HI-SPEED INDUSTRIAL SERVICE QualiTest® Diagnostics

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May 18, 2020

NUCOR Melt Shop

Subject: May vibration survey

Most of the machines surveyed were found to be in good condition with the exception of 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. 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 not in service during this survey: however the following most likely 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.

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.

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 #2 Supply Pump

Pump was not in service during this survey: however the following most likely 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.

I

Furnace Reverse Air Fan

Drive end fan bearing axial data still shows some impacting occurring within the bearing. This could be signs of axial thrusting or some other type of aerodynamic forces being generated by the fan. For now, it is recommended to inspect the fan bearings as time allows. Ensure drive end bearing is fixed and outboard end bearing is set to float. Rated as a **CLASS II** defect.

Spray Chamber Exhaust Fan

The DE fan bearing data still shows a high 1 x fan rpm vibration which typically indicates imbalance of the fan wheel. Outboard fan bearing data also shows a once per revolution impact in the time waveform data and an increase in high frequency acceleration amplitude. This indicates that the bearing is under stress and may have lack of lubrication or mechanical issue. Motor still has a high 1 x fan rpm vibration as well. Inspect fan wheel SOON for build-up/damage/wear and inspect fan bearings especially the ODE fan bearing. This unit may be operating near a critical speed or resonance which could influence some of the high vibration. **INSPECT UNIT SOON**. We will continue to monitor this closely. Rated as a **CLASS III** defect.

Abbreviated Last Measurement Summary

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Database: nucorja9.rbm
Station: Melt Shop

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD
WCMWP - WEST CASTER MOLD WATER PUMP (13-May-20)		
	OVERALL LEVEL	1K-20KHz
MOH	.160 In/Sec	.658 G-s
MIH	.120 In/Sec	1.163 G-s
MIA	.275 In/Sec	.540 G-s
PIA	.303 In/Sec	.770 G-s
PIH	.243 In/Sec	.716 G-s
POH	.116 In/Sec	.693 G-s
MCMWP - MID CASTER MOLD WATER PUMP (13-May-20)		
	OVERALL LEVEL	1K-20KHz
MOH	.062 In/Sec	.549 G-s
MIH	.068 In/Sec	.342 G-s
MIA	.092 In/Sec	.810 G-s
PIA	.135 In/Sec	.928 G-s
PIH	.139 In/Sec	.729 G-s
POH	.149 In/Sec	.748 G-s
EBOSTRP - EAST Booster PUMP (13-May-20)		
	OVERALL LEVEL	1K-20KHz
MOH	.072 In/Sec	.328 G-s
MIH	.061 In/Sec	.240 G-s
MIA	.049 In/Sec	.117 G-s
PIA	.097 In/Sec	.121 G-s
PIH	.065 In/Sec	.064 G-s
POH	.052 In/Sec	.130 G-s
ECSWP 1LFT - EAST CASTER SPRAY WP 1 LEFT (13-May-20)		
	OVERALL LEVEL	1K-20KHz
MOH	.165 In/Sec	.414 G-s
MIH	.134 In/Sec	.715 G-s
MIA	.258 In/Sec	.363 G-s
MCSWP 2LFT - MID CASTER SPRAY WP 2 LEFT (13-May-20)		
	OVERALL LEVEL	1K-20KHz
MOH	.468 In/Sec	.527 G-s
MIH	.309 In/Sec	.787 G-s
MIA	.230 In/Sec	.568 G-s
MCSWP 3RT - MID CASTER SPRAY WP 3 RIGHT (13-May-20)		
	OVERALL LEVEL	1K-20KHz
MOH	.333 In/Sec	1.302 G-s
MIH	.101 In/Sec	.661 G-s
MIA	.204 In/Sec	.238 G-s
ESERVOHYDP - EAST SERVO Hyd PUMP (13-May-20)		
	OVERALL LEVEL	1K-20KHz
MOH	.018 In/Sec	.179 G-s
MIH	.049 In/Sec	.234 G-s
PIV	.132 In/Sec	.454 G-s
WSERVOHYDP - WEST SERVO Hyd PUMP (13-May-20)		
	OVERALL LEVEL	1K-20KHz
MOH	.111 In/Sec	.276 G-s
MIH	.073 In/Sec	.240 G-s
PIV	.092 In/Sec	1.233 G-s
SERVOHRECP - SERVO Hyd RECIRC PUMP (13-May-20)		
	OVERALL LEVEL	1K-20KHz
MOH	.049 In/Sec	.128 G-s

