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April 14, 2023

Nucor Roll Mill Jackson-Flowood, MS

Subject: April vibration survey

Below is a summary report for the monthly Roll Mill vibration survey that was performed on April 11-12, 2023. 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 NUCOR Steel Flowood, MS. If there are any comments or questions, do not hesitate to contact us.

Sincerely,

win W. Maruell

ISO Certified Vibration Analyst, Category III



QualiTest 
<sup>®</sup> Diagnostics

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# Defects

#### Roll Stand 1A

Planetary gearbox has some increased vibration and noise floor in spectral data at the input end of the gearbox. (bearings 1,2,) The increased amplitudes and gear mesh frequencies in spectral data may be influenced some due to load and speed; however the noise floor and high g's are concerning and may indicate internal wear or defects in internal components. We are monitoring this close. Rated as a **CLASS II** defect.

### Roll Stand 2

Inboard gearbox (Int.) is showing some gear mesh vibration with sidebands of input rpm. This issue appears to come and go based on load and speed. This type of vibration is an indication of heavy tooth load or possible gear wear. Rated as a **CLASS I** defect for now.

#### Roll Stand 5

Cooling fan motor still has elevated 1 x rpm vibration with some DC drive motor rpm vibration as well (this may be a resonance). Check all fasteners and motor frame for looseness. The cooling fan may have build up causing imbalance. As far as gearbox goes, gear mesh vibration decreased slightly this month. Previous gear inspections of the gearbox show some tooth wear in this gearbox. The up and down amplitude of this peak from month to month is likely due to change in tooth load and machine speed. We will continue to monitor this very closely. This is rated as a **CLASS II** defect.

## Roll Stand 6

Gear mesh vibration was slightly higher again this month. A dominant gear mesh vibration is sometimes present towards the output of the gearbox. The up and down amplitude of this peak is likely due to change in tooth load and speed. We will continue to monitor this very closely. Because of the high amplitude this month, this issue is rated as a **CLASS II** defect.

#### Roll Stand 7

Gearbox vibration was quite a bit higher this survey. High gear mesh harmonics on outboard end gear casing. We still suspect this to be possibly due to a resonant gear mesh frequency vibration. The up and down amplitude of this peak from month to month is likely due to change in tooth load and machine speed. We will continue to monitor this very closely. Because of the high amplitudes in the gearbox, this is rated as a **CLASS II** defect.

#### Roll Stand 8

Cooling fan motor has elevated 1 x rpm vibration. The cooling fan may have build up causing imbalance. Check all fasteners and motor frame for looseness and inspect fan for build up as time allows. Rated as a **CLASS II** defect.

#### Roll Stand 15

Drive motor inboard data is showing some newly presence of non-synchronous peaks in spectral data. This indicates some minor bearings defects are likely present in DE motor bearing. This is minor as of now and this will be watched closely. Rated as a **CLASS I** defect.

#### North Quincy Air Compressor

Compressor has elevated drive end axial vibration. Data shows vibration to be at 1 x rpm. For now check compressor shaft for run-out and ensure coupling is in good condition and properly aligned. Rated as a **CLASS II** defect.

#### Furnace Cooling Tower Drives North and South

Motors data shows axial vibration that appears to be occurring at or near 1 x motor rpm and may indicate a structural issue such as loose fasteners, weak flexible motor base. This could also be caused by a resonance or air flow turbulence in this unit. We will continue to monitor this issue closely. Rated as a **CLASS II** defect.

#### Mill Water West Pump

*Motor was not in operation this survey; however, the following still applies:* Top thrust bearing spectral data shows signs of bearing defects according to the spectral data of the Outboard end of the motor. This appears to be light defects at this time and will be monitored closely. Rated as a **CLASS I** defect.

#### **Ejector Fan**

Fan outboard bearing is showing some ½ harmonics of rpm in the spectral data. The fan did seem to have a strange type of noise this month which appeared to come and go as the load changed. For now, inspect fan bearing clearances and inspect fan wheel ensuring the fan wheel is not rubbing into inner cone. Rated as a **CLASS II** defect.

