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September 6, 2022

NUCOR Melt Shop Subject: August 2022 vibration survey

Below is a summary report for the Melt Shop monthly vibration survey that was performed on 9/1/22. 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.

<u>Class I:</u> Defect is present, but effect on reliability is not clear; no immediate action is required. Continue to normally monitor.

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

<u>Class III</u>: 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.

<u>Class IV</u>; 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,

1. Maxwell

ISO Certified Vibration Analyst, Category III



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Defects

West Caster Mold Water Pump

Elevated 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.

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 recently replaced; however, data still shows high 1 x rpm axial vibration in the pump. Pump impeller/shaft could be out of balance or pump has cocked bearing or some other internal misalignment. Inspect 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. Impeller may have excessive wear. Rated as a **CLASS II** defect.

Caster ID Baghouse Fan

Motor inboard vertical and DE fan waveform data shows an impacting or knock type vibration. DE fan bearing and couplings should be visually inspected during next down day. Rated as a **CLASS II** defect.

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 Hyd. Pump

Pump had high 1 x rpm vibration this month. Could be a loading issue with pump. For now, ensure pump is operating at normal pressures. Coupling may need to be inspected as well .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.

Database: nucorja9.rbm Station: Melt Shop

MEASUREMENT	POINT	OVERALL LEVEL	HFD / VHFD
WCMWP	- WEST CASTER MOL	D WATER PUMP (0	1-Sep-22)
		OVERALL LEVEL	1K-20KHz
MOH		.276 In/Sec	.381 G-s
MIH		.215 In/Sec	.678 G-s
MIA		.263 In/Sec	.719 G-s
PIA		.208 In/Sec	1.323 G-s
PIH		.191 In/Sec	1.594 G-s
POH		.178 In/Sec	1.693 G-s
MCMWP	- MID CASTER MOLD	WATER PUMP (0	1-Sep-22)
		OVERALL LEVEL	1K-20KHz
MOH		.131 In/Sec	1.045 G-s
MIH		.157 In/Sec	.804 G-s
MIA		.247 In/Sec	.660 G-s
PIA		.233 In/Sec	1.113 G-s
PIH		.208 In/Sec	1.091 G-s
POH		.156 In/Sec	.877 G-s
WBOSTRP	- WEST Booster PU	MP (0	1-Sep-22)
MOH		OVERALL LEVEL	200 C a
MOH			.300 G-S
MIH		.048 IN/Sec	.305 G-S
MIA			.140 G-S
PIA		100 Tr /Ge a	.906 G-S
PIH		.120 In/Sec	1.006 G-S
POH		.184 In/Sec	1.645 G-S
ECSWP 11FT	- EAST CASTER SPR	AY WP 1 LEFT (0	1-Sep-22)
MOH			300 C-s
мтн		072 Tr/Sec	341 G-s
MIA		.074 In/Sec	.252 G-s
MCSWP 2LFT	- MID CASTER SPRA	Y WP 2 LEFT (0	1-Sep-22)
		OVERALL LEVEL	1K-20KHz
MOH		.104 In/Sec	.303 G-s
MIH		.093 In/Sec	.706 G-s
MIA		.106 In/Sec	.208 G-s
MCSWP 3RT	- MID CASTER SPRA	Y WP 3 RIGHT (0	1-Sep-22)
		OVERALL LEVEL	1K-20KHz
MOH		.135 In/Sec	.589 G-s
MIH		.125 In/Sec	1.273 G-s
MIA		.116 In/Sec	.288 G-s
ESERVOHYDP	- EAST SERVO Hyd	PUMP (0	1-Sep-22)
		OVERALL LEVEL	1K-20KHz
MOH		.021 In/Sec	.188 G-s
MIH		.062 In/Sec	.109 G-s
PIV		.128 In/Sec	.330 G-s
MSERVOHYDP	- MIDDLE SERVO Hy	d PUMP (0	1-Sep-22)
		OVERALL LEVEL	1K-20KHz
MOH		.146 In/Sec	.241 G-s
MIH		.054 In/Sec	.250 G-s
PIV		.190 In/Sec	.489 G-s
SERVOHRECP	- SERVO Hyd RECIR	C PUMP (0	1-Sep-22)
		OVERALL LEVEL	1K-20KHz
MOH		.075 In/Sec	.128 G-s

