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August 19, 2019

NUCOR Melt Shop Subject: August vibration survey

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.

<u>Class I:</u> Defect is present, but effect on reliability is not clear; no immediate action is required. Continue to normally monitor.

<u>Class II:</u> Defect (s) present that may cause problem in long term (2-6 months). Repair during normal maintenance scheduling. Continue to monitor.

<u>Class III</u>: 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.

<u>Class IV</u>; 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. Perform a precision alignment with less than .003" offset and angularity. Ensure there is no soft foot present. Rated as a **CLASS II** defect.

East Caster Mold Water Pump

Pump is 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.

Cooling Tower #6 Supply Pump

The pump bearing vibration data still indicates 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

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 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 be worn which could be causing this vibration. Pump needs to be inspected as time allows. Rated as a **CLASS II** defect.

Spray Chamber Exhaust Fan

Fan bearing data is showing signs of mechanical looseness/wear in the bearings and/or fits. Fan bearings need to be checked for looseness wear SOON. Motor axial vibration remains higher than normal and may be due to sheave or belt issue. Ensure belts are in good shape and sheaves are aligned and not worn. Rated as a **CLASS III** defect.

Caster Baghouse Reverse Fan

This motor has a NU bearing in the drive end instead of a deep groove ball bearing. The NU bearing is designed for a radial type of load such as belt drive application. This unit is a direct drive application and does not need this type of motor bearing at the drive end. The bearing may not be able to load properly at times and can cause the type of vibration previously seen a few months ago. Motor may need to be swapped out in the future with a motor that has the proper bearing. We will continue to monitor this closely. Rated as a **CLASS I** defect for now.

Caster Baghouse ID Fan

1 x fan rpm vibration has **decreased** in both fan bearings after balancing the fan wheel. Also the new motor has a 7 x rpm vibration which may be due to some slight clearance issue with the sleeve bearings or could also be a natural frequency. We will monitor these vibrations closely. Rated as a **CLASS I** defect.

