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July 6, 2021

NUCOR Melt Shop

Subject: June 2021 vibration survey

Below is a summary report for the Melt Shop monthly vibration survey that was performed on 6/29/21. 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.

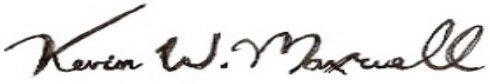
Class III; Defect (s) present that may cause failure in short term (less than 2 months). This should be addressed as soon as practical, with a high maintenance priority. Increase monitoring frequency.

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

Hi-Speed **Industrial Service** tests and inspects industrial machinery and equipment and makes recommendations concerning maintenance and repairs based on its experience in the field of industrial repair and maintenance. The information contained herein is provided as an opinion only, not as a guaranty or warranty of the matters discussed herein.

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

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

West Caster Spray Water Pump
Motor data shows defects are present in the motor bearings. Motor will likely need attention in the next couple of months. We will monitor this closely. Rated as a **CLASS II** defect for now.

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
Pump was down this survey; however, the following still applies: 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
Motor still has high fan speed vibration. Outboard fan bearing is showing signs of defects/wear. Inspect fan bearings especially the ODE fan bearing for defects and proper lubrication as soon as practical. 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. We will continue to monitor this closely. 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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Database: nucorja9.rbm
Station: Melt Shop
Route No. 1: MELT SHOP

MEASUREMENT POINT		OVERALL LEVEL	HFD / VHFD
WCMWP	- WEST CASTER MOLD WATER PUMP	(29-Jun-21)	
		OVERALL LEVEL	1K-20KHz
MOH		.175 In/Sec	.651 G-s
MIH		.134 In/Sec	.767 G-s
MIA		.098 In/Sec	.854 G-s
PIA		.291 In/Sec	1.808 G-s
PIH		.252 In/Sec	1.680 G-s
POH		.202 In/Sec	2.799 G-s
MCMWP	- MID CASTER MOLD WATER PUMP	(29-Jun-21)	
		OVERALL LEVEL	1K-20KHz
MOH		.105 In/Sec	.774 G-s
MIH		.098 In/Sec	.568 G-s
MIA		.182 In/Sec	.945 G-s
PIA		.263 In/Sec	2.411 G-s
PIH		.245 In/Sec	2.096 G-s
POH		.213 In/Sec	2.068 G-s
EBOSTRP	- EAST Booster PUMP	(29-Jun-21)	
		OVERALL LEVEL	1K-20KHz
MOH		.053 In/Sec	.097 G-s
MIH		.069 In/Sec	.210 G-s
MIA		.038 In/Sec	.117 G-s
PIA		.074 In/Sec	.081 G-s
PIH		.092 In/Sec	.140 G-s
POH		.072 In/Sec	.179 G-s
MCSWP 3RT	- MID CASTER SPRAY WP 3 RIGHT	(29-Jun-21)	
		OVERALL LEVEL	1K-20KHz
MOH		.176 In/Sec	.237 G-s
MIH		.116 In/Sec	.751 G-s
MIA		.112 In/Sec	.325 G-s
WCSWP 4RT	- WEST CASTER SPRAY WP 4 RIGH	(29-Jun-21)	
		OVERALL LEVEL	1K-20KHz
MOH		.255 In/Sec	2.387 G-s
MIH		.153 In/Sec	1.367 G-s
MIA		.139 In/Sec	.532 G-s
ESERVOHYDP	- EAST SERVO Hyd PUMP	(29-Jun-21)	
		OVERALL LEVEL	1K-20KHz
MOH		.023 In/Sec	.122 G-s
MIH		.061 In/Sec	.200 G-s
PIV		.140 In/Sec	.415 G-s
WSERVOHYDP	- WEST SERVO Hyd PUMP	(29-Jun-21)	
		OVERALL LEVEL	1K-20KHz
MOH		.095 In/Sec	.158 G-s
MIH		.079 In/Sec	.203 G-s
PIV		.141 In/Sec	.747 G-s
SERVOHRECP	- SERVO Hyd RECIRC PUMP	(29-Jun-21)	
		OVERALL LEVEL	1K-20KHz
MOH		.108 In/Sec	.298 G-s
MIH		.078 In/Sec	.886 G-s
PIV		.158 In/Sec	1.830 G-s
N2DECKHYDP	- North 2ND DECK Hyd PUMP	(29-Jun-21)	
		OVERALL LEVEL	1K-20KHz
MOH		.109 In/Sec	1.748 G-s

MIH	.223 In/Sec	2.898 G-s
PIV	.317 In/Sec	4.239 G-s

2DEKRECIP - 2ND DECK L&S Hyd RECIRC PUM (29-Jun-21)

	OVERALL LEVEL	1K-20KHz
MOH	.080 In/Sec	.433 G-s
MIH	.111 In/Sec	.516 G-s
PIV	.336 In/Sec	1.157 G-s

S2DECKHYDP - SOUTH 2ND DECK Hyd PUMP (29-Jun-21)

	OVERALL LEVEL	1K-20KHz
MOH	.058 In/Sec	.624 G-s
MIH	.079 In/Sec	.557 G-s
PIV	.167 In/Sec	1.805 G-s

1SUPLYP - #1 Supply Pump (29-Jun-21)

	OVERALL LEVEL	1K-20KHz
MOH	.064 In/Sec	.188 G-s
MIH	.092 In/Sec	.193 G-s
MIA	.098 In/Sec	.139 G-s
PIA	.246 In/Sec	1.275 G-s
PIH	.203 In/Sec	1.064 G-s
POH	.208 In/Sec	.865 G-s

4SUPLYP - #4 Supply Pump (29-Jun-21)

