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December 14, 2023

Nucor Roll Mill
Jackson-Flowood, MS

Subject: December vibration survey

Below is a summary report for the monthly Roll Mill vibration survey that was performed on 12/12/23. Most of the machines surveyed were found to be in good condition except for the following.

HI-SPEED 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 NUCOR Steel Flowood, MS. If there are any comments or questions, do not hesitate to contact us.

Sincerely,

Kevin W. Maxwell

ISO Certified Vibration Analyst, Category III

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Defects

Roll Stand 1A
Planetary gearbox also has some increased vibration and noise floor in spectral data at the input end of the gearbox. The increased amplitudes and gear mesh frequencies in spectral data may be influenced some due to load and speed; however, they may also indicate internal wear or defects in internal components. We are monitoring this closely. Rated as a **CLASS I** defect.

Roll Stand 2
Inboard gearbox (Int.) is showing some elevated 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 some 1 x rpm vibration. Check all fasteners and motor frame for looseness. The cooling fan may have build up causing imbalance. As far as the gearbox goes, gear mesh vibration increased 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
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. This is rated as a **CLASS I** defect.

Roll Stand 7
Gearbox vibration was lower in amplitude this survey. Vibration data shows high amplitude gear mesh harmonics on outboard end of the gear casing. We 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 outboard end of gearbox, this is rated as a **CLASS II** defect.

Furnace Cooling Tower Drive South
Motor data shows axial and radial 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.

West Air Compressor
Compressor was not in operation this survey; however, the following still applies: Motor and compressor has an increase in 1 x rpm vibration with vibration being the highest in the axial direction. For now, check couplings, check all base fasteners, and ensure alignment is good. Rated as a **CLASS III** 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 was running very slow this survey so amplitudes were very low; however, at full speed the following may still apply: Fan bearing data is still showing some ½ harmonics of rpm in the spectral data. For now, inspect fan bearing clearances and inspect fan wheel ensuring the fan wheel is not rubbing into inner cone. Inspect fan wheel for cracks also. Rated as a **CLASS II** defect.

Abbreviated Last Measurement Summary
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Database: nucorja9.rbm
Station: Roll Mill Rolls
Route No. 1: RM ROLL DRIVES

MEASUREMENT POINT		OVERALL LEVEL	HFD / VHFD
STD1A	- Stand 1A	(12-Dec-23)	
		OVERALL LEVEL	1K-20KHz
MOH		.110 In/Sec	.023 G-s
MIH		.085 In/Sec	.042 G-s
MIA		.107 In/Sec	.066 G-s
COH		.203 In/Sec	.044 G-s
GIA		.153 In/Sec	.309 G-s
GIH		.325 In/Sec	.772 G-s
GI2		.237 In/Sec	.277 G-s
GI3		.207 In/Sec	.621 G-s
GI4		.165 In/Sec	1.700 G-s
GI5		.111 In/Sec	.629 G-s
GI6		.083 In/Sec	.433 G-s
GOH		.071 In/Sec	.031 G-s
STD2A	- Stand 2A	(12-Dec-23)	
		OVERALL LEVEL	1K-20KHz
MOH		.043 In/Sec	.0098 G-s
MIH		.038 In/Sec	.077 G-s
MIA		.069 In/Sec	.143 G-s
COH		.063 In/Sec	.099 G-s
STD1	- Stand 1	(12-Dec-23)	
		OVERALL LEVEL	1K-20KHz
MOH		.094 In/Sec	.154 G-s
MIH		.133 In/Sec	.054 G-s
MIA		.462 In/Sec	.312 G-s
GIA		.036 In/Sec	.050 G-s
GIH		.044 In/Sec	.043 G-s
COH		.092 In/Sec	.054 G-s
STD2	- Stand 2	(12-Dec-23)	
		OVERALL LEVEL	1K-20KHz
MOH		.108 In/Sec	.043 G-s
MIH		.193 In/Sec	.171 G-s
MIA		.412 In/Sec	.516 G-s
GIA		.114 In/Sec	.113 G-s
GIH		.192 In/Sec	.367 G-s
COH		.371 In/Sec	.058 G-s

STD3 - Stand 3 (12-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.044 In/Sec	.027 G-s
MIH	.065 In/Sec	.040 G-s
MIA	.103 In/Sec	.040 G-s
GIA	.031 In/Sec	.026 G-s
GIH	.050 In/Sec	.021 G-s
COH	.146 In/Sec	.036 G-s

