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November 23, 2021

Nucor Roll Mill
Jackson-Flowood, MS

Subject: November vibration survey

Below is a summary report for the monthly Roll Mill vibration survey that was performed on November 17-18th, 2021. 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.

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

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,

Kevin W. Maxwell

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Defects

Roll Stand 1A Planetary Gearbox
Gearbox looks much better after replacing the defective gear section of the gearbox. Vibration data shows no issues at this time.

Roll Stand 2
Motor was showing a higher than normal 360 Hz. vibration with rpm sidebands. This may be caused by issues with the VFD, commutator, brushes, and or armature. We will monitor this closely. The drive end of the intermediate gearbox also shows gear mesh frequencies with 2 and 4 x input GMF being dominant. Input rpm sidebands were also present around the GMF harmonics. These peaks vary in amplitude according to speed and gear load. This may indicate some internal gear issues such as misaligned gears. We will continue to monitor closely. Rated as a **CLASS I** defect.

Roll Stand 3
Outboard motor bearing is starting to show some signs of bearing issue. This will be monitored very closely in the coming surveys. Rated as a **CLASS II** defect for now.

Roll Stand 5
Gear mesh vibration decreased some this month. Inspection of the gearbox does 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 increased this month. Overall amplitude at the outboard side horizontal was .76 ips-pk. A dominant gear mesh vibration is 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 about the same this month. 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.

Furnace Cooling Tower Drives North and South
Motor has high vibration. This appears to be occurring at 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 turbulance in this unit since the blade pitch has been altered. We will continue to monitor this issue closely. Rated as a **CLASS II** defect.

East Booster Pump (Small)
Motor has high 1 x rpm vibration. This may be due to excessive pump shaft movement. Pump may need attention in the near future. Rated as a **CLASS II** defect.

Abbreviated Last Measurement Summary

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Database: nucorja9.rbm
Station: Roll Mill Rolls

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD
STD1A - Stand 1A	(18-Nov-21)	
	OVERALL LEVEL	1K-20KHz
* MOH	.061 In/Sec	.021 G-s
* MIH	.076 In/Sec	.060 G-s
* MIA	.131 In/Sec	.063 G-s
* COH	.168 In/Sec	.139 G-s
GIA	.030 In/Sec	.084 G-s
GIH	.062 In/Sec	.273 G-s
GI2	.048 In/Sec	.112 G-s
GI3	.060 In/Sec	.257 G-s
GI4	.052 In/Sec	.464 G-s
GI5	.043 In/Sec	.230 G-s
GI6	.029 In/Sec	.073 G-s
* GOH	.036 In/Sec	.036 G-s
STD2A - Stand 2A	(17-Nov-21)	
	OVERALL LEVEL	1K-20KHz
MOH	.055 In/Sec	.040 G-s
MIH	.055 In/Sec	.186 G-s
MIA	.095 In/Sec	.033 G-s
COH	.114 In/Sec	.060 G-s
STD1 - Stand 1	(17-Nov-21)	
	OVERALL LEVEL	1K-20KHz
MOH	.124 In/Sec	.251 G-s
MIH	.128 In/Sec	.032 G-s
MIA	.398 In/Sec	.116 G-s
GIA	.028 In/Sec	.020 G-s
GIH	.088 In/Sec	.019 G-s
COH	.098 In/Sec	.032 G-s
STD2 - Stand 2	(17-Nov-21)	
	OVERALL LEVEL	1K-20KHz
MOH	.135 In/Sec	.025 G-s
MIH	.081 In/Sec	.104 G-s
MIA	.210 In/Sec	.178 G-s
GIA	.047 In/Sec	.048 G-s
GIH	.049 In/Sec	.051 G-s
COH	.193 In/Sec	.048 G-s
STD3 - Stand 3	(17-Nov-21)	
	OVERALL LEVEL	1K-20KHz
MOH	.100 In/Sec	.063 G-s
MIH	.176 In/Sec	.086 G-s
MIA	.270 In/Sec	.095 G-s
GIA	.036 In/Sec	.147 G-s
GIH	.042 In/Sec	.100 G-s
COH	.205 In/Sec	.036 G-s
STD4 - Stand 4	(17-Nov-21)	
	OVERALL LEVEL	1K-20KHz
MOH	.064 In/Sec	.045 G-s
MIH	.136 In/Sec	.085 G-s
MIA	.279 In/Sec	.647 G-s
GIA	.079 In/Sec	.260 G-s
GIH	.085 In/Sec	.172 G-s
COH	.178 In/Sec	.065 G-s
STD5 - Stand 5	(17-Nov-21)	
	OVERALL LEVEL	1K-20KHz
MOH	.068 In/Sec	.071 G-s