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,

Kerin W. Maxuell

ISO Certified Vibration Analyst, Category III



QualiTest Diagnostics

Cell: 901-486-4565 Email: <u>kwilliam@gohispeed.com</u>

> Database: nucorja9.rbm Station: Melt Shop Report Date: 19-Aug-19 13:11

MIH .123 In/Sec .857 G-s MIA .473 In/Sec .940 G-s PIA .474 In/Sec .933 G-s	MEASUREMEN	I POINT	OVERALL LEVEL	HFD / VHFD
OVERALL LEVEL IK-20KHz MOH .189 In/Sec .664 G-s MIH .123 In/Sec .857 G-s MIA .473 In/Sec .940 G-s PIA .474 In/Sec .933 G-s PIA .474 In/Sec .933 G-s PIH .318 In/Sec .864 G-s POH .215 In/Sec .806 G-s MCMWP - MID CASTER MOLD WATER PUMP (13-Aug-19) OVERALL LEVEL IK-20KHz MOH .036 In/Sec .812 G-s MIH .085 In/Sec .622 G-s MIA .112 In/Sec .894 G-s PIA .142 In/Sec 1.086 G-s PIA .127 In/Sec .325 G-s MIH .032 In/Sec .325 G-s MIA .030 In/Sec .351 G-s PIA .038 In/Sec .747 G-s PIA .038 In/Sec .747 G-s PIA .098 In/Sec .1393 G-s ECSWP 1LFT EAST CASTER SPRAY WP 1 LEFT (13-Aug-19) OVERALL LEVEL <th>WCMWP</th> <th>- WEST CASTER MO</th> <th>OLD WATER PUMP (13</th> <th>3-Aug-19)</th>	WCMWP	- WEST CASTER MO	OLD WATER PUMP (13	3-Aug-19)
MIH .123 In/Sec .857 G-s MIA .473 In/Sec .940 G-s PIA .474 In/Sec .933 G-s PIH .318 In/Sec .864 G-s POH .215 In/Sec .806 G-s MCMWP - MID CASTER MOLD WATER PUMP (13-Aug-19) OVERALL LEVEL 1K-20KHz MOH .036 In/Sec .812 G-s MIA .112 In/Sec .524 G-s MIA .112 In/Sec .524 G-s PIA .142 In/Sec 1.086 G-s PIH .121 In/Sec .894 G-s PIH .121 In/Sec .894 G-s POH .127 In/Sec .837 G-s WBOSTRP WEST Booster PUMP (13-Aug-19) OVERALL LEVEL 1K-20KHz MOH .035 In/Sec .325 G-s MIA .030 In/Sec .345 G-s MIA .030 In/Sec .345 G-s PIH .038 In/Sec .747 G-s PIH .0098 In/Sec .747 G-s PIH .008 In/Sec .66 G-s PIH .108 In/Sec .601 G-s<				
MIA .473 In/Sec .940 G-s PIA .474 In/Sec .933 G-s PIH .318 In/Sec .864 G-s POH .215 In/Sec .806 G-s MCMWP - MID CASTER MOLD WATER PUMP (13-Aug-19) OVERALL LEVEL 1K-20KHz MOH .036 In/Sec .812 G-s MIH .085 In/Sec .622 G-s MIA .112 In/Sec .684 G-s PIA .142 In/Sec .086 G-s PIH .121 In/Sec .894 G-s PIH .121 In/Sec .894 G-s POH .127 In/Sec .837 G-s WBOSTRP - WEST Booster PUMP (13-Aug-19) OVERALL LEVEL 1K-20KHz MOH .035 In/Sec .325 G-s MIA .030 In/Sec .351 G-s MIA .030 In/Sec .351 G-s PIA .098 In/Sec .747 G-s PIH .108 In/Sec .1393 G-s ECSWP 1LFT - EAST CASTER SPRAY WP 1 LEFT (13-Aug-19) OVERALL LEVEL 1K-20KHz MOH .473 In/Sec .601 G-s <t< td=""><td>MOH</td><td></td><td>.189 In/Sec</td><td>.664 G-s</td></t<>	MOH		.189 In/Sec	.664 G-s
MIA .473 In/Sec .940 G-s PIA .474 In/Sec .933 G-s PIH .318 In/Sec .864 G-s POH .215 In/Sec .806 G-s MCMWP - MID CASTER MOLD WATER PUMP (13-Aug-19) OVERALL LEVEL 1K-20KHz MOH .036 In/Sec .812 G-s MIH .085 In/Sec .622 G-s MIA .112 In/Sec .684 G-s PIA .142 In/Sec .086 G-s PIH .121 In/Sec .894 G-s PIH .121 In/Sec .894 G-s POH .127 In/Sec .837 G-s WBOSTRP - WEST Booster PUMP (13-Aug-19) OVERALL LEVEL 1K-20KHz MOH .035 In/Sec .325 G-s MIA .030 In/Sec .351 G-s MIA .030 In/Sec .351 G-s PIA .098 In/Sec .747 G-s PIH .108 In/Sec .1393 G-s ECSWP 1LFT - EAST CASTER SPRAY WP 1 LEFT (13-Aug-19) OVERALL LEVEL 1K-20KHz MOH .473 In/Sec .601 G-s <t< td=""><td>MIH</td><td></td><td>.123 In/Sec</td><td>.857 G-s</td></t<>	MIH		.123 In/Sec	.857 G-s
PIH .318 In/Sec .864 G-s POH .215 In/Sec .806 G-s MCMWP - MID CASTER MOLD WATER PUMP (13-Aug-19) OVERALL LEVEL 1K-20KHz MOH .036 In/Sec .812 G-s MIH .085 In/Sec .622 G-s MIA .112 In/Sec .524 G-s PIA .142 In/Sec 1.086 G-s PIH .121 In/Sec .894 G-s POH .127 In/Sec .837 G-s WBOSTRP - WEST Booster PUMP (13-Aug-19) OVERALL LEVEL 1K-20KHz MOH .035 In/Sec .325 G-s MIH .032 In/Sec .345 G-s MIA .030 In/Sec .351 G-s PIA .098 In/Sec .747 G-s PIA .098 In/Sec .140 In/Sec 1.393 G-s ECSWP 1LFT - EAST CASTER SPRAY WP 1 LEFT (13-Aug-19) OVERALL LEVEL 1K-20KHz MOH .473 In/Sec .601 G-s MIH .102 G-s MOH .473 In/Sec .601 G-s MIA .204 In/Sec .600 G-s MIA	MIA		.473 In/Sec	.940 G-s
