec       .847 G-s
       MIA                     .119 In/Sec       .224 G-s

ESERVOHYDP - EAST SERVO Hyd PUMP           (26-Sep-23)
                              OVERALL LEVEL     1K-20KHz
       MOH                     .039 In/Sec       .234 G-s
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MIH	.050 In/Sec	.279 G-s
PIV	.218 In/Sec	.872 G-s

WSERVOHYDP - WEST SERVO Hyd PUMP (26-Sep-23)

	OVERALL LEVEL	1K-20KHz
MOH	.151 In/Sec	.139 G-s
MIH	.119 In/Sec	.238 G-s
PIV	.217 In/Sec	1.079 G-s

SERVOHRECP - SERVO Hyd RECIRC PUMP (26-Sep-23)

	OVERALL LEVEL	1K-20KHz
MOH	.099 In/Sec	.115 G-s
MIH	.089 In/Sec	.922 G-s
PIV	.158 In/Sec	1.579 G-s

2DEKRECIP - 2ND DECK L&S Hyd RECIRC PUM (26-Sep-23)

	OVERALL LEVEL	1K-20KHz
MOH	.218 In/Sec	.402 G-s
MIH	.204 In/Sec	.776 G-s
PIV	.335 In/Sec	2.643 G-s

M2DECKHYDP - MIDDLE 2ND DECK Hyd PUMP (26-Sep-23)

	OVERALL LEVEL	1K-20KHz
MOH	.124 In/Sec	.612 G-s
MIH	.333 In/Sec	.720 G-s
PIV	1.429 In/Sec	4.896 G-s

S2DECKHYDP - SOUTH 2ND DECK Hyd PUMP (26-Sep-23)

	OVERALL LEVEL	1K-20KHz
MOH	.139 In/Sec	.505 G-s
MIH	.091 In/Sec	.726 G-s
PIV	.477 In/Sec	3.920 G-s

1SUPLYP - #1 Supply Pump (26-Sep-23)

	OVERALL LEVEL	1K-20KHz
MOH	.063 In/Sec	.166 G-s
MIH	.083 In/Sec	.135 G-s
MIA	.083 In/Sec	.090 G-s
PIA	.354 In/Sec	.432 G-s
PIH	.262 In/Sec	.380 G-s
POH	.188 In/Sec	.939 G-s

2SUPLYP - #2 Supply Pump (26-Sep-23)

	OVERALL LEVEL	1K-20KHz
MOH	.059 In/Sec	.564 G-s
MIH	.067 In/Sec	.666 G-s
MIA	.096 In/Sec	.148 G-s
PIA	.195 In/Sec	.949 G-s
PIH	.205 In/Sec	.767 G-s
POH	.256 In/Sec	1.805 G-s

3SUPLYP - #3 Supply Pump (26-Sep-23)

	OVERALL LEVEL	1K-20KHz
MOH	.062 In/Sec	.877 G-s
MIH	.068 In/Sec	.779 G-s
MIA	.066 In/Sec	.552 G-s
PIA	.137 In/Sec	.165 G-s
PIH	.156 In/Sec	.411 G-s
POH	.178 In/Sec	1.068 G-s

5SUPLYP - #5 Supply Pump (26-Sep-23)

	OVERALL LEVEL	1K-20KHz
MOH	.042 In/Sec	.409 G-s
MIH	.052 In/Sec	.519 G-s
MIA	.058 In/Sec	.190 G-s
PIA	.351 In/Sec	.878 G-s
PIH	.207 In/Sec	.693 G-s
POH	.303 In/Sec	.514 G-s

6SUPLYP - #6 Supply Pump (26-Sep-23)

	OVERALL LEVEL	1K-20KHz
MOH	.092 In/Sec	.165 G-s
MIH	.105 In/Sec	.164 G-s
MIA	.117 In/Sec	.146 G-s
PIA	.145 In/Sec	.471 G-s
PIH	.190 In/Sec	.474 G-s
POH	.247 In/Sec	1.664 G-s

CBRA - CASTER BAGHOUSE REVERSE AIR (26-Sep-23)

	OVERALL LEVEL	1K-20KHz
MOH	.029 In/Sec	.097 G-s
MIH	.036 In/Sec	.085 G-s
MIA	.023 In/Sec	.177 G-s
FIH	.025 In/Sec	.445 G-s
FOH	.063 In/Sec	.061 G-s

CBID - CASTER BAGHOUSE ID FAN (26-Sep-23)