previated La	ast Measuren ***	nent Summary	*****	****
	Database: Station:	nucorja9.rbm Roll Mill Roll	ls	
MEASUREM	MENT POINT	OVER	ALL LEVEL	HFD / VHFD
CUID 1 X	- Stand	1 እ	(12-7	nn-22)
SIDIA	- Stanu		עדע - ב- סאדד דיגעיד	1K-20KH4
N	10H	1	$\frac{1}{37}$ Tr/Sec	056 C-8
r N	1011 1TH	. 1.	04 In/Sec	179 G-s
L. N.	1111 (T D	.1	73 In/Sec	164 G-s
- -	CH	.1	32 In/Sec	.104 G S
		.1	42 In/Sec	440 G-s
- -	211 2TH	3.	17 In/Sec	945 G-s
с с	512	2	67 In/Sec	.421 G-s
( (	313	.2	31 In/Sec	.483 G-s
G	GI4	.1	68 In/Sec	.359 G-s
G	<b>3</b> I5	.1	18 In/Sec	.170 G-s
G	<b>3</b> I6	. 01	35 In/Sec	.110 G-s
G	ЮН	. 01	33 In/Sec	.034 G-s
STD2A	- Stand	2 <b>A</b>	(12-2	pr-23)
		OVE	RALL LEVEL	1K-20KHz
N	IOH	. 0.	50 In/Sec	.0077 G-s
M	IIH	. 0.	57 In/Sec	.065 G-s
М	AIA	.0	54 In/Sec	.127 G-s
C	СОН	.14	10 In/Sec	.027 G-s
STD1	- Stand	1	(12-A	pr-23)
		OVE	RALL LEVEL	1K-20KHz
M	IOH	.1	32 In/Sec	.066 G-s
M	<b>IIH</b>	.1:	21 In/Sec	.028 G-s
M	AIA	. 22	27 In/Sec	.251 G-s
G	SIA	. 0.	37 In/Sec	.033 G-s
G	SIH	.0	61 In/Sec	.016 G-s
C	СОН	.1:	23 In/Sec	.077 G-s
STD2	- Stand	2	(12-4	pr-23)
-	<b>1</b> 011	OVE	КАЦЦ ЦЁVЁЦ 10 Тр /0 с	IK-2UKHZ
N .		.1	LU IN/SEC	.U91 G-S
N .	11H	.1	DD IN/SEC	.055 G-S
N		.3	JD IN/SEC	.1// G-S
	TTU TTU	. 34	10 IN/Sec	190 G-S
C	СОН	. 5	31 In/Sec	.100 G-s .074 G-s
STD3	- Stand	3	(12-2	pr-23)
		OVE	RALL LEVEL	1K-20KHz
M	ЮН	. 0.	56 In/Sec	.078 G-s
M	IIH	. 08	34 In/Sec	.017 G-s