STD4 - Stand 4 (12-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.045 In/Sec	.045 G-s
MIH	.064 In/Sec	.069 G-s
MIA	.102 In/Sec	.203 G-s
GIA	.046 In/Sec	.170 G-s
GIH	.041 In/Sec	.028 G-s
COH	.226 In/Sec	.039 G-s

STD5 - Stand 5 (12-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.034 In/Sec	.012 G-s
MIH	.051 In/Sec	.086 G-s
MIA	.112 In/Sec	.036 G-s
GIA	.140 In/Sec	.011 G-s
GIH	.072 In/Sec	.011 G-s
GOH	.437 In/Sec	.096 G-s
COH	.376 In/Sec	.054 G-s

STD6 - Stand 6 (12-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.048 In/Sec	.015 G-s
MIH	.044 In/Sec	.021 G-s
MIA	.066 In/Sec	.040 G-s
GIA	.051 In/Sec	.020 G-s
GIH	.040 In/Sec	.052 G-s
GOH	.197 In/Sec	.118 G-s
COH	.217 In/Sec	.044 G-s

STD7 - Stand 7 (12-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.057 In/Sec	.077 G-s
MIH	.038 In/Sec	.114 G-s
MIA	.077 In/Sec	.054 G-s
GIA	.079 In/Sec	.018 G-s
GIH	.047 In/Sec	.049 G-s
GOH	.309 In/Sec	.523 G-s
COH	.432 In/Sec	.079 G-s

STD9 - Stand 9 (12-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.039 In/Sec	.045 G-s
MIH	.150 In/Sec	.122 G-s
MIA	.168 In/Sec	.069 G-s
GIA	.160 In/Sec	.060 G-s
GIH	.119 In/Sec	.801 G-s
COH	.144 In/Sec	.030 G-s

STD11 - Stand 11 (12-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.019 In/Sec	.028 G-s
MIH	.031 In/Sec	.039 G-s
MIA	.043 In/Sec	.067 G-s
GIA	.036 In/Sec	.079 G-s
GIH	.038 In/Sec	.044 G-s
GOH	.034 In/Sec	.033 G-s
COH	.175 In/Sec	.020 G-s

STD12 - Stand 12 (12-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.023 In/Sec	.030 G-s

	MIH	.028 In/Sec	.062 G-s
	MIA	.036 In/Sec	.101 G-s
	COH	.100 In/Sec	.067 G-s

STD13 - Stand 13 (12-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.087 In/Sec	.373 G-s
MIH	.085 In/Sec	.142 G-s
MIA	.123 In/Sec	.278 G-s
GIA	.041 In/Sec	.101 G-s
GIH	.053 In/Sec	.260 G-s
GOH	.038 In/Sec	.415 G-s
COH	.475 In/Sec	.612 G-s

STD14 - Stand 14 (12-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.101 In/Sec	.141 G-s
MIH	.068 In/Sec	.023 G-s
MIA	.075 In/Sec	.053 G-s
COH	.231 In/Sec	.186 G-s
GIA	.108 In/Sec	.073 G-s
GIH	.080 In/Sec	.071 G-s
GOH	.049 In/Sec	.057 G-s

STD15 - Stand 15 (12-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.066 In/Sec	.242 G-s
MIH	.066 In/Sec	.043 G-s
MIA	.065 In/Sec	.096 G-s
GIA	.052 In/Sec	.095 G-s
GIH	.050 In/Sec	.361 G-s
COH	.219 In/Sec	.150 G-s

STD16 - Stand 16 (12-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.028 In/Sec	.153 G-s
MIH	.080 In/Sec	.037 G-s
MIA	.070 In/Sec	.133 G-s
GIA	.045 In/Sec	.064 G-s
GIH	.030 In/Sec	.020 G-s
GOH	.036 In/Sec	.055 G-s
COH	.152 In/Sec	.054 G-s

NORTH AC - NORTH AIR COMPRESSOR QUINCY (12-Dec-23)

