7030 Ryburn Dr. Millington, TN Phone: (901) 873-5300 Fax: (901) 873-5301 www.gohispeed.com

July 27, 2021

NUCOR Melt Shop

Subject: July 2021 vibration survey

Below is a summary report for the Melt Shop monthly vibration survey that was performed on 7/23/21. 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.

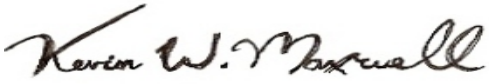
Class II: Defect (s) present that may cause problem in long term (2-6 months). Repair during normal maintenance scheduling. Continue to monitor.

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

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

Cell: 901-486-4565

Email: kwilliam@gohispeed.com

Defects

West Caster Mold Water Pump

High 2 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 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.

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

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

Overall vibration is up on the motor and the 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. Because of the high vibration amplitudes, this is rated as a **CLASS III** 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	(22-Jul-21)	
	OVERALL LEVEL	1K-20KHz
MOH	.115 In/Sec	.650 G-s
MIH	.103 In/Sec	1.596 G-s
MIA	.121 In/Sec	1.043 G-s
PIA	.422 In/Sec	.734 G-s
PIH	.214 In/Sec	1.337 G-s
POH	.324 In/Sec	1.355 G-s
ECMWP - EAST CASTER MOLD WATER PUMP	(22-Jul-21)	
	OVERALL LEVEL	1K-20KHz
MOH	.175 In/Sec	.352 G-s
MIH	.188 In/Sec	.297 G-s
MIA	.524 In/Sec	.262 G-s
PIA	.543 In/Sec	1.828 G-s
PIH	.158 In/Sec	1.193 G-s
POH	.232 In/Sec	1.513 G-s
EBOSTRP - EAST Booster PUMP	(22-Jul-21)	
	OVERALL LEVEL	1K-20KHz
MOH	.057 In/Sec	.415 G-s
MIH	.070 In/Sec	.231 G-s
MIA	.037 In/Sec	.112 G-s
PIA	.068 In/Sec	.066 G-s
PIH	.072 In/Sec	.108 G-s
POH	.059 In/Sec	.168 G-s
ECSWP 1LFT - EAST CASTER SPRAY WP 1 LEFT	(22-Jul-21)	
	OVERALL LEVEL	1K-20KHz
MOH	.493 In/Sec	.357 G-s
MIH	.340 In/Sec	1.183 G-s
MIA	.215 In/Sec	1.373 G-s
MCSWP 2LFT - MID CASTER SPRAY WP 2 LEFT	(22-Jul-21)	
	OVERALL LEVEL	1K-20KHz
MOH	.155 In/Sec	.294 G-s
MIH	.099 In/Sec	.477 G-s
MIA	.114 In/Sec	.304 G-s
MCSWP 3RT - MID CASTER SPRAY WP 3 RIGHT	(22-Jul-21)	
	OVERALL LEVEL	1K-20KHz
MOH	.176 In/Sec	.262 G-s
MIH	.108 In/Sec	.659 G-s
MIA	.146 In/Sec	.444 G-s
ESERVOHYDP - EAST SERVO Hyd PUMP	(22-Jul-21)	
	OVERALL LEVEL	1K-20KHz
MOH	.021 In/Sec	.094 G-s
MIH	.047 In/Sec	.185 G-s
PIV	.130 In/Sec	.516 G-s
WSERVOHYDP - WEST SERVO Hyd PUMP	(22-Jul-21)	
	OVERALL LEVEL	1K-20KHz
MOH	.084 In/Sec	.219 G-s
MIH	.067 In/Sec	.201 G-s
PIV	.105 In/Sec	.806 G-s
SERVOHRECP - SERVO Hyd RECIRC PUMP	(22-Jul-21)	
	OVERALL LEVEL	1K-20KHz

MOH		.121 In/Sec	.047 G-s
MIH		.074 In/Sec	.608 G-s
PIV		.160 In/Sec	.698 G-s

N2DECKHYDP - North 2ND DECK Hyd PUMP (22-Jul-21)

	OVERALL LEVEL	1K-20KHz
MOH	.193 In/Sec	2.728 G-s
MIH	.104 In/Sec	1.056 G-s
PIV	.250 In/Sec	3.864 G-s

2DEKRECIP - 2ND DECK L&S Hyd RECIRC PUM (22-Jul-21)

	OVERALL LEVEL	1K-20KHz
MOH	.087 In/Sec	.360 G-s
MIH	.084 In/Sec	.372 G-s
PIV	.215 In/Sec	1.457 G-s

S2DECKHYDP - SOUTH 2ND DECK Hyd PUMP (22-Jul-21)

	OVERALL LEVEL	1K-20KHz
MOH	.091 In/Sec	.624 G-s
MIH	.112 In/Sec	1.688 G-s
PIV	.166 In/Sec	1.683 G-s

1SUPLYP - #1 Supply Pump (22-Jul-21)

	OVERALL LEVEL	1K-20KHz
MOH	.054 In/Sec	.172 G-s
MIH	.063 In/Sec	.176 G-s
MIA	.077 In/Sec	.111 G-s
PIA	.231 In/Sec	.940 G-s
PIH	.200 In/Sec	.949 G-s
POH	.201 In/Sec	.519 G-s

3SUPLYP - #3 Supply Pump (22-Jul-21)

