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

February 25, 2022

NUCOR Melt Shop

Subject: January 2022 vibration survey

Below is a summary report for the Melt Shop monthly vibration survey that was performed on 2/24/22. 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.

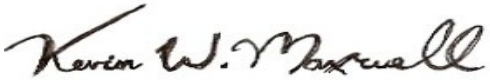
Class II: Defect (s) present that may cause problem in long term (2-6 months). Repair during normal maintenance scheduling. Continue to monitor.

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 in motor and pump. This indicates angular misalignment. Motor and pump may also have some internal wear. Perform a precision alignment with less than .003" offset and angularity (rim and face). 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 Boost Pump
Data of the pump shows extreme amount of acceleration and high noise floor in spectral data. This is very likely either cavitation or bearing issue in pump. Ensure pump is not cavitating for now. Rated as a **CLASS II** defect.

Cooling Tower #2 Supply Pump
Motor data is showing signs of motor bearing issues. 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 Pump #5
Pump was down this survey; however, if no actions have been taken, then the following still applies: Pump vibration has increased significantly since last month's survey. Pump has a high amplitude 1 x rpm vibration with a 2 x rpm vibration present as well. This could be coupling related or issue with impeller causing an imbalance. For now, it is recommended to inspect the pump coupling. If all looks good, then the issue may be with the impeller or pump shaft could be bent. Rated as a **CLASS III** 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.

Caster ID Baghouse Fan
The bearing peaks and sidebands previously seen appear to have subsided for the most part, Previous data showed fan inboard axial spectrum to have several sidebands peaks around 2 x outer race defect frequency. We are monitoring this closely. Rated as a **CLASS I** defect for now.

Furnace Reverse Air Fan
The thrusting and impacting that was seen a couple of surveys ago was not present this month. It is unclear if the process flow was influencing this. Rated as a **CLASS I** defect for now.

Spray Chamber Exhaust Fan

Motor and fan have 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. 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

Caster was in operation this survey; however, the following 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.

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Abbreviated Last Measurement Summary
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              Database:  nucorja9.rbm
              Station:   Melt Shop

       MEASUREMENT POINT             OVERALL LEVEL       HFD / VHFD
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       WCMWP      - WEST CASTER MOLD WATER PUMP   (24-Feb-22)
                                     OVERALL LEVEL     1K-20KHz
              MOH                     .190 In/Sec       .571 G-s
              MIH                     .164 In/Sec      1.097 G-s
              MIA                     .069 In/Sec       .690 G-s
              PIA                     .174 In/Sec      2.143 G-s
              PIH                     .201 In/Sec      1.832 G-s
              POH                     .146 In/Sec      1.437 G-s

       ECMWP      - EAST CASTER MOLD WATER PUMP   (24-Feb-22)
                                     OVERALL LEVEL     1K-20KHz
              MOH                     .145 In/Sec       .261 G-s
              MIH                     .093 In/Sec       .194 G-s
              MIA                     .369 In/Sec       .364 G-s
              PIA                     .449 In/Sec      1.490 G-s
              PIH                     .261 In/Sec      1.136 G-s
              POH                     .213 In/Sec       .954 G-s

       WBOSTRP    - WEST Booster PUMP             (24-Feb-22)
                                     OVERALL LEVEL     1K-20KHz
              MOH                     .072 In/Sec       .223 G-s
              MIH                     .072 In/Sec       .243 G-s
              MIA                     .052 In/Sec       .141 G-s
              PIA                     .134 In/Sec      1.040 G-s
              PIH                     .177 In/Sec      1.867 G-s
              POH                     .244 In/Sec      2.991 G-s

       EBOSTRP    - EAST Booster PUMP             (24-Feb-22)
                                     OVERALL LEVEL     1K-20KHz
              MOH                     .058 In/Sec       .175 G-s
              MIH                     .056 In/Sec       .143 G-s
              MIA                     .041 In/Sec       .145 G-s
              PIA                     .127 In/Sec       .243 G-s
              PIH                     .125 In/Sec       .358 G-s
              POH                     .114 In/Sec       .257 G-s