	OVERALL LEVEL	1K-20KHz
MOH	.060 In/Sec	.063 G-s
MOV	.033 In/Sec	.098 G-s
MIH	.069 In/Sec	.156 G-s
MIV	.060 In/Sec	.192 G-s
MIA	.033 In/Sec	.168 G-s
FIA	.140 In/Sec	.811 G-s
FIH	.145 In/Sec	.717 G-s
FIV	.080 In/Sec	.972 G-s
FOH	.174 In/Sec	.850 G-s
FOV	.061 In/Sec	.714 G-s
FOA	.118 In/Sec	.598 G-s

FRAF - Furnace REVERSE AIR Fan (26-Sep-23)

	OVERALL LEVEL	1K-20KHz
MOH	.086 In/Sec	.474 G-s
MIH	.081 In/Sec	.195 G-s
MIA	.051 In/Sec	.230 G-s
FIA	.068 In/Sec	.802 G-s
FIH	.098 In/Sec	.760 G-s
FOH	.155 In/Sec	.111 G-s

EFBHF - East Furnace Bag House Fan (26-Sep-23)

	OVERALL LEVEL	1K-20KHz
MOH	.055 In/Sec	.603 G-s
MIH	.059 In/Sec	.447 G-s
MIA	.056 In/Sec	.782 G-s
FIA	.067 In/Sec	.835 G-s
FIH	.085 In/Sec	.646 G-s
FOH	.090 In/Sec	1.048 G-s

WFBHF - WEST Furnace Bag House Fan (26-Sep-23)

	OVERALL LEVEL	1K-20KHz
MOH	.185 In/Sec	.351 G-s
MIH	.230 In/Sec	.244 G-s
MIA	.118 In/Sec	.921 G-s
FIA	.096 In/Sec	1.269 G-s
FIH	.100 In/Sec	1.259 G-s

MIDCHYDP - MIDDLE CASTER Hyd PUMP (26-Sep-23)

	OVERALL LEVEL	1K-20KHz
MOH	.127 In/Sec	.229 G-s
MIH	.107 In/Sec	.276 G-s
PIH	.278 In/Sec	.591 G-s

SCHYDP - SOUTH CASTER Hyd PUMP (26-Sep-23)

	OVERALL LEVEL	1K-20KHz
MOH	.111 In/Sec	.232 G-s
MIH	.084 In/Sec	.390 G-s
PIH	.986 In/Sec	.431 G-s

SCEXFAN - SPRAY CHAMBER EXHAUST Fan (26-Sep-23)

		OVERALL LEVEL	1K-20KHz
	MOH	1.085 In/Sec	.117 G-s
	MIH	1.258 In/Sec	.193 G-s
	MIA	1.140 In/Sec	.296 G-s
	FIH	1.076 In/Sec	.417 G-s
	FOH	.798 In/Sec	3.215 G-s

WNARCOHYDP - WEST NARCO Hyd PUMP (26-Sep-23)

		OVERALL LEVEL	1K-20KHz
	MOH	.048 In/Sec	.170 G-s
	MIH	.042 In/Sec	.114 G-s
	PIV	.071 In/Sec	.154 G-s

NC OCILLA - North Caster Oscillator (26-Sep-23)

		OVERALL LEVEL	1K-20KHz
	MOH	.171 In/Sec	.059 G-s
	MIH	.156 In/Sec	.252 G-s
	MIA	.143 In/Sec	.338 G-s
	GIA	.119 In/Sec	.110 G-s
	GIH	.132 In/Sec	.376 G-s
	GOH	.131 In/Sec	.737 G-s

MC OCILLA - Middle Caster Oscillator (26-Sep-23)

		OVERALL LEVEL	1K-20KHz
	MOH	.277 In/Sec	.298 G-s
	MIH	.189 In/Sec	.139 G-s
	MIA	.119 In/Sec	.191 G-s
	GIA	.099 In/Sec	.077 G-s
	GIH	.127 In/Sec	.333 G-s
	GOH	.109 In/Sec	.415 G-s

SC OCILLA - South Caster Oscillator (26-Sep-23)

		OVERALL LEVEL	1K-20KHz
	MOH	.069 In/Sec	.154 G-s
	MIH	.050 In/Sec	.076 G-s
	MIA	.042 In/Sec	.029 G-s
	GIA	.128 In/Sec	.057 G-s
	GIH	.052 In/Sec	.105 G-s
	GOH	.044 In/Sec	.124 G-s

Clarification Of Vibration Units:

Acc --> G-s RMS

Vel --> In/Sec PK