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May 15, 2024

Nucor Roll Mill
Jackson-Flowood, MS

Subject: May vibration survey

Below is a summary report for the monthly Roll Mill vibration survey that was performed on 5/13/24. 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**

HI-SPEED INDUSTRIAL SERVICE

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## Defects

**Roll Stand 1A**
Planetary gearbox still has some vibration and noise floor in spectral data at the input end of the gearbox. The 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 continuing to monitor this closely. Rated as a **CLASS I** defect.

**Roll Stand 1**
Drive motor continues to have elevated axial vibration associated with line frequency 60 Hz and 360 HZ. (6 x line freq.). The amplitudes tend to go up and down depending on motor load and speed. This may be an SCR issue. It is recommended to inspect drive components for issues. Rated as a **CLASS II** 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 II** defect for now.

**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 changes in tooth load and speed. This vibration was present during testing, but amplitude is below alarm level. We will continue to monitor this very closely. This is rated as a **CLASS I** defect.

**Roll Stand 7**
Gearbox vibration was much lower in amplitude this survey. Vibration data shows dominant gear mesh harmonics on outboard end of the gear casing. The up and down amplitude of this peak from month to month is likely due to changes in tooth load and machine speed. We suspect this to be possibly due to a resonant gear mesh frequency vibration and we will continue to monitor this very closely. Rated as a **CLASS I** defect.

**Roll Stand 8**
Cooling fan motor has some elevated vibration at 10 Hz. This is likely a resonant frequency of the frame that the fan motor is mounted to. Rated as a **CLASS I** defect.

**Roll Stand 12**
***Drive was not in service this survey; however the following likely still applies:*** Drive motor spectral data is showing some non-synchronous peaks that may be associated with bearing race defects. Typically, this issue is caused by fluting of the bearing races. This is low level at this time, and we are monitoring this closely. Rated as a **CLASS I** defect.

**Roll Stand 15**
Cooling fan motor vibration has increased significantly this survey. Overall amplitude of the motor is over 1.2 ips-pk. Data shows a dominant vibration at 1 x rpm. This is likely structural or imbalance of the cooling fan. It is recommended to inspect all mounting fasteners and check fan wheel for build up or other causes of imbalance. 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.

# Abbreviated Last Measurement Summary

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Database: nucorja9.rbm
Station: Roll Mill Rolls

| MEASUREMENT POINT | OVERALL LEVEL | HFD / VHFD |
|---|---|---|
| STD1A - Stand 1A | (13-May-24) | |
| | OVERALL LEVEL | 1K-20KHz |
| MOH | .102 In/Sec | .027 G-s |
| MIH | .056 In/Sec | .051 G-s |
| MIA | .080 In/Sec | .057 G-s |
| COH | .165 In/Sec | .058 G-s |
| GIA | .135 In/Sec | .282 G-s |
| GIH | .276 In/Sec | 1.207 G-s |
| GI2 | .228 In/Sec | .103 G-s |
| GI3 | .202 In/Sec | .556 G-s |
| GI4 | .148 In/Sec | .792 G-s |
| GI5 | .093 In/Sec | 1.001 G-s |
| GI6 | .067 In/Sec | .385 G-s |
| GOH | .069 In/Sec | .035 G-s |
| STD2A - Stand 2A | (13-May-24) | |
| | OVERALL LEVEL | 1K-20KHz |
| MOH | .061 In/Sec | .032 G-s |
| MIH | .058 In/Sec | .090 G-s |
| MIA | .067 In/Sec | .139 G-s |
| COH | .396 In/Sec | .061 G-s |
| STD1 - Stand 1 | (13-May-24) | |
| | OVERALL LEVEL | 1K-20KHz |
| MOH | .138 In/Sec | .142 G-s |
| MIH | .080 In/Sec | .070 G-s |
| MIA | .325 In/Sec | .654 G-s |
| GIA | .050 In/Sec | .016 G-s |
| GIH | .053 In/Sec | .031 G-s |
| COH | .130 In/Sec | .086 G-s |
| STD2 - Stand 2 | (13-May-24) | |
| | OVERALL LEVEL | 1K-20KHz |
| MOH | .091 In/Sec | .091 G-s |
| MIH | .163 In/Sec | .098 G-s |
| MIA | .295 In/Sec | .589 G-s |
| GIA | .081 In/Sec | .669 G-s |
| GIH | .124 In/Sec | .424 G-s |
| COH | .535 In/Sec | .106 G-s |
| STD3 - Stand 3 | (13-May-24) | |
| | OVERALL LEVEL | 1K-20KHz |
| MOH | .068 In/Sec | .131 G-s |
| MIH | .082 In/Sec | .029 G-s |
| MIA | .103 In/Sec | .079 G-s |
| GIA | .030 In/Sec | .031 G-s |
| GIH | .055 In/Sec | .054 G-s |
| COH | .179 In/Sec | .054 G-s |
| STD4 - Stand 4 | (13-May-24) | |
| | OVERALL LEVEL | 1K-20KHz |
| MOH | .121 In/Sec | .015 G-s |
| MIH | .089 In/Sec | .065 G-s |
| MIA | .099 In/Sec | .050 G-s |
| GIA | .074 In/Sec | .105 G-s |
| GIH | .070 In/Sec | .086 G-s |