	OVERALL LEVEL	1K-20KHz
MOH	.052 In/Sec	.727 G-s
MIH	.063 In/Sec	.558 G-s
MIA	.070 In/Sec	.844 G-s
PIA	.215 In/Sec	.318 G-s
PIH	.151 In/Sec	.381 G-s
POH	.272 In/Sec	1.547 G-s

4SUPLYP - #4 Supply Pump (22-Jul-21)

	OVERALL LEVEL	1K-20KHz
MOH	.040 In/Sec	.419 G-s
MIH	.055 In/Sec	.611 G-s
MIA	.084 In/Sec	.519 G-s
PIA	.198 In/Sec	.549 G-s
PIH	.177 In/Sec	.489 G-s
POH	.208 In/Sec	.541 G-s

6SUPLYP - #6 Supply Pump (22-Jul-21)

	OVERALL LEVEL	1K-20KHz
MOH	.051 In/Sec	.224 G-s
MIH	.073 In/Sec	.176 G-s
MIA	.074 In/Sec	.121 G-s
PIA	.179 In/Sec	.464 G-s
PIH	.220 In/Sec	.563 G-s
POH	.246 In/Sec	2.120 G-s

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

	OVERALL LEVEL	1K-20KHz
MOH	.066 In/Sec	.411 G-s
MIH	.061 In/Sec	.171 G-s
MIA	.035 In/Sec	.096 G-s
FIH	.061 In/Sec	.325 G-s
FOH	.131 In/Sec	.185 G-s

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

	OVERALL LEVEL	1K-20KHz
MOH	.058 In/Sec	.078 G-s
MOV	.031 In/Sec	.115 G-s

MIH	.056 In/Sec	.118 G-s
MIV	.043 In/Sec	.141 G-s
MIA	.034 In/Sec	.200 G-s
FIA	.170 In/Sec	.981 G-s
FIH	.112 In/Sec	1.235 G-s
FIV	.074 In/Sec	.865 G-s
FOH	.122 In/Sec	.509 G-s
FOV	.031 In/Sec	.441 G-s
FOA	.085 In/Sec	.476 G-s

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

	OVERALL LEVEL	1K-20KHz
MOH	.049 In/Sec	.266 G-s
MIH	.059 In/Sec	.227 G-s
MIA	.057 In/Sec	.173 G-s
FIA	.056 In/Sec	.326 G-s
FIH	.051 In/Sec	.572 G-s
FOH	.033 In/Sec	.345 G-s

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

	OVERALL LEVEL	1K-20KHz
MOH	.067 In/Sec	.890 G-s
MIH	.066 In/Sec	.734 G-s
MIA	.026 In/Sec	.138 G-s
FIA	.072 In/Sec	.485 G-s
FIH	.081 In/Sec	.717 G-s
FOH	.097 In/Sec	1.414 G-s

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

	OVERALL LEVEL	1K-20KHz
MOH	.083 In/Sec	.830 G-s
MIH	.104 In/Sec	.408 G-s
MIA	.116 In/Sec	.373 G-s
FIA	.076 In/Sec	1.167 G-s
FIH	.117 In/Sec	1.329 G-s
FOH	.098 In/Sec	.849 G-s

MIDCHYDP - MIDDLE CASTER Hyd PUMP (23-Jul-21)

	OVERALL LEVEL	1K-20KHz
MOH	.080 In/Sec	.177 G-s
MIH	.052 In/Sec	.266 G-s
PIH	.142 In/Sec	.473 G-s

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

	OVERALL LEVEL	1K-20KHz
MOH	.058 In/Sec	.211 G-s
MIH	.037 In/Sec	.178 G-s
PIH	.120 In/Sec	.535 G-s

SCEXFAN - SPRAY CHAMBER EXHAUST Fan (23-Jul-21)

	OVERALL LEVEL	1K-20KHz
MOH	2.427 In/Sec	.225 G-s
MIH	2.225 In/Sec	.355 G-s
MIA	.774 In/Sec	.182 G-s
FIH	.931 In/Sec	.418 G-s
FOH	.762 In/Sec	1.251 G-s

ENARCOHYDP - EAST NARCO Hyd PUMP (23-Jul-21)

	OVERALL LEVEL	1K-20KHz
MOH	.075 In/Sec	.194 G-s
MIH	.093 In/Sec	1.175 G-s
PIV	.348 In/Sec	1.094 G-s

NC OCILLA - North Caster Oscillator (23-Jul-21)

	OVERALL LEVEL	1K-20KHz
MOH	.373 In/Sec	.074 G-s
MIH	.290 In/Sec	.197 G-s
MIA	.241 In/Sec	.730 G-s
GIA	.143 In/Sec	.193 G-s
GIH	.237 In/Sec	.359 G-s

	GOH	.242 In/Sec	.336 G-s

MC OCILLA - Middle Caster Oscillator (23-Jul-21)

	OVERALL LEVEL	1K-20KHz
MOH	.445 In/Sec	.062 G-s
MIH	.293 In/Sec	.190 G-s
MIA	.219 In/Sec	.450 G-s
GIA	.140 In/Sec	.201 G-s
GIH	.237 In/Sec	.140 G-s
GOH	.220 In/Sec	.206 G-s

SC OCILLA - South Caster Oscillator (23-Jul-21)

	OVERALL LEVEL	1K-20KHz
MOH	.223 In/Sec	.119 G-s
MIH	.172 In/Sec	.063 G-s
MIA	.137 In/Sec	.956 G-s
GIA	.124 In/Sec	.319 G-s
GIH	.147 In/Sec	.547 G-s
GOH	.142 In/Sec	.170 G-s

Clarification Of Vibration Units:

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