	MIA		.219 In/Sec	.034 G-s
	CTA		026 Tm/Sec	066 0 0
	GIA		.030 11/300	.000 G-S
	GIH		.061 In/Sec	.010 G-s
	COH		.178 In/Sec	.030 G-s
STD 1	- Stand	٨	/1	2-202-23)
3104	- Stanu	-	(1	.2-Api-25)
			OVERALL LEVEL	1K-20KHz
	MOH		.065 In/Sec	.021 G-s
	мін		.074 In/Sec	.030 G-s
	MT 7		100 Tr/Sec	297 C-2
	MIA		.100 11/360	.207 G-S
	GIA		.058 In/Sec	.082 G-s
	GIH		.064 In/Sec	.012 G-s
	COH		424 In/Sec	.028 G-s
	0011			.020 0 0
	<b>~</b> 1	-		a <b>a</b> aas
STD5	- Stand	5	(1	2-Apr-23)
			OVERALL LEVEL	1K-20KHz
	MOH		.057 In/Sec	.097 G-s
	мтц		061 Tp/Soc	157 C-s
	MIN		.001 11/360	.137 G-5
	MIA		.084 In/Sec	.176 G-s
	GIA		.113 In/Sec	.021 G-s
	GIH		.076 In/Sec	.050 G-s
	COH		231 Tn/Sec	294 G-8
	GOII		.231 IN/Sec	.234 6 3
	СОН		.528 In/Sec	.045 G-s
STD6	- Stand	6	(1	2-Apr-23)
			OVERALL LEVEL	1K-20KHz
	MOH		.06/ In/Sec	.026 G-S
	MIH		.055 In/Sec	.050 G-s
	MIA		.142 In/Sec	.055 G-s
	GTA		079 TR/Sec	0057 G-8
	0111		051 7. (0	
	GIH		.051 In/Sec	.076 G-S
	GOH		.555 In/Sec	.417 G-s
	СОН		.330 In/Sec	.145 G-s
	Chand	7	/1	2 7mm 221
SIDI	- stand	/	(1	2-Apr-23)
			OVERALL LEVEL	1K-20KHz
	MOH		.095 In/Sec	.115 G-s
	мтн		050 Tn/Sec	121 G-s
	MTA		205 Tr/Sec	1 224 C a
	MIA		.205 IN/Sec	1.524 G-S
	GIA		.114 In/Sec	.052 G-s
	GIH		.070 In/Sec	.079 G-s
	GOH		1.195 In/Sec	2.998 G-s
	CON		422 Tp/Soc	059 C-0
	COH		.425 11/560	.050 G-S
STD8	- Stand	8	(1	.2-Apr-23)
			OVERALL LEVEL	1K-20KHz
	MOH		117 Tn/Sec	041 C-s
	1011		110 Ta /0 a	.041 G 3
	MIH		.113 In/Sec	.020 G-S
	MIA		.072 In/Sec	.218 G-s
	GIA		.079 In/Sec	.011 G-s
	GIH		.095 In/Sec	.027 G-s
	CON		582 TR/Soc	048 6-5
	COII		.502 11/560	.040 G-5
_		_		
STD9	- Stand	9	(1	.2-Apr-23)
			OVERALL LEVEL	1K-20KHz
	MOH		058 In/Sec	057 G-s
	MTH		.050 IN/Dec	.037 0 5
	MTH		.US4 IN/SEC	.033 G-S
	MIA		.181 In/Sec	.077 G-s
	GIA		.143 In/Sec	.184 G-s
	GIH		.111 In/Sec	.281 G-s
	CON		207 Tr/Sec	095 0-5
	COR		.zv/ II/Sec	.005 G-S
STD11	- Stand	11	(1	.2-Apr-23)
			OVERALL LEVEL	1K-20KHz
	MOH		.028 Tn/Sec	.019 C-e
	MTU		0.025  m/0.000	017 G S
	NTU		.U23 IN/Sec	.054 G-S
	MIA		.045 In/Sec	.034 G-s
	GIA		.040 In/Sec	.178 G-s
	GIH		.066 In/Sec	.077 G-s
	CON		057 Th/See	076 0 -
	171711		TH/26C	. U/U G-S

СОН	.167 In/Sec	.012 G-s
cmp12 = Stand 12	(10	)-7mm-03)
	OVERALL LEVEL	1K-20KH7
MOH		312 G-s
MTH	.103 In/Sec	.181 G-s
MIA	.086 In/Sec	.109 G-s
GIA	.051 In/Sec	.024 G-s
GIH	.044 In/Sec	.0092 G-s
GOH	.040 In/Sec	.103 G-s
СОН	.247 In/Sec	.203 G-s
STD14 - Stand 14	(12	2-Apr-23)
MOU	OVERALL LEVEL	IK-ZUKHZ
MOH	.039 IN/Sec	.209 G-S
MIN	071 In/Sec	.102 G-S 346 G-S
GIA	.173 In/Sec	.132 G-s
GIH	.082 In/Sec	.040 G-s
GOH	.073 In/Sec	.022 G-s
СОН	.171 In/Sec	.162 G-s
STD15 - Stand 15	(12	2-Apr-23)
	OVERALL LEVEL	1K-20KHz
MOH	.062 In/Sec	.129 G-s
MIH	.0/9 In/Sec	.115 G-s
MIA	.083 In/Sec	.136 G-S
GIA	.065 In/Sec	.214 G-S
GIH	.069 IN/Sec	.343 G-S
NORTH AC - NORTH AIR COM	PRESSOR QUINCY (12	2-Apr-23)
	OVERALL LEVEL	1 - 20 KHz
MOH	.136 In/Sec	1.675 G-s
MIH	.093 In/Sec	.722 G-s
MIA	.100 In/Sec	.548 G-s
	OVERALL LEVEL	1K-20KHz
CIA	.427 In/Sec	.673 G-s
CIH	.211 In/Sec	.642 G-s
СОН	.206 In/Sec	.408 G-S
SOUTH AC - SOUTH AIR COM	PRESSOR QUINCY (12	2-Apr-23)
	OVERALL LEVEL	1 - 20 KHz
MOH	.170 In/Sec	.208 G-s
MIH	.160 In/Sec	.280 G-s
MIA	.341 In/Sec	.139 G-s
	OVERALL LEVEL	1K-20KHz
CIA	.337 In/Sec	.613 G-s
CIH	.151 In/Sec	.396 G-s
СОН	.223 In/Sec	.222 G-s
Database: nucorj	a9.rbm	
Station: Roll M	ill Utilities	
MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD
HYDPMP1 - Hydraulic Pum	p East (11	1 - Apr - 23
MOH	OVERALL LEVEL	IN-ZUKHZ
MUN MIU	257 To/Sec	.299 G-S 575 C-2
DIA	336 Tn/900	.575 G-S 2 763 G-S
ETA	.550 11/560	2.703 6-8
HYDPMP2 - Hydraulic Pump	p Center (11	-Apr-23)
	OVERALL LEVEL	1K-20KHz
MOH	.111 In/Sec	.287 G-s
MIH	.233 In/Sec	.171 G-s
PIV	.308 In/Sec	1.131 G-s