| | | | |
|---|---|---|---|
| | COH | .327 In/Sec | .036 G-s |

STD5 - Stand 5 (13-May-24)

| | OVERALL LEVEL | 1K-20KHz |
|---|---|---|
| MOH | .037 In/Sec | .085 G-s |
| MIH | .042 In/Sec | .180 G-s |
| MIA | .092 In/Sec | .205 G-s |
| GIA | .114 In/Sec | .080 G-s |
| GIH | .066 In/Sec | .053 G-s |
| GOH | .289 In/Sec | .204 G-s |
| COH | .387 In/Sec | .078 G-s |

STD6 - Stand 6 (13-May-24)

| | OVERALL LEVEL | 1K-20KHz |
|---|---|---|
| MOH | .102 In/Sec | .059 G-s |
| MIH | .054 In/Sec | .052 G-s |
| MIA | .122 In/Sec | .042 G-s |
| GIA | .088 In/Sec | .025 G-s |
| GIH | .053 In/Sec | .060 G-s |
| GOH | .248 In/Sec | .512 G-s |
| COH | .277 In/Sec | .083 G-s |

STD7 - Stand 7 (13-May-24)

| | OVERALL LEVEL | 1K-20KHz |
|---|---|---|
| MOH | .098 In/Sec | .067 G-s |
| MIH | .053 In/Sec | .290 G-s |
| MIA | .194 In/Sec | .116 G-s |
| GIA | .083 In/Sec | .053 G-s |
| GIH | .134 In/Sec | .067 G-s |
| COH | .436 In/Sec | .150 G-s |

STD8 - Stand 8 (13-May-24)

| | OVERALL LEVEL | 1K-20KHz |
|---|---|---|
| MOH | .083 In/Sec | .089 G-s |
| MIH | .055 In/Sec | .064 G-s |
| MIA | .085 In/Sec | .281 G-s |
| GIA | .168 In/Sec | .139 G-s |
| GIH | .094 In/Sec | .110 G-s |
| COH | .168 In/Sec | .192 G-s |

STD9 - Stand 9 (13-May-24)

| | OVERALL LEVEL | 1K-20KHz |
|---|---|---|
| MOH | .081 In/Sec | .087 G-s |
| MIH | .078 In/Sec | .145 G-s |
| MIA | .089 In/Sec | .451 G-s |
| GIA | .082 In/Sec | .125 G-s |
| GIH | .070 In/Sec | .065 G-s |
| COH | .221 In/Sec | .062 G-s |

STD14 - Stand 14 (13-May-24)

| | OVERALL LEVEL | 1K-20KHz |
|---|---|---|
| MOH | .206 In/Sec | .104 G-s |
| MIH | .111 In/Sec | .075 G-s |
| MIA | .104 In/Sec | .234 G-s |
| GIA | .035 In/Sec | .018 G-s |
| GIH | .017 In/Sec | .017 G-s |
| GOH | .025 In/Sec | .019 G-s |
| COH | .230 In/Sec | .326 G-s |

STD15 - Stand 15 (13-May-24)

| | OVERALL LEVEL | 1K-20KHz |
|---|---|---|
| MOH | .085 In/Sec | .101 G-s |
| MIH | .059 In/Sec | .055 G-s |
| MIA | .082 In/Sec | .114 G-s |
| GIA | .044 In/Sec | .137 G-s |
| GIH | .042 In/Sec | .092 G-s |
| COH | 1.281 In/Sec | .217 G-s |

SOUTH AC - SOUTH AIR COMPRESSOR QUINCY (13-May-24)

| | OVERALL LEVEL | 1 - 20 KHz |
|---|---|---|

| | | | |
|---|---|---|---|
| | MOH | .214 In/Sec | .100 G-s |
| | MIH | .267 In/Sec | .254 G-s |
| | MIA | .307 In/Sec | .080 G-s |
| | | OVERALL LEVEL | 1K-20KHz |
| | CIA | .320 In/Sec | .244 G-s |
| | CIH | .277 In/Sec | .200 G-s |
| | COH | .319 In/Sec | .169 G-s |
| WEST AC | - WEST AIR COMPRESSOR QUINCY | (13-May-24) | |
| | | OVERALL LEVEL | 1 - 20 KHz |
| | MOH | .231 In/Sec | .066 G-s |
| | MIH | .174 In/Sec | .096 G-s |
| | MIA | .264 In/Sec | .065 G-s |
| | | OVERALL LEVEL | 1K-20KHz |
| | CIA | .319 In/Sec | .247 G-s |
| | CIH | .126 In/Sec | .223 G-s |
| | COH | .161 In/Sec | .181 G-s |