	MIH	.095 In/Sec	.075 G-s
	MIA	.077 In/Sec	.090 G-s
	GIA	.096 In/Sec	.0058 G-s
	GIH	.120 In/Sec	.046 G-s
	GOH	.252 In/Sec	.147 G-s
	COH	.462 In/Sec	.038 G-s

STD6 - Stand 6 (17-Nov-21)

	OVERALL LEVEL	1K-20KHz
MOH	.054 In/Sec	.031 G-s
MIH	.088 In/Sec	.049 G-s
MIA	.105 In/Sec	.146 G-s
GIA	.056 In/Sec	.0064 G-s
GIH	.035 In/Sec	.029 G-s
GOH	.548 In/Sec	.242 G-s
COH	.338 In/Sec	.091 G-s

STD7 - Stand 7 (17-Nov-21)

	OVERALL LEVEL	1K-20KHz
MOH	.085 In/Sec	.090 G-s
MIH	.084 In/Sec	.185 G-s
MIA	.241 In/Sec	.720 G-s
GIA	.059 In/Sec	.013 G-s
GIH	.028 In/Sec	.145 G-s
GOH	.165 In/Sec	.136 G-s
COH	.545 In/Sec	.131 G-s

STD8 - Stand 8 (17-Nov-21)

	OVERALL LEVEL	1K-20KHz
MOH	.055 In/Sec	.064 G-s
MIH	.057 In/Sec	.138 G-s
MIA	.122 In/Sec	.136 G-s
GIA	.035 In/Sec	.079 G-s
GIH	.039 In/Sec	.085 G-s
COH	.157 In/Sec	.088 G-s

STD9 - Stand 9 (17-Nov-21)

	OVERALL LEVEL	1K-20KHz
MOH	.054 In/Sec	.141 G-s
MIH	.088 In/Sec	.208 G-s
MIA	.234 In/Sec	.098 G-s
GIA	.097 In/Sec	.013 G-s
GIH	.065 In/Sec	.141 G-s
COH	.198 In/Sec	.122 G-s

STD10 - Stand 10 (17-Nov-21)

	OVERALL LEVEL	1K-20KHz
MOH	.033 In/Sec	.029 G-s
MIH	.072 In/Sec	.017 G-s
MIA	.088 In/Sec	.043 G-s
GIA	.079 In/Sec	.042 G-s
GIH	.050 In/Sec	.156 G-s
COH	.139 In/Sec	.060 G-s

STD11 - Stand 11 (17-Nov-21)

	OVERALL LEVEL	1K-20KHz
MOH	.027 In/Sec	.067 G-s
MIH	.043 In/Sec	.126 G-s
MIA	.041 In/Sec	.173 G-s
GIA	.096 In/Sec	.054 G-s
GIH	.069 In/Sec	.049 G-s
GOH	.052 In/Sec	.118 G-s
COH	.151 In/Sec	.023 G-s

STD12 - Stand 12 (17-Nov-21)

	OVERALL LEVEL	1K-20KHz
MOH	.027 In/Sec	.047 G-s
MIH	.034 In/Sec	.144 G-s
MIA	.043 In/Sec	.083 G-s
COH	.079 In/Sec	.059 G-s

STD13	- Stand 13		(18-Nov-21)
		OVERALL LEVEL	1K-20KHz
* MOH		.132 In/Sec	.200 G-s
* MIH		.104 In/Sec	.108 G-s
* MIA		.136 In/Sec	.196 G-s
* GIA		.066 In/Sec	.091 G-s
* GIH		.034 In/Sec	.076 G-s
* GOH		.047 In/Sec	.163 G-s
COH		.209 In/Sec	.508 G-s
STD14	- Stand 14		(17-Nov-21)
		OVERALL LEVEL	1K-20KHz
MOH		.128 In/Sec	.263 G-s
MIH		.113 In/Sec	.032 G-s
MIA		.084 In/Sec	.121 G-s
COH		.368 In/Sec	.232 G-s
GIA		.091 In/Sec	.112 G-s
GIH		.044 In/Sec	.038 G-s
GOH		.038 In/Sec	.020 G-s
STD15	- Stand 15		(17-Nov-21)
		OVERALL LEVEL	1K-20KHz
MOH		.138 In/Sec	.102 G-s
MIH		.067 In/Sec	.049 G-s
MIA		.060 In/Sec	.117 G-s
GIA		.092 In/Sec	.023 G-s
GIH		.042 In/Sec	.298 G-s
COH		.163 In/Sec	.625 G-s
NORTH AC	- NORTH AIR COMPRESSOR QUINCY		(18-Nov-21)
		OVERALL LEVEL	1 - 20 KHz
MOH		.175 In/Sec	1.173 G-s
MIH		.157 In/Sec	1.277 G-s
MIA		.162 In/Sec	.808 G-s
		OVERALL LEVEL	1K-20KHz
CIA		.396 In/Sec	.606 G-s
CIH		.234 In/Sec	.477 G-s
COH		.273 In/Sec	.325 G-s
SOUTH AC	- SOUTH AIR COMPRESSOR QUINCY		(18-Nov-21)
		OVERALL LEVEL	1 - 20 KHz
MOH		.076 In/Sec	1.359 G-s
MIH		.127 In/Sec	1.064 G-s
MIA		.111 In/Sec	.976 G-s
		OVERALL LEVEL	1K-20KHz
CIA		.323 In/Sec	.560 G-s
CIH		.112 In/Sec	.478 G-s
COH		.314 In/Sec	.273 G-s