DESFAN	- Desoluti	on Fan		(11-Apr-23)	
		OVERA	LL LEVEL	1K-20K	Hz
MOH		.043	3 In/Sec	.101	 G-s
MIH		.039	In/Sec	.036	G-s
COMFAN	- Combusti	on Air Fan		(11-Apr-23)	
		OVERA	LL LEVEL	1K-20K	Hz
MOH		.105	5 In/Sec	.179	G-s
MIH		. 091	. In/Sec	.212	G-s
MIA		.101	In/Sec	.170	G-s
FIH		.056	In/Sec	.084	G-s
FOR		.100	5 III/Sec	.500	6-5
EJCFAN	- Eiector	Air Fan		(11-Apr-23)	
	<b>J</b>	OVERA	LL LEVEL	1K-20K	Hz
MOH		.203	3 In/Sec	.248	G-s
MIH		.174	l In/Sec	.276	G-s
MIA		.104	In/Sec	.153	G-s
FIA		.096	5 In/Sec	. 321	G-s
FIH		.117	In/Sec	.299	G-s
FOH		.245	in/Sec	.554	G-S
COLPMP2	- Furnace	Cooling Pump	enter	(11-Apr-23)	
CONTINE 7	- armace	OVERA	LL LEVEL	1K-20K	Hz
MOH		. 304	In/Sec	.137	G-s
MIH		.138	3 In/Sec	.169	G-s
MIA		.076	5 In/Sec	.207	G-s
FCTSOUTH	- Furnace	CT Drive South	1	(11-Apr-23)	
		OVERA	LL LEVEL	1K-20K	Hz
MOH		. 394	In/Sec	.119	G-s
МІН		.240	In/Sec	.079	G-S C-S
МІА		. 521	. III/Sec	.025	6-5
FCTNORTH	- Furnace	CT Drive North	1	(11-Apr-23)	
		OVERA	LL LEVEL	1K-20K	Hz
MOH		.279	) In/Sec	.051	G-s
MIH		.169	) In/Sec	.087	G-s
MIA		.160	) In/Sec	.076	G-s
		t Dumm Manth		(11 7	
SCLPMPZ	- Scale Pi	t Pump North		(11-Apr-23) 1x-20x	·u
мон		250	Tr/Sec	300	nz G-s
MIH		.125	5 In/Sec	.317	G-s
MIA		.125	5 In/Sec	.094	G-s
PIH		.144	In/Sec	.187	G-s
CTWTR1	- CT Pump	East/Middle Pu	ump	(11-Apr-23)	
		OVERA	LL LEVEL	1K-20K	Hz
MOH		.134	In/Sec	. 437	G-s
MIH		.065	In/Sec	.128	G-s
MIA		.061	. In/Sec	.150	G-s
MTT.WTD2	- Mill Wat	er Pump Center	-	(11 - 2nr - 23)	
MILWINZ	- MIII Wat	OVERA		1K-20K	H7
МОН		.065	5 In/Sec	.235	G-s
MIH		.073	3 In/Sec	.631	G-s
MIA		.056	5 In/Sec	.436	G-s
MILWTR1	- Mill Wat	er Pump East		(11-Apr-23)	
		OVERA	LL LEVEL	1K-20K	Hz
MOH		.044	In/Sec	.108	G-s
MIH		.055	In/Sec	. 352	G-s
MIA		.038	5 III/Sec	.119	5-9
Clarification	Of Vibrati	on Units:			
Acc	-> G-s	RMS			
Vel	-> In/Sec	PK			