



**QualiTest® Diagnostics**

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September 21, 2020

NUCOR Melt Shop

Subject: September 2020 vibration survey

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Most of the machines surveyed were found to be in good condition with the exception of 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.

## **Defects**

### **West Caster Mold Water Pump**

High 1 x rpm vibration is present in the motor axial. This indicates angular misalignment. Motor and pump may also have some internal wear. Perform a precision alignment with less than .003" offset and angularity. Ensure there is no soft foot present in the motor. Rated as a **CLASS II** defect.

### **East Caster Mold Water Pump**

Pump is still showing some signs of internal wear. Coupling may also be wearing due to misalignment. Perform a precision alignment with less than .003" offset and angularity. Ensure there is no soft foot present. Rated as a **CLASS II** defect.

### **West Booster Pump**

Pump data shows another increase in non-synchronous vibration at the outboard end of the pump. This is good indication of bearing defects taking place in the pump bearings. Pump will need attention SOON. Rated as a **CLASS III** defect.

### **Caster Spray Water Pump (2<sup>nd</sup> pump from road -Middle-East Pump)**

***Pump was not in service during this survey; however, the following most likely still applies:*** Motor has extreme amount of vibration this survey. 1 x rpm vibration indicates issue likely in the pump or drive shaft. Motor bearings may also have damage especially the drive end motor bearing. Inspect unit ASAP. Rated as a **CLASS III** defect.

### **Cooling Tower #6 Supply Pump**

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

### **Cooling Tower #3 Supply Pump**

***Pump was not in service during this survey; however, the following most likely still applies:*** The pump appears to have cavitation which is causing a high noise floor in the spectrum. This is also making the ODE pump bearing have high acceleration. This could also be a bearing issues but the noise floor is masking the data somewhat. Pump impeller or other pump internals could also be worn which could be causing this vibration. Pump needs to be inspected as time allows. Rated as a **CLASS II** defect.

### **Cooling Tower #2 Supply Pump**

The pump appears to have cavitation which is causing a high noise floor in the spectrum. This is also making the ODE pump bearing have high acceleration. This could also be a bearing issues but the noise floor is masking the data somewhat. Pump impeller or other pump internals may also be worn which could be causing this vibration. Pump needs to be inspected as time allows. Rated as a **CLASS II** defect.

### **South 2<sup>nd</sup> Deck Hyd. Pump**

Pump data indicates internal wear of the hydraulic pump. Pump likely need attention soon. Rated as a **CLASS II** defect.

### **Furnace Reverse Air Fan**

Fan bearing data still shows some impacting occurring within the bearings. Previous data showed the impacting to be higher in the outboard bearing; however, recent data shows impacting is occurring in the drive end bearing. This could be signs of axial thrusting or some other type of aerodynamic forces being generated by the fan. For now, it is recommended to inspect the fan bearings as time allows. Ensure drive end bearing is fixed and outboard end bearing is set to float. Rated as a **CLASS II** defect.

### Caster Baghouse ID Fan

High frequency acceleration is trending upward in the outboard fan bearing. This is likely an early indication of bearing defects/wear of the outboard bearing. This will be monitored closely. Rated as a **CLASS I** defect.

### Spray Chamber Exhaust Fan

Fan vibration is lower this month. Outboard fan bearing also is showing signs of defects/wear. Inspect fan bearings especially the ODE fan bearing for defects and proper lubrication. This unit is very likely operating near a critical speed and is resonant which is likely influencing the high vibration in the motor and fan. It is recommended to replace the fan and fan shaft assembly as downtime allows. Fan has excessive build up and fan shaft is possibly bent and or worn. We will continue to monitor this closely. Rated as a **CLASS II** defect.

#### Abbreviated Last Measurement Summary

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Database: nucorja9.rbm

Station: Melt Shop

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD
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WCMWP - WEST CASTER MOLD WATER PUMP	(16-Sep-20)	
	OVERALL LEVEL	1K-20KHz
MOH	.110 In/Sec	.772 G-s
MIH	.150 In/Sec	1.111 G-s
MIA	.219 In/Sec	1.320 G-s
PIA	.270 In/Sec	.918 G-s
PIH	.165 In/Sec	.834 G-s
POH	.129 In/Sec	1.092 G-s
MCMWP - MID CASTER MOLD WATER PUMP	(16-Sep-20)	
	OVERALL LEVEL	1K-20KHz
MOH	.045 In/Sec	.453 G-s
MIH	.068 In/Sec	.689 G-s
MIA	.086 In/Sec	.894 G-s
PIA	.112 In/Sec	1.012 G-s
PIH	.120 In/Sec	.964 G-s
POH	.086 In/Sec	.881 G-s
EBOSTRP - EAST Booster PUMP	(16-Sep-20)	
	OVERALL LEVEL	1K-20KHz
MOH	.046 In/Sec	.268 G-s
MIH	.053 In/Sec	.272 G-s
MIA	.034 In/Sec	.198 G-s
PIA	.072 In/Sec	.059 G-s
PIH	.090 In/Sec	.113 G-s
POH	.057 In/Sec	.103 G-s
ECSWP 1LFT - EAST CASTER SPRAY WP 1 LEFT	(16-Sep-20)	
	OVERALL LEVEL	1K-20KHz
MOH	.237 In/Sec	.344 G-s
MIH	.133 In/Sec	.644 G-s
MIA	.113 In/Sec	.363 G-s
MCSWP 3RT - MID CASTER SPRAY WP 3 RIGHT	(16-Sep-20)	
	OVERALL LEVEL	1K-20KHz
MOH	.284 In/Sec	.995 G-s
MIH	.106 In/Sec	.525 G-s
MIA	.137 In/Sec	.325 G-s

