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November 13, 2023

Nucor Roll Mill
Jackson-Flowood, MS

Subject: October vibration survey

Below is a summary report for the monthly Roll Mill vibration survey that was performed on 11/10/23. We were unable to get data on the roll stands this survey because of changeovers. We plan on coming back out in a couple of weeks to perform the November survey. 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

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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 elevated 1 x rpm vibration. 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 quite a bit 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 significantly higher 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.

Roll Stand 8 and 9 COOLING FANS
It appears that the newly installed cooling fan structure for 8 and 9 stands is resonant at three different frequencies. A bump test was performed on the structure to determine the natural frequencies of the structure. 13, 15.5, and 19 Hz. are natural frequencies of the structure. The first peak at 13 Hz. is close to the rpm of the motor under load. This is causing excessive vibration of the cooling fan frame. For now, it is recommended to install a flexible expansion joint between the motor and cooling fan ducting/housing. This should help isolate the motor from the cooling fan structure. 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.

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.

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                  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
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NORTH AC    - NORTH AIR COMPRESSOR QUINCY    (10-Nov-23)
                               OVERALL LEVEL     1 - 20 KHz
        MOH                     .096 In/Sec      1.163 G-s
        MIH                     .096 In/Sec       .602 G-s
        MIA                     .070 In/Sec       .645 G-s
                               OVERALL LEVEL     1K-20KHz
        CIA                     .273 In/Sec       .540 G-s
        CIH                     .143 In/Sec       .683 G-s
        COH                     .243 In/Sec       .667 G-s

SOUTH AC    - SOUTH AIR COMPRESSOR QUINCY    (10-Nov-23)
                               OVERALL LEVEL     1 - 20 KHz
        MOH                     .115 In/Sec       .579 G-s
        MIH                     .121 In/Sec       .667 G-s
        MIA                     .208 In/Sec       .728 G-s
                               OVERALL LEVEL     1K-20KHz
        CIA                     .320 In/Sec       .558 G-s
        CIH                     .271 In/Sec       .567 G-s
        COH                     .335 In/Sec       .772 G-s




          Station:   Roll Mill Utilities
          Route No.  1:  UTILITIES

MEASUREMENT POINT             OVERALL LEVEL       HFD / VHFD
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HYDPMP1     - Hydraulic Pump East            (10-Nov-23)
                               OVERALL LEVEL     1K-20KHz
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MOH	.147 In/Sec	.402 G-s
MIH	.327 In/Sec	.325 G-s
PIV	.421 In/Sec	6.657 G-s

HYDPMP2 - Hydraulic Pump Center (10-Nov-23)

	OVERALL LEVEL	1K-20KHz
MOH	.104 In/Sec	.288 G-s
MIH	.335 In/Sec	.545 G-s
PIV	.299 In/Sec	3.204 G-s

DESFAN - Desolution Fan (10-Nov-23)

	OVERALL LEVEL	1K-20KHz
MOH	.035 In/Sec	.044 G-s
MIH	.040 In/Sec	.043 G-s
MIA	.132 In/Sec	.068 G-s

COMFAN - Combustion Air Fan (10-Nov-23)

	OVERALL LEVEL	1K-20KHz
MOH	.112 In/Sec	.417 G-s
MIH	.090 In/Sec	.382 G-s
MIA	.081 In/Sec	.175 G-s
FIH	.062 In/Sec	.086 G-s
FOH	.076 In/Sec	.216 G-s

EJCFAN - Ejector Air Fan (10-Nov-23)

	OVERALL LEVEL	1K-20KHz
MOH	.039 In/Sec	.326 G-s
MIH	.035 In/Sec	.768 G-s
MIA	.020 In/Sec	.572 G-s
FIA	.019 In/Sec	.280 G-s
FIH	.023 In/Sec	.384 G-s
FOH	.052 In/Sec	.239 G-s

COLPMP2 - Furnace Cooling Pump center (10-Nov-23)

	OVERALL LEVEL	1K-20KHz
MOH	.113 In/Sec	.344 G-s
MIH	.051 In/Sec	.456 G-s
MIA	.095 In/Sec	.170 G-s

FCTNORTH - Furnace CT Drive North (10-Nov-23)

	OVERALL LEVEL	1K-20KHz
MOH	.439 In/Sec	.133 G-s
MIH	.482 In/Sec	.207 G-s
MIA	.203 In/Sec	.114 G-s

SCLPMP2 - Scale Pit Pump North (10-Nov-23)

	OVERALL LEVEL	1K-20KHz
MOH	.348 In/Sec	.217 G-s
MIH	.123 In/Sec	.734 G-s
MIA	.178 In/Sec	.229 G-s

EASTBOOST - East Booster Pump Small (10-Nov-23)

	OVERALL LEVEL	1K-20KHz
MOH	.471 In/Sec	.0022 G-s
MIH	.295 In/Sec	.0025 G-s
MIA	.255 In/Sec	.0017 G-s

CTWTR2 - CT Pump West (10-Nov-23)

	OVERALL LEVEL	1K-20KHz
MOH	.108 In/Sec	.515 G-s
MIH	.111 In/Sec	.563 G-s
MIA	.074 In/Sec	.254 G-s

MILWTR2 - Mill Water Pump Center (10-Nov-23)

	OVERALL LEVEL	1K-20KHz
MOH	.071 In/Sec	.864 G-s
MIH	.075 In/Sec	1.396 G-s
MIA	.033 In/Sec	.579 G-s

MILWTR1 - Mill Water Pump East (10-Nov-23)

	OVERALL LEVEL	1K-20KHz
MOH	.057 In/Sec	.201 G-s
MIH	.043 In/Sec	.417 G-s
MIA	.040 In/Sec	.154 G-s

Clarification Of Vibration Units:

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