	OVERALL LEVEL	1K-20KHz
MOH	.043 In/Sec	.171 G-s
MIH	.069 In/Sec	.726 G-s
MIA	.092 In/Sec	.347 G-s
PIA	.208 In/Sec	.506 G-s
PIH	.182 In/Sec	.542 G-s
POH	.199 In/Sec	1.006 G-s

5SUPLYP - #5 Supply Pump (29-Jun-21)

	OVERALL LEVEL	1K-20KHz
MOH	.033 In/Sec	.287 G-s
MIH	.056 In/Sec	.672 G-s
MIA	.095 In/Sec	.655 G-s
PIA	.244 In/Sec	.412 G-s
PIH	.211 In/Sec	.781 G-s
POH	.226 In/Sec	1.329 G-s

CBRA - CASTER BAGHOUSE REVERSE AIR (29-Jun-21)

	OVERALL LEVEL	1K-20KHz
MOH	.049 In/Sec	.154 G-s
MIH	.041 In/Sec	.190 G-s
MIA	.021 In/Sec	.102 G-s
FIH	.041 In/Sec	.221 G-s
FOH	.096 In/Sec	.174 G-s

CBID - CASTER BAGHOUSE ID FAN (29-Jun-21)

	OVERALL LEVEL	1K-20KHz
MOH	.057 In/Sec	.075 G-s
MOV	.056 In/Sec	.103 G-s
MIH	.063 In/Sec	.083 G-s
MIV	.049 In/Sec	.124 G-s
MIA	.033 In/Sec	.259 G-s
FIA	.175 In/Sec	.654 G-s
FIH	.120 In/Sec	1.860 G-s
FIV	.086 In/Sec	.895 G-s
FOH	.135 In/Sec	.595 G-s
FOV	.027 In/Sec	.439 G-s
FOA	.080 In/Sec	.421 G-s

FRAF - Furnace REVERSE AIR Fan (29-Jun-21)

	OVERALL LEVEL	1K-20KHz
MOH	.037 In/Sec	.363 G-s
MIH	.039 In/Sec	.438 G-s
MIA	.029 In/Sec	.156 G-s
FIA	.039 In/Sec	.347 G-s

	FIH	.035 In/Sec	.963 G-s
	FOH	.027 In/Sec	.509 G-s

EFBHF - East Furnace Bag House Fan (29-Jun-21)

	OVERALL LEVEL	1K-20KHz
MOH	.074 In/Sec	.872 G-s
MIH	.073 In/Sec	.603 G-s
MIA	.030 In/Sec	.232 G-s
FIA	.064 In/Sec	.506 G-s
FIH	.090 In/Sec	.433 G-s
FOH	.098 In/Sec	.990 G-s

WFBHF - WEST Furnace Bag House Fan (29-Jun-21)

	OVERALL LEVEL	1K-20KHz
MOH	.085 In/Sec	.644 G-s
MIH	.110 In/Sec	.457 G-s
MIA	.100 In/Sec	.397 G-s
FIA	.107 In/Sec	.964 G-s
FIH	.116 In/Sec	1.285 G-s
FOH	.108 In/Sec	.620 G-s

MIDCHYDP - MIDDLE CASTER Hyd PUMP (29-Jun-21)

	OVERALL LEVEL	1K-20KHz
MOH	.071 In/Sec	.247 G-s
MIH	.058 In/Sec	.230 G-s
PIH	.162 In/Sec	.443 G-s

SCHYDP - SOUTH CASTER Hyd PUMP (29-Jun-21)

	OVERALL LEVEL	1K-20KHz
MOH	.056 In/Sec	.201 G-s
MIH	.035 In/Sec	.291 G-s
PIH	.102 In/Sec	.406 G-s

SCEXFAN - SPRAY CHAMBER EXHAUST Fan (29-Jun-21)

	OVERALL LEVEL	1K-20KHz
MOH	1.184 In/Sec	.276 G-s
MIH	1.326 In/Sec	.271 G-s
MIA	.558 In/Sec	.174 G-s
FIH	.556 In/Sec	.222 G-s
FOH	.289 In/Sec	1.247 G-s

ENARCOHYDP - EAST NARCO Hyd PUMP (29-Jun-21)

	OVERALL LEVEL	1K-20KHz
MOH	.054 In/Sec	.168 G-s
MIH	.083 In/Sec	.255 G-s
PIV	.156 In/Sec	.475 G-s

NC OCILLA - North Caster Oscillator (29-Jun-21)

	OVERALL LEVEL	1K-20KHz
MOH	.224 In/Sec	.305 G-s
MIH	.199 In/Sec	.300 G-s
MIA	.133 In/Sec	.397 G-s
GIA	.134 In/Sec	.604 G-s
GIH	.169 In/Sec	.467 G-s
GOH	.176 In/Sec	.858 G-s

MC OCILLA - Middle Caster Oscillator (29-Jun-21)

	OVERALL LEVEL	1K-20KHz
MOH	.309 In/Sec	.420 G-s
MIH	.212 In/Sec	.625 G-s
MIA	.132 In/Sec	.136 G-s
GIA	.127 In/Sec	.186 G-s
GIH	.179 In/Sec	.806 G-s
GOH	.193 In/Sec	1.830 G-s

SC OCILLA - South Caster Oscillator (29-Jun-21)

	OVERALL LEVEL	1K-20KHz
MOH	.174 In/Sec	.221 G-s
MIH	.157 In/Sec	.400 G-s
MIA	.162 In/Sec	.102 G-s

GIA	.128 In/Sec	1.438 G-s
GIH	.143 In/Sec	.468 G-s
GOH	.117 In/Sec	1.267 G-s

Clarification Of Vibration Units:

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