WCSWP 4RT - WEST CASTER SPRAY WP 4 RIGH (16-Sep-20)		
	OVERALL LEVEL	1K-20KHz
MOH	.158 In/Sec	.730 G-s
MIH	.100 In/Sec	.355 G-s
MIA	.085 In/Sec	.352 G-s
ESERVOHYDP - EAST SERVO Hyd PUMP (16-Sep-20)		
	OVERALL LEVEL	1K-20KHz
MOH	.022 In/Sec	.179 G-s
MIH	.061 In/Sec	.241 G-s
PIV	.130 In/Sec	1.414 G-s
WSERVOHYDP - WEST SERVO Hyd PUMP (16-Sep-20)		
	OVERALL LEVEL	1K-20KHz
MOH	.108 In/Sec	.192 G-s
MIH	.074 In/Sec	.331 G-s
PIV	.090 In/Sec	1.280 G-s
SERVOHRECP - SERVO Hyd RECIRC PUMP (16-Sep-20)		
	OVERALL LEVEL	1K-20KHz
MOH	.064 In/Sec	.165 G-s
MIH	.046 In/Sec	.215 G-s
PIV	.070 In/Sec	1.519 G-s
2DEKRECIP - 2ND DECK L&S Hyd RECIRC PUM (16-Sep-20)		
	OVERALL LEVEL	1K-20KHz
MOH	.163 In/Sec	.218 G-s
MIH	.084 In/Sec	.429 G-s
PIV	.229 In/Sec	1.516 G-s
M2DECKHYDP - MIDDLE 2ND DECK Hyd PUMP (16-Sep-20)		
	OVERALL LEVEL	1K-20KHz
MOH	.117 In/Sec	.218 G-s
MIH	.190 In/Sec	.314 G-s
PIV	1.172 In/Sec	1.228 G-s
S2DECKHYDP - SOUTH 2ND DECK Hyd PUMP (16-Sep-20)		
	OVERALL LEVEL	1K-20KHz
MOH	.324 In/Sec	.371 G-s
MIH	.384 In/Sec	.524 G-s
PIV	.382 In/Sec	4.705 G-s
1SUPLYP - #1 Supply Pump (16-Sep-20)		
	OVERALL LEVEL	1K-20KHz
MOH	.061 In/Sec	.267 G-s
MIH	.053 In/Sec	.264 G-s
MIA	.091 In/Sec	.148 G-s
PIA	.215 In/Sec	1.585 G-s
PIH	.177 In/Sec	1.003 G-s
POH	.184 In/Sec	.844 G-s
2SUPLYP - #2 Supply Pump (16-Sep-20)		
	OVERALL LEVEL	1K-20KHz
MOH	.045 In/Sec	.685 G-s
MIH	.048 In/Sec	1.481 G-s
MIA	.059 In/Sec	.936 G-s
PIA	.210 In/Sec	.604 G-s
PIH	.179 In/Sec	.384 G-s
POH	.212 In/Sec	1.583 G-s
3SUPLYP - #3 Supply Pump (16-Sep-20)		
	OVERALL LEVEL	1K-20KHz
MOH	.050 In/Sec	.414 G-s
MIH	.053 In/Sec	.875 G-s
MIA	.054 In/Sec	.773 G-s
PIA	.178 In/Sec	.658 G-s
PIH	.151 In/Sec	.773 G-s
POH	.230 In/Sec	1.481 G-s

