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April 1, 2021

NUCOR Melt Shop

Subject: March 2021 vibration survey

Below is a summary report for the Melt Shop monthly vibration survey that was performed on 3/31/21. 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

Defects

West Caster Mold Water Pump

High 1 x rpm vibration is present in the motor axial. This indicates angular misalignment. Motor and pump may also have some internal wear. Perform a precision alignment with less than .003" offset and angularity. Ensure there is no soft foot present in the motor. Rated as a **CLASS II** defect.

East Caster Mold Water Pump

Pump is still showing some signs of internal wear. Coupling may also be wearing due to misalignment. Perform a precision alignment with less than .003" offset and angularity. Ensure there is no soft foot present. Rated as a **CLASS II** defect.

West Booster Pump

Pump data shows another increase in non-synchronous vibration at the outboard end of the pump. This is good indication of bearing defects taking place in the pump bearings. Pump will need attention SOON. Rated as a **CLASS III** defect.

Cooling Tower #2 Supply Pump

Pump was down this survey; however, the following still applies: The pump appears to have cavitation which is causing a high noise floor in the spectrum. This is also making the ODE pump bearing have high acceleration. This could also be a bearing issues, but the noise floor is masking the data somewhat. Pump impeller or other pump internals may also be worn which could be causing this vibration. Pump needs to be inspected as time allows. Rated as a **CLASS II** defect.

Cooling Tower #3 Supply Pump

Pump was down this survey; however, the following still applies: The pump appears to have cavitation which is causing a high noise floor in the spectrum. This is also making the ODE pump bearing have high acceleration. This could also be a bearing issues, but the noise floor is masking the data somewhat. Pump impeller or other pump internals could also be worn which could be causing this vibration. Pump needs to be inspected 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. Rated as a **CLASS II** defect.

Spray Chamber Exhaust Fan

Fan and motor vibration is much higher this survey **Motor is vibrating at 2.0 ips-pk.** Outboard fan bearing is showing signs of defects/wear. Inspect fan bearings especially the ODE fan bearing for defects and proper lubrication. 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. It is recommended to replace the fan and fan shaft assembly as downtime allows. Fan has excessive build up and fan shaft is possibly bent and or worn. We will continue to monitor this closely. Rated as a **CLASS IV** defect.

West Furnace Baghouse Fan

Fan data continues to show an uprise in fan speed vibration that is likely due to imbalance of the fan wheel. Overall vibration at the inboard horizontal is .18 ips-pk this month. On average, it is .1 ips-pk. There has also been an uptick in high frequency vibration which may be early signs of bearing issue. Ensure grease is adequate and clean. Rated as a **CLASS II** 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

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Station: Melt Shop

MEASUREMENT POINT		OVERALL LEVEL	HFD / VHFD
WCMWP	- WEST CASTER MOLD WATER PUMP	(31-Mar-21)	
		OVERALL LEVEL	1K-20KHz
MOH		.134 In/Sec	.888 G-s
MIH		.129 In/Sec	1.583 G-s
MIA		.147 In/Sec	.987 G-s
PIA		.211 In/Sec	.892 G-s
PIH		.163 In/Sec	.911 G-s
POH		.145 In/Sec	.783 G-s
MCMWP	- MID CASTER MOLD WATER PUMP	(31-Mar-21)	
		OVERALL LEVEL	1K-20KHz
MOH		.091 In/Sec	1.522 G-s
MIH		.096 In/Sec	.609 G-s
MIA		.132 In/Sec	.987 G-s
PIA		.170 In/Sec	1.068 G-s
PIH		.176 In/Sec	1.288 G-s
POH		.092 In/Sec	1.126 G-s
WBOSTRP	- WEST Booster PUMP	(31-Mar-21)	
		OVERALL LEVEL	1K-20KHz
MOH		.064 In/Sec	.410 G-s
MIH		.052 In/Sec	.383 G-s
MIA		.048 In/Sec	.246 G-s
PIA		.121 In/Sec	.708 G-s
PIH		.105 In/Sec	.756 G-s
POH		.172 In/Sec	1.679 G-s
ECSWP 1LFT	- EAST CASTER SPRAY WP 1 LEFT	(31-Mar-21)	
		OVERALL LEVEL	1K-20KHz
MOH		.349 In/Sec	.441 G-s
MIH		.232 In/Sec	1.713 G-s
MIA		.200 In/Sec	2.197 G-s
MCSWP 2LFT	- MID CASTER SPRAY WP 2 LEFT	(31-Mar-21)	
		OVERALL LEVEL	1K-20KHz
MOH		.449 In/Sec	.454 G-s
MIH		.234 In/Sec	.642 G-s
MIA		.191 In/Sec	.505 G-s
MCSWP 3RT	- MID CASTER SPRAY WP 3 RIGHT	(31-Mar-21)	
		OVERALL LEVEL	1K-20KHz
MOH		.112 In/Sec	.421 G-s
MIH		.099 In/Sec	.448 G-s
MIA		.156 In/Sec	.119 G-s
MSERVOHYDP	- MIDDLE SERVO Hyd PUMP	(31-Mar-21)	
		OVERALL LEVEL	1K-20KHz
MOH		.115 In/Sec	.254 G-s
MIH		.052 In/Sec	.280 G-s
PIV		.094 In/Sec	.622 G-s
WSERVOHYDP	- WEST SERVO Hyd PUMP	(31-Mar-21)	
		OVERALL LEVEL	1K-20KHz
MOH		.065 In/Sec	.218 G-s
MIH		.053 In/Sec	.368 G-s

