7030 Ryburn Dr. Millington, TN Phone: (901) 873-5300 Fax: (901) 873-5301 www.gohispeed.com

February 6, 2024

NUCOR Melt Shop

Subject: January 2024 vibration survey

Below is a summary report for the Melt Shop monthly vibration survey that was performed on 2/2/24. 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



As always, it has been a pleasure to serve NUCOR Steel Flowood-Jackson, MS. If there are any comments or questions, do not hesitate to contact us.

Sincerely,

**ISO Certified Vibration Analyst, Category III**

Cell: 901-486-4565

Email: kwilliam@gohispeed.com

## *Defects*

**Middle Caster Mold Water Pump**

***Pump was down this survey; however, the following still applies:*** Vibration data shows issues in the pump. Data suggests looseness/wear of the pump bearings/fits. Impeller and other pump internals may also have wear. The pump will likely need attention soon. Rated as a **CLASS II** defect.

**Servo Hyd. Recirc. Pump**

The pump still has higher than average vibration. Spectral data shows harmonics of hydraulic vane frequency. This may be due to internal pump wear and or flow issue. Rated as a **CLASS II** defect.

**Middle 2nd Deck Hyd. Pump**

The hyd. Pump has had a significant increase in vibration. Data shows vibration to be 1 x rpm with overall amplitude over 1.7 ips. Check coupling and pump soon. Rated a **CLASS III** defect.

**South 2nd Deck Hyd. Pump**

Spectral data of the pump shows harmonics of hydraulic vane frequency. This may be due to internal pump wear and or flow issue. Rated as a **CLASS II** defect.

**Cooling Tower Pump #4**

***Pump was down this survey; however, the following still applies:*** Pump data shows some signs of bearing defects/wear in the ODE pump bearing. Inspect pump as scheduling allows. Rated as a **CLASS II** defect.

**Cooling Tower Pump #5**

Data still shows high 1 x rpm axial vibration in the pump. Pump impeller/shaft could be out of balance or bent. Pump could also have cocked bearing or some other internal misalignment. Inspect as time allows. Rated as a **CLASS II** defect.

**Cooling Tower #6 Supply Pump**

The pump vibration data still indicates that there is bearing wear, and possibly cavitation in the pump. Inspect ODE pump bearing. Ensure the pump has no inlet restrictions and is operating in the correct part of the curve. Impeller may have excessive wear. Rated as a **CLASS II** defect.

**Caster ID Baghouse Fan**

Motor and fan inboard vertical data still shows some impacting. It is recommended to inspect gear couplings as time allows. We will continue to monitor this closely. Rated as a **CLASS II** defect.

**Furnace Reverse Air Fan**

The impacting vibration in fan bearings was higher in amplitude this survey. The fan shaft also appears to have visible axial movement especially at the outboard (ODE) fan bearing. It is recommended to perform a lift check of the fan shaft as scheduling allows. Ensure fan and inner cone are not making contact. We will continue to monitor this issue closely. Rated as a **CLASS II** defect.

**West Furnace Baghouse Fan**

Data shows a 2 x rpm vibration in the motor. This usually is an indication of an alignment and or coupling issue. Vibration is not at an alarm level yet, so this is a **CLASS I** defect.

**Spray Chamber Exhaust Fan**

Motor and fan both have increased vibration. Belts could be slipping which is allowing the motor to operate at speeds near a resonance which causing high 1 x fan rpm vibration in the unit. Inspect fan for build-up and inspect belt tension soon. Rated as a **CLASS II** defect.