       ECSWP 1LFT - EAST CASTER SPRAY WP 1 LEFT   (24-Feb-22)
                                     OVERALL LEVEL     1K-20KHz
              MOH                     .131 In/Sec       .269 G-s
              MIH                     .072 In/Sec       .236 G-s
              MIA                     .089 In/Sec       .228 G-s
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MCSWP 2LFT - MID CASTER SPRAY WP 2 LEFT (24-Feb-22)

	OVERALL LEVEL	1K-20KHz
MOH	.092 In/Sec	.198 G-s
MIH	.086 In/Sec	.499 G-s
MIA	.093 In/Sec	.244 G-s

WCSWP 4RT - WEST CASTER SPRAY WP 4 RIGH (24-Feb-22)

	OVERALL LEVEL	1K-20KHz
MOH	.186 In/Sec	.194 G-s
MIH	.113 In/Sec	.412 G-s
MIA	.166 In/Sec	.208 G-s

MSERVOHYDP - MIDDLE SERVO Hyd PUMP (24-Feb-22)

	OVERALL LEVEL	1K-20KHz
MOH	.161 In/Sec	.166 G-s
MIH	.054 In/Sec	.291 G-s
PIV	.179 In/Sec	.823 G-s

WSERVOHYDP - WEST SERVO Hyd PUMP (24-Feb-22)

	OVERALL LEVEL	1K-20KHz
MOH	.062 In/Sec	.309 G-s
MIH	.052 In/Sec	.211 G-s
PIV	.090 In/Sec	1.301 G-s

SERVOHRECP - SERVO Hyd RECIRC PUMP (24-Feb-22)

	OVERALL LEVEL	1K-20KHz
MOH	.074 In/Sec	.234 G-s
MIH	.079 In/Sec	.612 G-s
PIV	.123 In/Sec	1.036 G-s

N2DECKHYDP - North 2ND DECK Hyd PUMP (24-Feb-22)

	OVERALL LEVEL	1K-20KHz
MOH	.067 In/Sec	.710 G-s
MIH	.165 In/Sec	.922 G-s
PIV	.437 In/Sec	4.403 G-s

2DEKRECIP - 2ND DECK L&S Hyd RECIRC PUM (24-Feb-22)

	OVERALL LEVEL	1K-20KHz
MOH	.121 In/Sec	.854 G-s
MIH	.141 In/Sec	.714 G-s
PIV	.406 In/Sec	3.787 G-s

S2DECKHYDP - SOUTH 2ND DECK Hyd PUMP (24-Feb-22)

	OVERALL LEVEL	1K-20KHz
MOH	.134 In/Sec	.640 G-s
MIH	.073 In/Sec	.539 G-s
PIV	.193 In/Sec	1.981 G-s

1SUPLYP - #1 Supply Pump (24-Feb-22)

	OVERALL LEVEL	1K-20KHz
MOH	.053 In/Sec	.128 G-s
MIH	.064 In/Sec	.244 G-s
MIA	.072 In/Sec	.160 G-s
PIA	.250 In/Sec	.346 G-s
PIH	.177 In/Sec	.956 G-s
POH	.179 In/Sec	.870 G-s

2SUPLYP - #2 Supply Pump (24-Feb-22)

	OVERALL LEVEL	1K-20KHz
MOH	.066 In/Sec	1.253 G-s
MIH	.067 In/Sec	1.319 G-s
MIA	.061 In/Sec	.990 G-s
PIA	.210 In/Sec	.453 G-s
PIH	.197 In/Sec	.534 G-s
POH	.214 In/Sec	.863 G-s

4SUPLYP - #4 Supply Pump (24-Feb-22)

	OVERALL LEVEL	1K-20KHz
MOH	.041 In/Sec	.458 G-s

MIH	.050 In/Sec	.604 G-s
MIA	.080 In/Sec	.641 G-s
PIA	.198 In/Sec	.326 G-s
PIH	.174 In/Sec	.416 G-s
POH	.182 In/Sec	.864 G-s

6SUPLYP - #6 Supply Pump (24-Feb-22)

