HI-SPEED INDUSTRIAL SERVICE QualiTest® Diagnostics

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December 16, 2019

NUCOR Melt Shop

Subject: December 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. Perform a precision alignment with less than .003" offset and angularity. Ensure there is no soft foot present. Rated as a **CLASS II** defect.

East Caster Mold Water Pump
Pump is 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 #6 Supply Pump
The pump bearing vibration data still indicates 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.

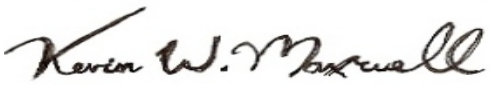
Cooling Tower #2 Supply Pump
The pump appears to have cavitation which is causing a high noise floor in the spectrum. This is also making the ODE pump bearing have high acceleration. This could also be a bearing issues but the noise floor is masking the data somewhat. Pump impeller or other pump internals may also be worn which could be causing this vibration. Pump needs to be inspected as time allows. Rated as a **CLASS II** defect.

Furnace Reverse Air Fan
Drive end fan bearing axial data 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 bearing as time allows. Rated as a **CLASS II** defect.

Spray Chamber Exhaust Fan
The DE fan bearing data shows a high 1 x fan rpm vibration. Motor still has a high 1 x fan rpm vibration as well. This may be due to the fan operating near a critical speed or resonance. We will monitor this closely. Rated as a **CLASS II** defect.

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

HI-SPEED INDUSTRIAL SERVICE

QualiTest® Diagnostics

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Abbreviated Last Measurement Summary

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Database: nucorja9.rbm
Station: Melt Shop
Report Date: 16-Dec-19 10:27

MEASUREMENT POINT		OVERALL LEVEL	HFD / VHFD
WCMWP	- WEST CASTER MOLD WATER PUMP	(09-Dec-19)	
		OVERALL LEVEL	1K-20KHz
MOH		.182 In/Sec	.394 G-s
MIH		.127 In/Sec	.549 G-s
MIA		.309 In/Sec	.401 G-s
PIA		.446 In/Sec	.963 G-s
PIH		.286 In/Sec	1.340 G-s
POH		.101 In/Sec	.939 G-s
ECMWP	- EAST CASTER MOLD WATER PUMP	(09-Dec-19)	
		OVERALL LEVEL	1K-20KHz
MOH		.119 In/Sec	.149 G-s
MIH		.110 In/Sec	.176 G-s
MIA		.284 In/Sec	.213 G-s
PIA		.323 In/Sec	.980 G-s
PIH		.240 In/Sec	.755 G-s
POH		.285 In/Sec	.715 G-s
WBOSTRP	- WEST Booster PUMP	(09-Dec-19)	
		OVERALL LEVEL	1K-20KHz
MOH		.050 In/Sec	.273 G-s
MIH		.049 In/Sec	.278 G-s
MIA		.035 In/Sec	.217 G-s
PIA		.161 In/Sec	.636 G-s
PIH		.189 In/Sec	1.571 G-s
POH		.430 In/Sec	3.901 G-s
ECSWP 1LFT	- EAST CASTER SPRAY WP 1 LEFT	(09-Dec-19)	
		OVERALL LEVEL	1K-20KHz
MOH		.316 In/Sec	.534 G-s
MIH		.155 In/Sec	1.831 G-s
MIA		.125 In/Sec	.537 G-s
MCSWP 3RT	- MID CASTER SPRAY WP 3 RIGHT	(09-Dec-19)	
		OVERALL LEVEL	1K-20KHz
MOH		.307 In/Sec	.414 G-s
MIH		.135 In/Sec	.849 G-s
MIA		.152 In/Sec	.151 G-s

WCSWP 4RT - WEST CASTER SPRAY WP 4 RIGH (09-Dec-19)

	OVERALL LEVEL	1K-20KHz
MOH	.167 In/Sec	.384 G-s
MIH	.095 In/Sec	.558 G-s
MIA	.087 In/Sec	.639 G-s

ESERVOHYDP - EAST SERVO Hyd PUMP (09-Dec-19)

	OVERALL LEVEL	1K-20KHz
MOH	.034 In/Sec	.130 G-s
MIH	.065 In/Sec	.107 G-s
PIV	.126 In/Sec	.419 G-s

WSERVOHYDP - WEST SERVO Hyd PUMP (09-Dec-19)

	OVERALL LEVEL	1K-20KHz
MOH	.137 In/Sec	.224 G-s
MIH	.085 In/Sec	.226 G-s
PIV	.101 In/Sec	.897 G-s

SERVOHRECP - SERVO Hyd RECIRC PUMP (09-Dec-19)

	OVERALL LEVEL	1K-20KHz
MOH	.073 In/Sec	.095 G-s
MIH	.049 In/Sec	.270 G-s
PIV	.096 In/Sec	.681 G-s

2DEKRECIP - 2ND DECK L&S Hyd RECIRC PUM (09-Dec-19)

	OVERALL LEVEL	1K-20KHz
MOH	.191 In/Sec	.072 G-s
MIH	.141 In/Sec	.130 G-s
PIV	.358 In/Sec	.303 G-s

M2DECKHYDP - MIDDLE 2ND DECK Hyd PUMP (09-Dec-19)

	OVERALL LEVEL	1K-20KHz
MOH	.242 In/Sec	.208 G-s
MIH	.157 In/Sec	.193 G-s
PIV	1.045 In/Sec	1.005 G-s