	OVERALL LEVEL	1 - 20 KHz
MOH	.107 In/Sec	1.005 G-s
MIH	.079 In/Sec	.428 G-s
MIA	.083 In/Sec	.584 G-s
	OVERALL LEVEL	1K-20KHz
CIA	.356 In/Sec	.571 G-s
CIH	.179 In/Sec	.521 G-s
COH	.207 In/Sec	.366 G-s

SOUTH AC - SOUTH AIR COMPRESSOR QUINCY (12-Dec-23)

	OVERALL LEVEL	1 - 20 KHz
MOH	.121 In/Sec	.345 G-s
MIH	.131 In/Sec	.211 G-s
MIA	.315 In/Sec	.391 G-s
	OVERALL LEVEL	1K-20KHz
CIA	.318 In/Sec	.562 G-s
CIH	.144 In/Sec	.411 G-s
COH	.281 In/Sec	.400 G-s

Station: Roll Mill Utilities
Route No. 1: UTILITIES

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD
HYDPMP2 - Hydraulic Pump Center	(12-Dec-23)	
	OVERALL LEVEL	1K-20KHz
MOH	.122 In/Sec	.213 G-s
MIH	.217 In/Sec	.250 G-s
PIV	.266 In/Sec	.389 G-s
HYDPMP3 - Hydraulic Pump West	(12-Dec-23)	
	OVERALL LEVEL	1K-20KHz
MOH	.163 In/Sec	.316 G-s
MIH	.409 In/Sec	.246 G-s
PIV	.326 In/Sec	1.680 G-s
DESFAN - Desolution Fan	(12-Dec-23)	
	OVERALL LEVEL	1K-20KHz
MOH	.029 In/Sec	.060 G-s
MIH	.043 In/Sec	.036 G-s
MIA	.078 In/Sec	.167 G-s
COMFAN - Combustion Air Fan	(12-Dec-23)	
	OVERALL LEVEL	1K-20KHz
MOH	.100 In/Sec	.167 G-s
MIH	.077 In/Sec	.205 G-s
MIA	.053 In/Sec	.173 G-s
FIH	.060 In/Sec	.088 G-s
FOH	.078 In/Sec	.103 G-s
EJCFAN - Ejector Air Fan	(12-Dec-23)	
	OVERALL LEVEL	1K-20KHz
MOH	.030 In/Sec	.221 G-s
MIH	.029 In/Sec	.321 G-s
MIA	.019 In/Sec	.162 G-s
FIA	.022 In/Sec	.163 G-s
FIH	.017 In/Sec	.321 G-s
FOH	.045 In/Sec	.307 G-s
COLPMP2 - Furnace Cooling Pump center	(12-Dec-23)	
	OVERALL LEVEL	1K-20KHz
MOH	.128 In/Sec	.228 G-s
MIH	.074 In/Sec	.220 G-s
MIA	.114 In/Sec	.150 G-s
FCTSOUTH - Furnace CT Drive South	(12-Dec-23)	
	OVERALL LEVEL	1K-20KHz
MOH	.342 In/Sec	.154 G-s
MIH	.109 In/Sec	.077 G-s
MIA	.524 In/Sec	.076 G-s
FCTNORTH - Furnace CT Drive North	(12-Dec-23)	
	OVERALL LEVEL	1K-20KHz
MOH	.377 In/Sec	.060 G-s
MIH	.314 In/Sec	.099 G-s
MIA	.188 In/Sec	.041 G-s
SCLPMP2 - Scale Pit Pump North	(12-Dec-23)	
	OVERALL LEVEL	1K-20KHz
MOH	.206 In/Sec	.165 G-s
MIH	.096 In/Sec	.284 G-s
MIA	.160 In/Sec	.157 G-s
CTWTR2 - CT Pump West	(12-Dec-23)	
	OVERALL LEVEL	1K-20KHz
MOH	.063 In/Sec	.236 G-s
MIH	.049 In/Sec	.258 G-s

	MIA	.082 In/Sec	.184 G-s

MILWTR2 - Mill Water Pump Center (12-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.059 In/Sec	.451 G-s
MIH	.059 In/Sec	.704 G-s
MIA	.043 In/Sec	.528 G-s

MILWTR1 - Mill Water Pump East (12-Dec-23)

	OVERALL LEVEL	1K-20KHz
MOH	.062 In/Sec	.129 G-s
MIH	.048 In/Sec	.146 G-s
MIA	.035 In/Sec	.174 G-s

Clarification Of Vibration Units:

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