MIH		.077 In/Sec	.450 G-s
PIV		.150 In/Sec	1.240 G-s
		•	
N2DECKHYDP	- North 2ND DECK H	vd DIMP	(01 - Sep - 22)
NEDDORUTDI	NOT CHI ZND DECIN H	OVEDALT TEVEL	1K-20KH-
MOIT			
MOH		.044 IN/Sec	.405 G-S
MIH		.110 In/Sec	1.669 G-s
PIV		.287 In/Sec	5.084 G-s
2DEKRECIP	- 2ND DECK L&S Hyd	RECIRC PUM	(01-Sep-22)
		OVERALL LEVEL	1K-20KHz
МОН		.056 In/Sec	.507 G-s
мтн		071 Tn/Sec	423 G-s
DTV		220 Tr/Sec	1 229 C-0
PIV		.239 11/300	1.230 G-S
SZDECKHYDP	- SOUTH 2ND DECK H	IYA PUMP	(01-Sep-22)
		OVERALL LEVEL	1K-20KHz
MOH		.166 In/Sec	.751 G-s
MIH		.158 In/Sec	1.075 G-s
PIV		.593 In/Sec	3.689 G-s
1 CIIDI VD	- #1 Supply Bump		(01 - 800 - 22)
ISOFILIF	- #1 Subbit Fumb		1v 20vv-
		OVERALL LEVEL	IK-20KHZ
MOH		.058 In/Sec	.228 G-s
MIH		.069 In/Sec	.183 G-s
MIA		.079 In/Sec	.081 G-s
PIA		.247 In/Sec	.545 G-s
PTH		196 Tn/Sec	1 042 G-s
DON		172 Tr/Sec	656 C-2
POH		.1/2 IN/Sec	.050 G-S
0	" 0 - 7 -		
2SUPLYP	- #2 Supply Pump		(01-Sep-22)
		OVERALL LEVEL	1K-20KHz
MOH		.059 In/Sec	.322 G-s
MIH		.098 In/Sec	.353 G-s
МТА		.157 In/Sec	.201 G-s
DTA		317 Tn/Sec	510 C-s
PIA		.317 IN/Sec	.510 G-S
PIH		.290 In/Sec	.531 G-S
POH		.281 In/Sec	1.459 G-s
5SUPLYP	- #5 Supply Pump		(01-Sep-22)
		OVERALL LEVEL	1K-20KHz
MOH		.056 In/Sec	.788 G-s
мтн		.061 In/Sec	.607 G-s
мта		079 Tn/Sec	332 6-8
DIA		252 Tr/Coc	134 C a
PIA		.353 II/Sec	.134 G-S
PIH		.198 In/Sec	.958 G-S
POH		.325 In/Sec	1.021 G-s
6SUPLYP	- #6 Supply Pump		(01-Sep-22)
		OVERALL LEVEL	1K-20KHz
MOH		.041 In/Sec	.198 G-s
MTH		.063 In/Sec	.165 G-s
мтъ		072 Tr/Sec	208 6-5
MIA		162 7- /0	.200 G-5
PIA		.105 IN/Sec	.030 G-S
PIH		.179 In/Sec	.491 G-s
POH		.222 In/Sec	1.557 G-s
CBRA	- CASTER BAGHOUSE	REVERSE AIR	(01-Sep-22)
		OVERALL LEVEL	1K-20KHz
мон		.036 In/Sec	.167 G-s
мтш		043 Tr/Sec	241 6-6
MTA		010 Tr/ccc	116 0
MIA 57			.140 G-S
F.TH		.uz/ in/Sec	.554 G-S
FOH		.045 In/Sec	.067 G-s
CBID	- CASTER BAGHOUSE	ID FAN	(01-Sep-22)
		OVERALL LEVEL	1K-20KHz
MOU		•••=====	
MOH		.066 In/Sec	.099 G-s
MON		.066 In/Sec	.099 G-s
MOH MOV MTH		.066 In/Sec .051 In/Sec .086 In/Sec	.099 G-s .113 G-s 214 G-s

MIV		.096 In/	Sec .437	/G-s
MIA		.060 In/	Sec .363	3 G-s
FIA		.113 In/	Sec 1.136	G-s
FIH		.221 In/	Sec 1.612	2 G-s
FIV		.139 In/	Sec 1.510) G-s
FOH		.199 In/	Sec .314	l G-s
FOV		.051 In/	Sec .428	3 G-s
FOA		.089 In/	Sec .295	6 G-s
FRAF	- Furnace REVERSE	AIR Fan	(01-Sep-22	2)
		OVERALL L	EVEL 1K-20)KHz
MOH		.021 In/	Sec .301	G-s
MIH		.025 In/	Sec .201	G-s
MIA		.018 In/	Sec .227	/G-s
FIA		.033 In/	Sec .391	G-s
FIH		.024 In/	Sec .430) G-s
FOH		.025 In/	Sec .140) G-s
EFBHF	- East Furnace Ba	lg House Fan	(01-Sep-22	2)
		OVERALL L	EVEL 1K-20	KHz
MOH		.067 In/	Sec .205	G-s
MIH		.084 In/	Sec .565	G-s
MIA		.023 In/	Sec .216	G-s
FIA		.083 In/	Sec 1.144	G-s
FIH		.092 In/	Sec .941	G-s
FOH		.108 In/	Sec 1.089	G-s
VFBHF	- WEST Furnace Ba	lg House Fan	(01-Sep-22	2)
		OVERALL L	EVEL 1K-20)KHz
MOH		.083 In/	Sec .720) G-s
MIH		.109 In/	Sec .515	G-s
MIA		.097 In/	Sec .434	l G-s
FIA		.105 In/	Sec 1.334	l G-s
FIH		.126 In/	Sec 1.231	G-s
FOH		.127 In/	Sec .962	2 G-s
MIDCHYDP	- MIDDLE CASTER H	lyd PUMP	(01-Sep-22	2)
		OVERALL L	EVEL 1K-20)KHz
MOH		.172 In/	Sec .430) G-s
MIH		.186 In/	Sec .351	G-s
PIH		.295 In/	Sec 1.587	/G-s
SCHYDP	- SOUTH CASTER Hy	d PUMP	(01-Sep-22	2)
		OVERALL L	EVEL 1K-20)KHz
MOH		.104 In/	Sec .570) G-s
MIH		.128 In/	Sec .380) G-s
PIH		1.142 In/	Sec 1.869	G-s
SCEXFAN	- SPRAY CHAMBER E	XHAUST Fan	(01-Sep-22	2)
		OVERALL L	EVEL 1K-20)KHz
MOH		.354 In/	Sec .293	G-s
MIH		.471 In/	Sec .196	G-s
MIA		.141 In/	Sec .254	l G-s
FIH		.248 In/	Sec .114	l G-s
		240	Soc 600	G-s
FOH		.342 ln/	Sec .090	

Vel --> In/Sec PK