	OVERALL LEVEL	1K-20KHz
MOH	.046 In/Sec	.239 G-s
MIH	.069 In/Sec	.210 G-s
MIA	.079 In/Sec	.190 G-s
PIA	.178 In/Sec	.428 G-s
PIH	.186 In/Sec	.599 G-s
POH	.227 In/Sec	1.396 G-s

CBRA - CASTER BAGHOUSE REVERSE AIR (24-Feb-22)

	OVERALL LEVEL	1K-20KHz
MOH	.028 In/Sec	.302 G-s
MIH	.025 In/Sec	.516 G-s
MIA	.016 In/Sec	.854 G-s
FIH	.021 In/Sec	.234 G-s
FOH	.044 In/Sec	.147 G-s

CBID - CASTER BAGHOUSE ID FAN (24-Feb-22)

	OVERALL LEVEL	1K-20KHz
MOH	.058 In/Sec	.083 G-s
MOV	.030 In/Sec	.145 G-s
MIH	.077 In/Sec	.124 G-s
MIV	.048 In/Sec	.203 G-s
MIA	.029 In/Sec	.218 G-s
FIA	.080 In/Sec	.842 G-s
FIH	.114 In/Sec	1.059 G-s
FIV	.072 In/Sec	1.068 G-s
FOH	.122 In/Sec	1.122 G-s
FOV	.041 In/Sec	.910 G-s
FOA	.067 In/Sec	.901 G-s

FRAF - Furnace REVERSE AIR Fan (24-Feb-22)

	OVERALL LEVEL	1K-20KHz
MOH	.042 In/Sec	.368 G-s
MIH	.065 In/Sec	.180 G-s
MIA	.036 In/Sec	.094 G-s
FIA	.062 In/Sec	.467 G-s
FIH	.060 In/Sec	.744 G-s
FOH	.041 In/Sec	.355 G-s

EFBHF - East Furnace Bag House Fan (24-Feb-22)

	OVERALL LEVEL	1K-20KHz
MOH	.053 In/Sec	.594 G-s
MIH	.073 In/Sec	.810 G-s
MIA	.041 In/Sec	.345 G-s
FIA	.067 In/Sec	.535 G-s
FIH	.073 In/Sec	1.181 G-s
FOH	.090 In/Sec	.958 G-s

WFBHF - WEST Furnace Bag House Fan (24-Feb-22)

	OVERALL LEVEL	1K-20KHz
MOH	.087 In/Sec	.445 G-s
MIH	.109 In/Sec	.451 G-s
MIA	.090 In/Sec	.362 G-s
FIA	.107 In/Sec	1.173 G-s
FIH	.126 In/Sec	1.295 G-s
FOH	.130 In/Sec	.932 G-s

MIDCHYDP - MIDDLE CASTER Hyd PUMP (24-Feb-22)

	OVERALL LEVEL	1K-20KHz
MOH	.242 In/Sec	.547 G-s
MIH	.124 In/Sec	.930 G-s
PIH	.300 In/Sec	2.333 G-s

SCHYDP - SOUTH CASTER Hyd PUMP (24-Feb-22)

	OVERALL LEVEL	1K-20KHz
MOH	.440 In/Sec	.962 G-s
MIH	.385 In/Sec	1.579 G-s
PIH	.329 In/Sec	1.172 G-s

SCEXFAN - SPRAY CHAMBER EXHAUST Fan (24-Feb-22)

	OVERALL LEVEL	1K-20KHz
MOH	1.255 In/Sec	.144 G-s
MIH	1.392 In/Sec	.175 G-s
MIA	.722 In/Sec	.136 G-s
FIH	.501 In/Sec	.218 G-s
FOH	.812 In/Sec	.688 G-s

ENARCOHYDP - EAST NARCO Hyd PUMP (24-Feb-22)

	OVERALL LEVEL	1K-20KHz
MOH	.043 In/Sec	.238 G-s
MIH	.048 In/Sec	.382 G-s
PIV	.154 In/Sec	.842 G-s

Clarification Of Vibration Units:

Acc --> G-s RMS