PIH .318 In/Sec .864 G-s POH .215 In/Sec .806 G-s MCMWP - MID CASTER MOLD WATER PUMP (13-Aug-19) OVERALL LEVEL 1K-20KHz MOH .036 In/Sec .812 G-s MIH .085 In/Sec .622 G-s MIA .112 In/Sec .524 G-s PIA .142 In/Sec 1.086 G-s PIH .121 In/Sec .894 G-s POH .127 In/Sec .837 G-s WBOSTRP - WEST Booster PUMP (13-Aug-19) OVERALL LEVEL 1K-20KHz MOH .035 In/Sec .325 G-s MIH .032 In/Sec .345 G-s MIA .030 In/Sec .351 G-s PIA .098 In/Sec .747 G-s PIA .098 In/Sec .140 In/Sec 1.393 G-s ECSWP 1LFT - EAST CASTER SPRAY WP 1 LEFT (13-Aug-19) OVERALL LEVEL 1K-20KHz MOH .473 In/Sec .601 G-s MIH .102 G-s MOH .473 In/Sec .601 G-s MIA .204 In/Sec .600 G-s MIA	PIA		.474 In/Sec	.933 G-s
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OVERALL LEVEL IK-20KHz MOH .036 In/Sec .812 G-s MIH .085 In/Sec .622 G-s MIA .112 In/Sec .524 G-s PIA .142 In/Sec 1.086 G-s PIA .142 In/Sec .894 G-s PIA .127 In/Sec .894 G-s POH .127 In/Sec .837 G-s WBOSTRP - WEST Booster PUMP (13-Aug-19) OVERALL LEVEL 1K-20KHz MOH .035 In/Sec .325 G-s MIH .032 In/Sec .345 G-s MIA .030 In/Sec .351 G-s PIA .098 In/Sec .747 G-s PIA .098 In/Sec .747 G-s PIH .108 In/Sec .966 G-s POH .140 In/Sec 1.393 G-s ECSWP 1LFT EAST CASTER SPRAY WP 1 LEFT (13-Aug-19) OVERALL LEVEL 1K-20KHz MOH .473 In/Sec .601 G-s MIA .204 In/Sec .600 G-s MIA .204 In/Sec	POH		.215 In/Sec	.806 G-s
MIH .085 In/Sec .622 G-s MIA .112 In/Sec .524 G-s PIA .142 In/Sec 1.086 G-s PIH .121 In/Sec .894 G-s POH .127 In/Sec .894 G-s POH .127 In/Sec .837 G-s WBOSTRP - WEST Booster PUMP (13-Aug-19) OVERALL LEVEL 1K-20KHz MOH .035 In/Sec .325 G-s MIA .030 In/Sec .351 G-s MIA .030 In/Sec .351 G-s PIA .038 In/Sec .747 G-s PIH .108 In/Sec .966 G-s POH .140 In/Sec 1.393 G-s ECSWP 1LFT EAST CASTER SPRAY WP 1 LEFT (13-Aug-19) OVERALL LEVEL 1K-20KHz MOH .473 In/Sec 1.026 G-s MIH .187 In/Sec 1.026 G-s MIA .204 In/Sec .600 G-s MIA .204 In/Sec .600 G-s MIA .692 In/Sec .485 G-s MIH .196 In/Sec .846 G-s	MCMWP	- MID CASTER MOI		
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MIH .032 In/Sec .345 G-s MIA .030 In/Sec .351 G-s PIA .098 In/Sec .747 G-s PIH .108 In/Sec .747 G-s POH .140 In/Sec .966 G-s POH .140 In/Sec 1.393 G-s ECSWP 1LFT - EAST CASTER SPRAY WP 1 LEFT (13-Aug-19) OVERALL LEVEL 1K-20KHz MOH .473 In/Sec .601 G-s MIH .187 In/Sec 1.026 G-s MIA .204 In/Sec .600 G-s	WBOSTRP	- WEST Booster H		
MIH .032 In/Sec .345 G-s MIA .030 In/Sec .351 G-s PIA .098 In/Sec .747 G-s PIH .108 In/Sec .747 G-s POH .140 In/Sec .966 G-s POH .140 In/Sec 1.393 G-s ECSWP 1LFT - EAST CASTER SPRAY WP 1 LEFT (13-Aug-19) OVERALL LEVEL 1K-20KHz MOH .473 In/Sec .601 G-s MIH .187 In/Sec 1.026 G-s MIA .204 In/Sec .600 G-s			OVERALL LEVEL	1K-20KHz
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OVERALL LEVEL 1K-20KHz MOH .473 In/Sec .601 G-s MIH .187 In/Sec 1.026 G-s MIA .204 In/Sec .600 G-s MCSWP 2LFT - MID CASTER SPRAY WP 2 LEFT (13-Aug-19) OVERALL LEVEL 1K-20KHz MOH .692 In/Sec .485 G-s MIH .196 In/Sec .846 G-s	POH		.140 In/Sec	1.393 G-s
MIH .187 In/Sec 1.026 G-s MIA .204 In/Sec .600 G-s MCSWP 2LFT - MID CASTER SPRAY WP 2 LEFT (13-Aug-19) OVERALL LEVEL 1K-20KHz MOH .692 In/Sec .485 G-s MIH .196 In/Sec .846 G-s	ECSWP 1LFT	- EAST CASTER SE	PRAY WP 1 LEFT (13	3-Aug-19)
MIH .187 In/Sec 1.026 G-s MIA .204 In/Sec .600 G-s MCSWP 2LFT - MID CASTER SPRAY WP 2 LEFT (13-Aug-19) OVERALL LEVEL 1K-20KHz MOH .692 In/Sec .485 G-s MIH .196 In/Sec .846 G-s			OVERALL LEVEL	1K-20KHz
MIA .204 In/Sec .600 G-s MCSWP 2LFT - MID CASTER SPRAY WP 2 LEFT (13-Aug-19) OVERALL LEVEL 1K-20KHz MOH .692 In/Sec .485 G-s MIH .196 In/Sec .846 G-s			.473 In/Sec	.601 G-s
MCSWP 2LFT - MID CASTER SPRAY WP 2 LEFT (13-Aug-19) OVERALL LEVEL 1K-20KHz MOH .692 In/Sec .485 G-s MIH .196 In/Sec .846 G-s				
OVERALL LEVEL 1K-20KHz MOH .692 In/Sec .485 G-s MIH .196 In/Sec .846 G-s	MIA		.204 In/Sec	.600 G-s
MOH .692 In/Sec .485 G-s MIH .196 In/Sec .846 G-s	MCSWP 2LFT	- MID CASTER SPR		
MIH .196 In/Sec .846 G-s				
MIH .196 In/Sec .846 G-s MIA .115 In/Sec .333 G-s				
MIA .115 In/Sec .333 G-s			.196 In/Sec	.846 G-s
	MIA		.115 In/Sec	.333 G-s