**North Caster Oscillator**

This unit has visible axial movement of the input of the gear drive. You can see the movement at the coupling gap. Data of the gear drive does show some gear noise and this unit seems to be knocking worse than the other two drives. Inspect unit as scheduling allows. Rated as a **CLASS II** defect.

```
                Abbreviated Last Measurement Summary
                ************************************

          Database:  nucorja9.rbm
          Station:   Melt Shop

MEASUREMENT POINT             OVERALL LEVEL       HFD / VHFD
-----------------             -------------       ----------

WCMWP      - WEST CASTER MOLD WATER PUMP   (02-Feb-24)
                              OVERALL LEVEL     1K-20KHz
       MOH                     .039 In/Sec       .120 G-s
       MIH                     .060 In/Sec       .440 G-s
       MIA                     .078 In/Sec       .534 G-s
       PIA                     .300 In/Sec       .438 G-s
       PIH                     .127 In/Sec       .430 G-s
       POH                     .146 In/Sec       .571 G-s

ECMWP      - EAST CASTER MOLD WATER PUMP   (02-Feb-24)
                              OVERALL LEVEL     1K-20KHz
       MOH                     .104 In/Sec       .215 G-s
       MIH                     .050 In/Sec       .344 G-s
       MIA                     .252 In/Sec       .348 G-s
       PIA                     .184 In/Sec       .983 G-s
       PIH                     .092 In/Sec      1.414 G-s
       POH                     .106 In/Sec      1.205 G-s

ECSWP 1LFT - EAST CASTER SPRAY WP 1 LEFT   (02-Feb-24)
                              OVERALL LEVEL     1K-20KHz
       MOH                     .063 In/Sec       .181 G-s
       MIH                     .053 In/Sec       .178 G-s
       MIA                     .069 In/Sec       .149 G-s

MCSWP 2LFT - MID CASTER SPRAY WP 2 LEFT    (02-Feb-24)
                              OVERALL LEVEL     1K-20KHz
       MOH                     .165 In/Sec       .391 G-s
       MIH                     .091 In/Sec       .366 G-s
       MIA                     .095 In/Sec       .222 G-s

WCSWP 4RT  - WEST CASTER SPRAY WP 4 RIGH   (02-Feb-24)
                              OVERALL LEVEL     1K-20KHz
       MOH                     .129 In/Sec       .436 G-s
       MIH                     .082 In/Sec       .598 G-s
       MIA                     .060 In/Sec       .546 G-s

ESERVOHYDP - EAST SERVO Hyd PUMP           (02-Feb-24)
                              OVERALL LEVEL     1K-20KHz
       MOH                     .025 In/Sec       .304 G-s
       MIH                     .046 In/Sec       .314 G-s
       PIV                     .110 In/Sec      1.321 G-s

MSERVOHYDP - MIDDLE SERVO Hyd PUMP         (02-Feb-24)
                              OVERALL LEVEL     1K-20KHz
       MOH                     .144 In/Sec       .181 G-s
       MIH                     .062 In/Sec       .138 G-s
```

| | | | |
|---|---|---|---|
| PIV | .151 In/Sec | .757 G-s | |

SERVOHRECP - SERVO Hyd RECIRC PUMP (02-Feb-24)

| | OVERALL LEVEL | 1K-20KHz |
|---|---|---|
| MOH | .127 In/Sec | .024 G-s |
| MIH | .138 In/Sec | .660 G-s |
| PIV | .240 In/Sec | .840 G-s |

2DEKRECIP - 2ND DECK L&S Hyd RECIRC PUM (02-Feb-24)

| | OVERALL LEVEL | 1K-20KHz |
|---|---|---|
| MOH | .246 In/Sec | .104 G-s |
| MIH | .183 In/Sec | .352 G-s |
| PIV | .373 In/Sec | .652 G-s |

M2DECKHYDP - MIDDLE 2ND DECK Hyd PUMP (02-Feb-24)

| | OVERALL LEVEL | 1K-20KHz |
|---|---|---|
| MOH | .167 In/Sec | .094 G-s |
| MIH | .219 In/Sec | .842 G-s |
| PIV | 1.671 In/Sec | 3.135 G-s |

S2DECKHYDP - SOUTH 2ND DECK Hyd PUMP (02-Feb-24)

| | OVERALL LEVEL | 1K-20KHz |
|---|---|---|
| MOH | .215 In/Sec | .532 G-s |
| MIH | .144 In/Sec | .860 G-s |
| PIV | .327 In/Sec | 5.320 G-s |