PIV		.102 In/Sec	1.340 G-s

SERVOHRECP - SERVO Hyd RECIRC PUMP (31-Mar-21)

	OVERALL LEVEL	1K-20KHz
MOH	.056 In/Sec	.165 G-s
MIH	.040 In/Sec	.347 G-s
PIV	.079 In/Sec	.283 G-s

N2DECKHYDP - North 2ND DECK Hyd PUMP (31-Mar-21)

	OVERALL LEVEL	1K-20KHz
MOH	.083 In/Sec	.613 G-s
MIH	.105 In/Sec	.831 G-s
PIV	.334 In/Sec	4.864 G-s

2DEKRECIP - 2ND DECK L&S Hyd RECIRC PUM (31-Mar-21)

	OVERALL LEVEL	1K-20KHz
MOH	.089 In/Sec	.376 G-s
MIH	.098 In/Sec	.968 G-s
PIV	.299 In/Sec	3.520 G-s

S2DECKHYDP - SOUTH 2ND DECK Hyd PUMP (31-Mar-21)

	OVERALL LEVEL	1K-20KHz
MOH	.074 In/Sec	.786 G-s
MIH	.127 In/Sec	1.440 G-s
PIV	.124 In/Sec	3.643 G-s

1SUPLYP - #1 Supply Pump (31-Mar-21)

	OVERALL LEVEL	1K-20KHz
MOH	.050 In/Sec	.211 G-s
MIH	.053 In/Sec	.161 G-s
MIA	.080 In/Sec	.255 G-s
PIA	.225 In/Sec	1.225 G-s
PIH	.219 In/Sec	1.919 G-s
POH	.235 In/Sec	1.848 G-s

4SUPLYP - #4 Supply Pump (31-Mar-21)

	OVERALL LEVEL	1K-20KHz
MOH	.052 In/Sec	.496 G-s
MIH	.074 In/Sec	1.152 G-s
MIA	.082 In/Sec	.326 G-s
PIA	.188 In/Sec	.790 G-s
PIH	.189 In/Sec	1.496 G-s
POH	.191 In/Sec	1.138 G-s

5SUPLYP - #5 Supply Pump (31-Mar-21)

	OVERALL LEVEL	1K-20KHz
MOH	.049 In/Sec	.619 G-s
MIH	.072 In/Sec	.983 G-s
MIA	.070 In/Sec	.314 G-s
PIA	.211 In/Sec	1.238 G-s
PIH	.244 In/Sec	1.904 G-s
POH	.246 In/Sec	1.758 G-s

6SUPLYP - #6 Supply Pump (31-Mar-21)

	OVERALL LEVEL	1K-20KHz
MOH	.054 In/Sec	.270 G-s
MIH	.073 In/Sec	.278 G-s
MIA	.077 In/Sec	.218 G-s
PIA	.171 In/Sec	.573 G-s
PIH	.245 In/Sec	1.153 G-s
POH	.324 In/Sec	3.265 G-s

CBRA - CASTER BAGHOUSE REVERSE AIR (31-Mar-21)

	OVERALL LEVEL	1K-20KHz
MOH	.063 In/Sec	.268 G-s
MIH	.063 In/Sec	.473 G-s
MIA	.033 In/Sec	.348 G-s
FIH	.061 In/Sec	.568 G-s
FOH	.116 In/Sec	.103 G-s