	MIH	.038 In/Sec	.444 G-s
	PIV	.071 In/Sec	.464 G-s

N2DECKHYDP - North 2ND DECK Hyd PUMP (13-May-20)

	OVERALL LEVEL	1K-20KHz
MOH	.139 In/Sec	.309 G-s
MIH	.079 In/Sec	.490 G-s
PIV	.346 In/Sec	.636 G-s

2DEKRECIP - 2ND DECK L&S Hyd RECIRC PUM (13-May-20)

	OVERALL LEVEL	1K-20KHz
MOH	.068 In/Sec	.285 G-s
MIH	.120 In/Sec	.240 G-s
PIV	.383 In/Sec	1.313 G-s

S2DECKHYDP - SOUTH 2ND DECK Hyd PUMP (13-May-20)

	OVERALL LEVEL	1K-20KHz
MOH	.309 In/Sec	.342 G-s
MIH	.338 In/Sec	.446 G-s
PIV	.530 In/Sec	.878 G-s

1SUPLYP - #1 Supply Pump (13-May-20)

	OVERALL LEVEL	1K-20KHz
MOH	.076 In/Sec	.200 G-s
MIH	.069 In/Sec	.245 G-s
MIA	.098 In/Sec	.107 G-s
PIA	.195 In/Sec	.728 G-s
PIH	.153 In/Sec	.623 G-s
POH	.166 In/Sec	.666 G-s

3SUPLYP - #3 Supply Pump (13-May-20)

	OVERALL LEVEL	1K-20KHz
MOH	.048 In/Sec	.219 G-s
MIH	.056 In/Sec	.841 G-s
MIA	.052 In/Sec	1.134 G-s
PIA	.150 In/Sec	.958 G-s
PIH	.158 In/Sec	.754 G-s
POH	.234 In/Sec	1.839 G-s

4SUPLYP - #4 Supply Pump (13-May-20)

	OVERALL LEVEL	1K-20KHz
MOH	.036 In/Sec	.285 G-s
MIH	.042 In/Sec	.556 G-s
MIA	.059 In/Sec	.482 G-s
PIA	.157 In/Sec	.996 G-s
PIH	.154 In/Sec	.484 G-s
POH	.179 In/Sec	.604 G-s

6SUPLYP - #6 Supply Pump (13-May-20)

	OVERALL LEVEL	1K-20KHz
MOH	.045 In/Sec	.278 G-s
MIH	.070 In/Sec	.268 G-s
MIA	.083 In/Sec	.196 G-s
PIA	.179 In/Sec	1.109 G-s
PIH	.185 In/Sec	.865 G-s
POH	.215 In/Sec	1.193 G-s

CBRA - CASTER BAGHOUSE REVERSE AIR (13-May-20)

	OVERALL LEVEL	1K-20KHz
MOH	.046 In/Sec	.333 G-s
MIH	.042 In/Sec	.210 G-s
MIA	.019 In/Sec	.320 G-s
FIH	.043 In/Sec	.319 G-s
FOH	.066 In/Sec	.184 G-s

CBID - CASTER BAGHOUSE ID FAN (13-May-20)

	OVERALL LEVEL	1K-20KHz
MOH	.047 In/Sec	.078 G-s
MOV	.027 In/Sec	.080 G-s
MIH	.053 In/Sec	.178 G-s

MIV	.031 In/Sec	.160 G-s
MIA	.029 In/Sec	.150 G-s
FIA	.128 In/Sec	1.247 G-s
FIH	.109 In/Sec	2.072 G-s
FIV	.063 In/Sec	1.623 G-s
FOH	.089 In/Sec	1.452 G-s
FOV	.021 In/Sec	1.180 G-s
FOA	.065 In/Sec	1.290 G-s

FRAF - Furnace REVERSE AIR Fan (13-May-20)