1SUPLYP - #1 Supply Pump (02-Feb-24)

| | OVERALL LEVEL | 1K-20KHz |
|---|---|---|
| MOH | .059 In/Sec | .179 G-s |
| MIH | .081 In/Sec | .248 G-s |
| MIA | .092 In/Sec | .134 G-s |
| PIA | .295 In/Sec | .205 G-s |
| PIH | .235 In/Sec | .257 G-s |
| POH | .221 In/Sec | .678 G-s |

2SUPLYP - #2 Supply Pump (02-Feb-24)

| | OVERALL LEVEL | 1K-20KHz |
|---|---|---|
| MOH | .059 In/Sec | .839 G-s |
| MIH | .061 In/Sec | .978 G-s |
| MIA | .082 In/Sec | .257 G-s |
| PIA | .192 In/Sec | .248 G-s |
| PIH | .189 In/Sec | .611 G-s |
| POH | .228 In/Sec | 1.587 G-s |

3SUPLYP - #3 Supply Pump (02-Feb-24)

| | OVERALL LEVEL | 1K-20KHz |
|---|---|---|
| MOH | .063 In/Sec | .685 G-s |
| MIH | .062 In/Sec | .659 G-s |
| MIA | .074 In/Sec | .864 G-s |
| PIA | .177 In/Sec | .172 G-s |
| PIH | .147 In/Sec | .297 G-s |
| POH | .175 In/Sec | .656 G-s |

5SUPLYP - #5 Supply Pump (02-Feb-24)

| | OVERALL LEVEL | 1K-20KHz |
|---|---|---|
| MOH | .057 In/Sec | .585 G-s |
| MIH | .085 In/Sec | .724 G-s |
| MIA | .172 In/Sec | .284 G-s |
| PIA | .316 In/Sec | .677 G-s |
| PIH | .202 In/Sec | .914 G-s |
| POH | .329 In/Sec | .732 G-s |

6SUPLYP - #6 Supply Pump (02-Feb-24)

| | OVERALL LEVEL | 1K-20KHz |
|---|---|---|
| MOH | .053 In/Sec | .322 G-s |
| MIH | .068 In/Sec | .921 G-s |
| MIA | .079 In/Sec | .428 G-s |
| PIA | .176 In/Sec | .433 G-s |
| PIH | .186 In/Sec | .775 G-s |
| POH | .209 In/Sec | 1.215 G-s |

CBRA - CASTER BAGHOUSE REVERSE AIR (02-Feb-24)

| | OVERALL LEVEL | 1K-20KHz |
|---|---|---|
| MOH | .017 In/Sec | .126 G-s |
| MIH | .019 In/Sec | .103 G-s |
| MIA | .017 In/Sec | .044 G-s |
| FIH | .013 In/Sec | .286 G-s |
| FOH | .026 In/Sec | .060 G-s |

CBID - CASTER BAGHOUSE ID FAN (02-Feb-24)

| | OVERALL LEVEL | 1K-20KHz |
|---|---|---|
| MOH | .047 In/Sec | .091 G-s |
| MOV | .026 In/Sec | .124 G-s |
| MIH | .057 In/Sec | .174 G-s |
| MIV | .060 In/Sec | .188 G-s |
| MIA | .024 In/Sec | .114 G-s |
| FIA | .062 In/Sec | .832 G-s |
| FIH | .086 In/Sec | 1.429 G-s |
| FIV | .069 In/Sec | 1.050 G-s |
| FOH | .092 In/Sec | .240 G-s |
| FOV | .028 In/Sec | .246 G-s |
| FOA | .042 In/Sec | .176 G-s |

FRAF - Furnace REVERSE AIR Fan (02-Feb-24)

| | OVERALL LEVEL | 1K-20KHz |
|---|---|---|
| MOH | .126 In/Sec | .120 G-s |
| MIH | .145 In/Sec | 1.429 G-s |
| MIA | .065 In/Sec | .642 G-s |
| FIA | .145 In/Sec | .973 G-s |
| FIH | .169 In/Sec | .848 G-s |
| FOH | .161 In/Sec | 1.492 G-s |
| FOV | .158 In/Sec | 1.114 G-s |