5SUPLYP	- #5 Supply Pump	(16-Sep-20)
	OVERALL LEVEL	1K-20KHz
MOH	.052 In/Sec	.653 G-s
MIH	.048 In/Sec	.454 G-s
MIA	.077 In/Sec	.660 G-s
PIA	.185 In/Sec	1.450 G-s
PIH	.197 In/Sec	.974 G-s
POH	.229 In/Sec	.913 G-s
6SUPLYP	- #6 Supply Pump	(16-Sep-20)
	OVERALL LEVEL	1K-20KHz
MOH	.045 In/Sec	.301 G-s
MIH	.069 In/Sec	.194 G-s
MIA	.075 In/Sec	.131 G-s
PIA	.166 In/Sec	1.097 G-s
PIH	.233 In/Sec	1.050 G-s
POH	.243 In/Sec	1.082 G-s
CBRA	- CASTER BAGHOUSE REVERSE AIR	(16-Sep-20)
	OVERALL LEVEL	1K-20KHz
MOH	.038 In/Sec	.364 G-s
MIH	.036 In/Sec	.313 G-s
MIA	.021 In/Sec	.228 G-s
FIH	.030 In/Sec	.390 G-s
FOH	.047 In/Sec	.065 G-s
CBID	- CASTER BAGHOUSE ID FAN	(16-Sep-20)
	OVERALL LEVEL	1K-20KHz
MOH	.047 In/Sec	.070 G-s
MOV	.037 In/Sec	.076 G-s
MIH	.050 In/Sec	.146 G-s
MIV	.033 In/Sec	.158 G-s
MIA	.025 In/Sec	.206 G-s
FIA	.063 In/Sec	.813 G-s
FIH	.083 In/Sec	1.445 G-s
FIV	.056 In/Sec	1.786 G-s
FOH	.083 In/Sec	1.671 G-s
FOV	.019 In/Sec	1.718 G-s
FOA	.047 In/Sec	1.924 G-s
FRAF	- Furnace REVERSE AIR Fan	(16-Sep-20)
	OVERALL LEVEL	1K-20KHz
MOH	.105 In/Sec	.132 G-s
MIH	.067 In/Sec	.098 G-s
MIA	.057 In/Sec	.088 G-s
FIA	.155 In/Sec	.657 G-s
FIH	.141 In/Sec	.848 G-s
FOH	.055 In/Sec	.338 G-s
EFBHF	- East Furnace Bag House Fan	(16-Sep-20)
	OVERALL LEVEL	1K-20KHz
MOH	.056 In/Sec	.429 G-s
MIH	.065 In/Sec	.506 G-s
MIA	.042 In/Sec	.528 G-s
FIA	.049 In/Sec	.406 G-s
FIH	.070 In/Sec	.825 G-s
FOH	.103 In/Sec	1.510 G-s
WFBHF	- WEST Furnace Bag House Fan	(16-Sep-20)
	OVERALL LEVEL	1K-20KHz
MOH	.080 In/Sec	.608 G-s
MIH	.103 In/Sec	.388 G-s
MIA	.094 In/Sec	.364 G-s
FIA	.133 In/Sec	.460 G-s
FIH	.138 In/Sec	.764 G-s
FOH	.099 In/Sec	.974 G-s
MIDCHYDP	- MIDDLE CASTER Hyd PUMP	(16-Sep-20)
	OVERALL LEVEL	1K-20KHz
MOH	.112 In/Sec	.337 G-s

MIH	.072 In/Sec	.263 G-s
PIH	.126 In/Sec	.489 G-s
SCHYDP - SOUTH CASTER Hyd PUMP (16-Sep-20)		
OVERALL LEVEL		1K-20KHz
MOH	.062 In/Sec	.465 G-s
MIH	.032 In/Sec	.219 G-s
PIH	.147 In/Sec	1.267 G-s
SCEXFAN - SPRAY CHAMBER EXHAUST Fan (16-Sep-20)		
OVERALL LEVEL		1K-20KHz
MOH	.276 In/Sec	.045 G-s
MIH	.265 In/Sec	.182 G-s
MIA	.460 In/Sec	.050 G-s
FIH	.297 In/Sec	.543 G-s
FOH	.307 In/Sec	1.559 G-s
ENARCOHYDP - EAST NARCO Hyd PUMP (16-Sep-20)		
OVERALL LEVEL		1K-20KHz
MOH	.049 In/Sec	.081 G-s
MIH	.054 In/Sec	.267 G-s
PIV	.168 In/Sec	.756 G-s
NC OCILLA - North Caster Oscillator (16-Sep-20)		
OVERALL LEVEL		1K-20KHz
MOH	.165 In/Sec	.121 G-s
MIH	.144 In/Sec	.366 G-s
MIA	.132 In/Sec	.406 G-s
GIA	.100 In/Sec	.122 G-s
GIH	.115 In/Sec	.556 G-s
GOH	.117 In/Sec	.304 G-s
MC OCILLA - Middle Caster Oscillator (16-Sep-20)		
OVERALL LEVEL		1K-20KHz
MOH	.129 In/Sec	.052 G-s
MIH	.107 In/Sec	.118 G-s
MIA	.111 In/Sec	.111 G-s
GIA	.087 In/Sec	.031 G-s
GIH	.088 In/Sec	.053 G-s
GOH	.095 In/Sec	.489 G-s
SC OCILLA - South Caster Oscillator (16-Sep-20)		
OVERALL LEVEL		1K-20KHz
MOH	.100 In/Sec	.203 G-s
MIH	.085 In/Sec	.061 G-s
MIA	.084 In/Sec	.110 G-s
GIA	.104 In/Sec	.232 G-s
GIH	.092 In/Sec	.601 G-s
GOH	.089 In/Sec	.579 G-s

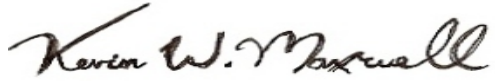
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Clarification Of Vibration Units:

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

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,

Handwritten signature of Kevin W. Marshall in black ink.

ISO Certified Vibration Analyst, Category III



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