Station: Roll Mill Utilities

| MEASUREMENT POINT | | OVERALL LEVEL | HFD / VHFD |
|---|---|---|---|
| HYDPMP1 | - Hydraulic Pump East | (13-May-24) | |
| | | OVERALL LEVEL | 1K-20KHz |
| | MOH | .136 In/Sec | .173 G-s |
| | MIH | .296 In/Sec | .269 G-s |
| | PIV | .403 In/Sec | 2.603 G-s |
| HYDPMP2 | - Hydraulic Pump Center | (13-May-24) | |
| | | OVERALL LEVEL | 1K-20KHz |
| | MOH | .090 In/Sec | .192 G-s |
| | MIH | .253 In/Sec | .271 G-s |
| | PIV | .286 In/Sec | .652 G-s |
| DESFAN | - Desolution Fan | (13-May-24) | |
| | | OVERALL LEVEL | 1K-20KHz |
| | MOH | .052 In/Sec | .056 G-s |
| | MIH | .047 In/Sec | .047 G-s |
| | MIA | .066 In/Sec | .088 G-s |
| COMFAN | - Combustion Air Fan | (13-May-24) | |
| | | OVERALL LEVEL | 1K-20KHz |
| | MOH | .065 In/Sec | .191 G-s |
| | MIH | .052 In/Sec | .212 G-s |
| | MIA | .060 In/Sec | .082 G-s |
| | FIH | .055 In/Sec | .125 G-s |
| | FOH | .057 In/Sec | .469 G-s |
| EJCFAN | - Ejector Air Fan | (13-May-24) | |
| | | OVERALL LEVEL | 1K-20KHz |
| | MOH | .061 In/Sec | .194 G-s |
| | MIH | .038 In/Sec | .496 G-s |
| | MIA | .022 In/Sec | .203 G-s |
| | FIA | .029 In/Sec | .266 G-s |
| | FIH | .043 In/Sec | .525 G-s |
| | FOH | .064 In/Sec | .299 G-s |
| COLPMP2 | - Furnace Cooling Pump center | (13-May-24) | |
| | | OVERALL LEVEL | 1K-20KHz |
| | MOH | .277 In/Sec | .237 G-s |
| | MIH | .313 In/Sec | .298 G-s |
| | MIA | .124 In/Sec | .195 G-s |
| FCTSOUTH | - Furnace CT Drive South | (13-May-24) | |

| | | OVERALL LEVEL | 1K-20KHz |
|---|---|---|---|
| | MOH | .317 In/Sec | .203 G-s |
| | MIH | .089 In/Sec | .256 G-s |
| | MIA | .392 In/Sec | .164 G-s |

FCTNORTH - Furnace CT Drive North (13-May-24)

| | | OVERALL LEVEL | 1K-20KHz |
|---|---|---|---|
| | MOH | .247 In/Sec | .071 G-s |
| | MIH | .227 In/Sec | .058 G-s |
| | MIA | .113 In/Sec | .096 G-s |

SCLPMP1 - Scale Pit Pump South (13-May-24)

| | | OVERALL LEVEL | 1K-20KHz |
|---|---|---|---|
| | MOH | .202 In/Sec | .488 G-s |
| | MOV | .106 In/Sec | .640 G-s |
| | MIV | .063 In/Sec | .171 G-s |
| | MIH | .105 In/Sec | .147 G-s |
| | MIA | .094 In/Sec | .066 G-s |
| | PIA | .070 In/Sec | .075 G-s |
| | PIH | .133 In/Sec | .116 G-s |
| | PIV | .055 In/Sec | .105 G-s |

CTWTR1 - CT Pump East/Middle Pump (13-May-24)

| | | OVERALL LEVEL | 1K-20KHz |
|---|---|---|---|
| | MOH | .114 In/Sec | .348 G-s |
| | MIH | .093 In/Sec | .239 G-s |
| | MIA | .102 In/Sec | .145 G-s |

MILWTR3 - Mill Water Pump West (13-May-24)

| | | OVERALL LEVEL | 1K-20KHz |
|---|---|---|---|
| | MOH | .070 In/Sec | .242 G-s |
| | MIH | .057 In/Sec | .164 G-s |
| | MIA | .037 In/Sec | .160 G-s |

MILWTR2 - Mill Water Pump Center (13-May-24)

| | | OVERALL LEVEL | 1K-20KHz |
|---|---|---|---|
| | MOH | .066 In/Sec | .260 G-s |
| | MIH | .061 In/Sec | .476 G-s |
| | MIA | .046 In/Sec | .530 G-s |

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Clarification Of Vibration Units:

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