S2DECKHYDP - SOUTH 2ND DECK Hyd PUMP (09-Dec-19)

	OVERALL LEVEL	1K-20KHz
MOH	.720 In/Sec	.394 G-s
MIH	.743 In/Sec	.378 G-s
PIV	.261 In/Sec	.704 G-s

1SUPLYP - #1 Supply Pump (09-Dec-19)

	OVERALL LEVEL	1K-20KHz
MOH	.080 In/Sec	.183 G-s
MIH	.077 In/Sec	.187 G-s
MIA	.080 In/Sec	.131 G-s
PIA	.218 In/Sec	.265 G-s
PIH	.169 In/Sec	.876 G-s
POH	.193 In/Sec	.607 G-s

2SUPLYP - #2 Supply Pump (09-Dec-19)

	OVERALL LEVEL	1K-20KHz
MOH	.038 In/Sec	.347 G-s
MIH	.068 In/Sec	1.114 G-s
MIA	.070 In/Sec	.513 G-s
PIA	.210 In/Sec	.711 G-s
PIH	.185 In/Sec	.461 G-s
POH	.282 In/Sec	2.714 G-s

3SUPLYP - #3 Supply Pump (09-Dec-19)

	OVERALL LEVEL	1K-20KHz
MOH	.053 In/Sec	.628 G-s
MIH	.058 In/Sec	.664 G-s
MIA	.056 In/Sec	.405 G-s
PIA	.174 In/Sec	.528 G-s
PIH	.161 In/Sec	1.005 G-s
POH	.251 In/Sec	1.975 G-s

6SUPLYP - #6 Supply Pump (09-Dec-19)

	OVERALL LEVEL	1K-20KHz
MOH	.042 In/Sec	.202 G-s
MIH	.069 In/Sec	.245 G-s
MIA	.079 In/Sec	.167 G-s
PIA	.192 In/Sec	.878 G-s
PIH	.237 In/Sec	1.027 G-s
POH	.220 In/Sec	1.546 G-s

CBRA - CASTER BAGHOUSE REVERSE AIR (09-Dec-19)

	OVERALL LEVEL	1K-20KHz
MOH	.047 In/Sec	.523 G-s
MIH	.035 In/Sec	.211 G-s
MIA	.018 In/Sec	.168 G-s
FIH	.035 In/Sec	.431 G-s
FOH	.052 In/Sec	.121 G-s

CBID - CASTER BAGHOUSE ID FAN (09-Dec-19)

	OVERALL LEVEL	1K-20KHz
MOH	.043 In/Sec	.093 G-s
MOV	.036 In/Sec	.083 G-s
MIH	.042 In/Sec	.111 G-s
MIV	.040 In/Sec	.142 G-s
MIA	.029 In/Sec	.177 G-s
FIA	.209 In/Sec	.957 G-s
FIH	.085 In/Sec	1.557 G-s
FIV	.072 In/Sec	.854 G-s
FOH	.041 In/Sec	.591 G-s
FOV	.021 In/Sec	.621 G-s

FRAF - Furnace REVERSE AIR Fan (10-Dec-19)

	OVERALL LEVEL	1K-20KHz
* MOH	.082 In/Sec	.069 G-s
* MIH	.059 In/Sec	.225 G-s
* MIA	.048 In/Sec	.253 G-s
FIA	.129 In/Sec	.518 G-s
FIH	.097 In/Sec	.466 G-s
* FOH	.080 In/Sec	.397 G-s

EFBHF - East Furnace Bag House Fan (09-Dec-19)

	OVERALL LEVEL	1K-20KHz
MOH	.045 In/Sec	.557 G-s
MIH	.064 In/Sec	.430 G-s
MIA	.069 In/Sec	.628 G-s
FIA	.067 In/Sec	.712 G-s
FIH	.081 In/Sec	.648 G-s
FOH	.097 In/Sec	1.171 G-s

WFBHF - WEST Furnace Bag House Fan (09-Dec-19)

	OVERALL LEVEL	1K-20KHz
MOH	.096 In/Sec	.234 G-s
MIH	.118 In/Sec	.287 G-s
MIA	.049 In/Sec	.504 G-s
FIA	.100 In/Sec	.427 G-s
FIH	.138 In/Sec	.761 G-s
FOH	.116 In/Sec	.917 G-s

NCHYDP - North CASTER Hyd PUMP (09-Dec-19)

	OVERALL LEVEL	1K-20KHz
MOH	.065 In/Sec	.284 G-s
MIH	.044 In/Sec	.302 G-s
PIH	.086 In/Sec	.316 G-s

SCHYDP - SOUTH CASTER Hyd PUMP (09-Dec-19)

	OVERALL LEVEL	1K-20KHz
MOH	.042 In/Sec	.213 G-s
MIH	.024 In/Sec	.220 G-s
PIH	.140 In/Sec	.271 G-s

SCEXFAN - SPRAY CHAMBER EXHAUST Fan (10-Dec-19)

	OVERALL LEVEL	1K-20KHz
MOH	.514 In/Sec	.039 G-s
MIH	.458 In/Sec	.084 G-s
MIA	.175 In/Sec	.058 G-s
FIH	.260 In/Sec	.267 G-s
FOH	.194 In/Sec	.344 G-s

Clarification Of Vibration Units:

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

*** - Indicates Data Has Date/Time Different From Machine Date/Time**