	OVERALL LEVEL	1K-20KHz
MOH	.059 In/Sec	.337 G-s
MIH	.047 In/Sec	.247 G-s
MIA	.041 In/Sec	.139 G-s
FIA	.090 In/Sec	.201 G-s
FIH	.087 In/Sec	.784 G-s
FOH	.052 In/Sec	.383 G-s

EFBHF - East Furnace Bag House Fan (13-May-20)

	OVERALL LEVEL	1K-20KHz
MOH	.048 In/Sec	.418 G-s
MIH	.052 In/Sec	.447 G-s
MIA	.034 In/Sec	.328 G-s
FIA	.059 In/Sec	.345 G-s
FIH	.058 In/Sec	.387 G-s
FOH	.066 In/Sec	1.680 G-s

WFBHF - WEST Furnace Bag House Fan (13-May-20)

	OVERALL LEVEL	1K-20KHz
MOH	.096 In/Sec	.174 G-s
MIH	.125 In/Sec	.330 G-s
MIA	.063 In/Sec	.791 G-s
FIA	.087 In/Sec	.448 G-s
FIH	.147 In/Sec	.935 G-s
FOH	.110 In/Sec	1.299 G-s

MIDCHYDP - MIDDLE CASTER Hyd PUMP (13-May-20)

	OVERALL LEVEL	1K-20KHz
MOH	.071 In/Sec	.358 G-s
MIH	.057 In/Sec	.305 G-s
PIH	.149 In/Sec	.686 G-s

SCHYDP - SOUTH CASTER Hyd PUMP (13-May-20)

	OVERALL LEVEL	1K-20KHz
MOH	.075 In/Sec	.153 G-s
MIH	.036 In/Sec	.284 G-s
PIH	.103 In/Sec	.491 G-s

SCEXFAN - SPRAY CHAMBER EXHAUST Fan (13-May-20)

	OVERALL LEVEL	1K-20KHz
MOH	.962 In/Sec	.027 G-s
MIH	.740 In/Sec	.048 G-s
MIA	.526 In/Sec	.109 G-s
FIH	.773 In/Sec	.797 G-s
FOH	.555 In/Sec	1.971 G-s

WNARCOHYDP - WEST NARCO Hyd PUMP (13-May-20)

	OVERALL LEVEL	1K-20KHz
MOH	.071 In/Sec	.055 G-s
MIH	.065 In/Sec	.082 G-s
PIV	.127 In/Sec	.380 G-s

NC OCILLA - North Caster Oscillator (13-May-20)

	OVERALL LEVEL	1K-20KHz
MOH	.330 In/Sec	.106 G-s
MIH	.294 In/Sec	.082 G-s
MIA	.193 In/Sec	.274 G-s
GIA	.139 In/Sec	.172 G-s
GIH	.210 In/Sec	.365 G-s
GOH	.214 In/Sec	.063 G-s

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MC OCILLA  - Middle Caster Oscillator      (13-May-20)
                                 OVERALL LEVEL     1K-20KHz
        MOH                       .242 In/Sec       .101 G-s
        MIH                       .233 In/Sec       .101 G-s
        MIA                       .169 In/Sec       .062 G-s
        GIA                       .141 In/Sec       .062 G-s
        GIH                       .190 In/Sec       .077 G-s
        GOH                       .184 In/Sec       .050 G-s

SC OCILLA  - South Caster Oscillator       (13-May-20)
                                 OVERALL LEVEL     1K-20KHz
        MOH                       .199 In/Sec       .071 G-s
        MIH                       .170 In/Sec       .055 G-s
        MIA                       .137 In/Sec       .108 G-s
        GIA                       .091 In/Sec       .275 G-s
        GIH                       .119 In/Sec       .485 G-s
        GOH                       .106 In/Sec       .428 G-s

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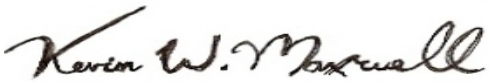
As always, it has been a pleasure to serve NUCOR Steel Flowood-Jackson, MS. If there are any comments or questions, do not hesitate to contact us.

Sincerely,



ISO Certified Vibration Analyst, Category III

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