EFBHF - East Furnace Bag House Fan (02-Feb-24)

| | OVERALL LEVEL | 1K-20KHz |
|---|---|---|
| MOH | .041 In/Sec | .383 G-s |
| MIH | .063 In/Sec | .280 G-s |
| MIA | .036 In/Sec | .365 G-s |
| FIA | .080 In/Sec | .405 G-s |
| FIH | .076 In/Sec | 1.320 G-s |
| FOH | .074 In/Sec | .593 G-s |

WFBHF - WEST Furnace Bag House Fan (02-Feb-24)

| | OVERALL LEVEL | 1K-20KHz |
|---|---|---|
| MOH | .138 In/Sec | .658 G-s |
| MIH | .186 In/Sec | .268 G-s |
| MIA | .040 In/Sec | .194 G-s |
| FIA | .113 In/Sec | .900 G-s |
| FIH | .109 In/Sec | 1.208 G-s |
| FOH | .115 In/Sec | .587 G-s |

NCHYDP - North CASTER Hyd PUMP (02-Feb-24)

| | OVERALL LEVEL | 1K-20KHz |
|---|---|---|
| MOH | .090 In/Sec | .404 G-s |
| MIH | .099 In/Sec | 1.260 G-s |
| PIH | .324 In/Sec | 1.421 G-s |

MIDCHYDP - MIDDLE CASTER Hyd PUMP (02-Feb-24)

| | OVERALL LEVEL | 1K-20KHz |
|---|---|---|
| MOH | .070 In/Sec | .304 G-s |
| MIH | .068 In/Sec | .384 G-s |
| PIH | .279 In/Sec | 1.465 G-s |

SCEXFAN - SPRAY CHAMBER EXHAUST Fan (02-Feb-24)

| | OVERALL LEVEL | 1K-20KHz |
|---|---|---|
| MOH | .585 In/Sec | .146 G-s |
| MIH | .768 In/Sec | .121 G-s |
| MIA | .203 In/Sec | .141 G-s |
| FIA | .636 In/Sec | .232 G-s |
| FIH | .749 In/Sec | .311 G-s |

| | | | |
|---|---|---|---|
| FOH | | .424 In/Sec | 1.035 G-s |

ENARCOHYDP - EAST NARCO Hyd PUMP (02-Feb-24)

| | OVERALL LEVEL | 1K-20KHz |
|---|---|---|
| MOH | .052 In/Sec | .100 G-s |
| MIH | .043 In/Sec | .285 G-s |
| PIV | .092 In/Sec | .523 G-s |

NC OCILLA - North Caster Oscillator (02-Feb-24)

| | OVERALL LEVEL | 1K-20KHz |
|---|---|---|
| MOH | .207 In/Sec | .415 G-s |
| MIH | .189 In/Sec | .471 G-s |
| MIA | .166 In/Sec | .680 G-s |
| GIA | .196 In/Sec | .449 G-s |
| GIH | .182 In/Sec | .105 G-s |
| GOH | .169 In/Sec | .851 G-s |

MC OCILLA - Middle Caster Oscillator (02-Feb-24)

| | OVERALL LEVEL | 1K-20KHz |
|---|---|---|
| MOH | .301 In/Sec | .238 G-s |
| MIH | .244 In/Sec | .351 G-s |
| MIA | .117 In/Sec | .204 G-s |
| GIA | .094 In/Sec | .043 G-s |
| GIH | .152 In/Sec | .071 G-s |
| GOH | .138 In/Sec | .420 G-s |

SC OCILLA - South Caster Oscillator (02-Feb-24)

| | OVERALL LEVEL | 1K-20KHz |
|---|---|---|
| MOH | .096 In/Sec | .209 G-s |
| MIH | .068 In/Sec | .143 G-s |
| MIA | .058 In/Sec | .111 G-s |
| GIA | .038 In/Sec | .0012 G-s |
| GIH | .056 In/Sec | .043 G-s |
| GOH | .054 In/Sec | .343 G-s |

---

Clarification Of Vibration Units:

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