CBID - CASTER BAGHOUSE ID FAN (31-Mar-21)

	OVERALL LEVEL	1K-20KHz
MOH	.056 In/Sec	.159 G-s
MOV	.030 In/Sec	.218 G-s
MIH	.067 In/Sec	.258 G-s
MIV	.051 In/Sec	.266 G-s
MIA	.034 In/Sec	.281 G-s
FIA	.182 In/Sec	.918 G-s
FIH	.138 In/Sec	1.490 G-s
FIV	.087 In/Sec	1.001 G-s
FOH	.129 In/Sec	.778 G-s
FOV	.034 In/Sec	.477 G-s
FOA	.086 In/Sec	.441 G-s

FRAF - Furnace REVERSE AIR Fan (31-Mar-21)

	OVERALL LEVEL	1K-20KHz
MOH	.041 In/Sec	.112 G-s
MIH	.039 In/Sec	.434 G-s
MIA	.026 In/Sec	.132 G-s
FIA	.044 In/Sec	.321 G-s
FIH	.039 In/Sec	.561 G-s
FOH	.029 In/Sec	.253 G-s

EFBHF - East Furnace Bag House Fan (31-Mar-21)

	OVERALL LEVEL	1K-20KHz
MOH	.049 In/Sec	.424 G-s
MIH	.048 In/Sec	.243 G-s
MIA	.030 In/Sec	.218 G-s
FIA	.060 In/Sec	.683 G-s
FIH	.056 In/Sec	.698 G-s
FOH	.084 In/Sec	2.585 G-s

WFBHF - WEST Furnace Bag House Fan (31-Mar-21)

	OVERALL LEVEL	1K-20KHz
MOH	.110 In/Sec	.723 G-s
MIH	.123 In/Sec	.584 G-s
MIA	.104 In/Sec	.453 G-s
FIA	.117 In/Sec	1.491 G-s
FIH	.182 In/Sec	1.595 G-s
FOH	.155 In/Sec	.637 G-s

SCEXFAN - SPRAY CHAMBER EXHAUST Fan (31-Mar-21)

	OVERALL LEVEL	1K-20KHz
MOH	1.873 In/Sec	1.340 G-s
MIH	2.061 In/Sec	.962 G-s
MIA	.842 In/Sec	.570 G-s
FIH	.828 In/Sec	1.159 G-s
FOH	.632 In/Sec	1.755 G-s

ENARCOHYDP - EAST NARCO Hyd PUMP (31-Mar-21)

	OVERALL LEVEL	1K-20KHz
MOH	.071 In/Sec	.129 G-s
MIH	.073 In/Sec	.130 G-s
PIV	.272 In/Sec	1.410 G-s

NC OCILLA - North Caster Oscillator (31-Mar-21)

	OVERALL LEVEL	1K-20KHz
MOH	.595 In/Sec	.162 G-s
MIH	.454 In/Sec	.263 G-s
MIA	.346 In/Sec	.702 G-s
GIA	.249 In/Sec	.157 G-s
GIH	.389 In/Sec	.683 G-s
GOH	.399 In/Sec	1.026 G-s

MC OCILLA - Middle Caster Oscillator (31-Mar-21)

	OVERALL LEVEL	1K-20KHz
MOH	.587 In/Sec	.360 G-s
MIH	.542 In/Sec	.156 G-s
MIA	.368 In/Sec	.088 G-s
GIA	.245 In/Sec	.095 G-s

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            GIH                        .362 In/Sec        .142 G-s
            GOH                        .369 In/Sec        .074 G-s

      SC OCILLA  - South Caster Oscillator        (31-Mar-21)
                                     OVERALL LEVEL     1K-20KHz
            MOH                        .353 In/Sec        .117 G-s
            MIH                        .297 In/Sec        .181 G-s
            MIA                        .190 In/Sec        .368 G-s
            GIA                        .134 In/Sec        .038 G-s
            GIH                        .218 In/Sec       1.102 G-s
            GOH                        .179 In/Sec       1.270 G-s

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   Clarification Of Vibration Units:
      Acc       -->  G-s       RMS
      Vel       -->  In/Sec    PK
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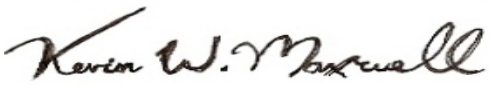
As always, it has been a pleasure to serve NUCOR Steel Flowood-Jackson, MS. If there are any comments or questions, do not hesitate to contact us.

Sincerely,



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