Database: nucorja9.rbm
Station: Roll Mill Utilities

MEASUREMENT POINT		OVERALL LEVEL	HFD / VHFD
HYDPMP1	- Hydraulic Pump East		(18-Nov-21)
		OVERALL LEVEL	1K-20KHz
MOH		.135 In/Sec	.200 G-s
MIH		.279 In/Sec	.233 G-s
PIV		.327 In/Sec	2.967 G-s
HYDPMP3	- Hydraulic Pump West		(18-Nov-21)
		OVERALL LEVEL	1K-20KHz
MOH		.140 In/Sec	.375 G-s
MIH		.392 In/Sec	.337 G-s
PIV		.341 In/Sec	1.478 G-s
DESFAN	- Desolution Fan		(18-Nov-21)

		OVERALL LEVEL	1K-20KHz
	MOH	.041 In/Sec	.079 G-s
	MIH	.031 In/Sec	.051 G-s

COMFAN - Combustion Air Fan (18-Nov-21)

	OVERALL LEVEL	1K-20KHz
MOH	.109 In/Sec	.237 G-s
MIH	.094 In/Sec	.345 G-s
MIA	.065 In/Sec	.163 G-s
FIH	.056 In/Sec	.114 G-s
FOH	.081 In/Sec	.320 G-s

EJCFAN - Ejector Air Fan (18-Nov-21)

	OVERALL LEVEL	1K-20KHz
MOH	.109 In/Sec	.372 G-s
MIH	.105 In/Sec	.344 G-s
MIA	.067 In/Sec	.196 G-s
FIA	.046 In/Sec	.256 G-s
FIH	.075 In/Sec	.498 G-s
FOH	.113 In/Sec	1.333 G-s

COLPMP2 - Furnace Cooling Pump center (18-Nov-21)

	OVERALL LEVEL	1K-20KHz
MOH	.366 In/Sec	.131 G-s
MIH	.157 In/Sec	.083 G-s
MIA	.177 In/Sec	.199 G-s

FCTSOUTH - Furnace CT Drive South (18-Nov-21)

	OVERALL LEVEL	1K-20KHz
MOH	.475 In/Sec	.089 G-s
MIH	.305 In/Sec	.153 G-s
MIA	.151 In/Sec	.097 G-s

FCTNORTH - Furnace CT Drive North (18-Nov-21)

	OVERALL LEVEL	1K-20KHz
MOH	.471 In/Sec	.152 G-s
MIH	.206 In/Sec	.162 G-s
MIA	.463 In/Sec	.046 G-s

SCLPMP1 - Scale Pit Pump South (18-Nov-21)

	OVERALL LEVEL	1K-20KHz
MOH	.257 In/Sec	.276 G-s
MOV	.213 In/Sec	.523 G-s
MIV	.127 In/Sec	.130 G-s
MIH	.151 In/Sec	.183 G-s
MIA	.131 In/Sec	.044 G-s

EASTBOOST - East Booster Pump Small (18-Nov-21)

	OVERALL LEVEL	1K-20KHz
MOH	.572 In/Sec	.0051 G-s
MIH	.279 In/Sec	.0074 G-s
MIA	.487 In/Sec	.0031 G-s

CTWTR1 - CT Pump East/Middle Pump (18-Nov-21)

	OVERALL LEVEL	1K-20KHz
MOH	.107 In/Sec	.243 G-s
MIH	.121 In/Sec	.303 G-s
MIA	.118 In/Sec	.167 G-s

MILWTR3 - Mill Water Pump West (18-Nov-21)

	OVERALL LEVEL	1K-20KHz
MOH	.086 In/Sec	.348 G-s
MIH	.063 In/Sec	.520 G-s
MIA	.094 In/Sec	.347 G-s

MILWTR1 - Mill Water Pump East (18-Nov-21)

	OVERALL LEVEL	1K-20KHz
MOH	.090 In/Sec	.131 G-s
MIH	.083 In/Sec	.324 G-s
MIA	.032 In/Sec	.123 G-s

Clarification Of Vibration Units:

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