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WCSWP 4RT - WEST CAS	STER SPRAY WP 4 RIGH ()	
	OVERALL LEVEL	
MOH	.153 In/Sec	
MIH	.129 In/Sec	.040 G-s
MIA	.084 In/Sec	.529 G-S
ESERVOHYDP - EAST SEE	RVO Hyd PUMP (1	13-Aug-19)
	OVERALL LEVEL	1K-20KHz
МОН	OVERALL LEVEL .018 In/Sec	.168 G-s
MIH	.069 In/Sec	.188 G-s
PIV	.122 In/Sec	1.359 G-s
WSERVOHYDP - WEST SER	RVO Hyd PUMP (1	13-Aug-19)
	OVERALL LEVEL	1K-20KHz
MOH	.131 In/Sec .073 In/Sec	.228 G-s
MIH	.073 In/Sec	.267 G-s
PIV	.086 In/Sec	1.233 G-s
	yd RECIRC PUMP ()	12
SERVOHRECP - SERVO HJ		
МОН	OVERALL LEVEL	.167 G-s
MOH MIH	.101 IN/Sec	.107 G-S
PIV	.101 In/Sec .033 In/Sec .033 In/Sec	.333 G-S
FIV	.055 11/560	.050 9-5
N2DECKHYDP - North 2N	ND DECK Hyd PUMP (13-Aug-19)
	OVERALL LEVEL	
МОН	.068 In/Sec	
MIH	.034 In/Sec	.238 G-s
PIV	.034 In/Sec .479 In/Sec	2.354 G-s
2DEKRECIP - 2ND DECH	K L&S Hyd RECIRC PUM (13-Aug-19)
	OVERALL LEVEL	1K-20KHz
MOH	.114 In/Sec	.020 G-s
MIH	.086 In/Sec	.157 G-s
PIV	.313 In/Sec	.644 G-s
	/	
S2DECKHYDP - SOUTH 21	ND DECK Hyd PUMP (13-Aug-19)
	ND DECK Hyd PUMP () OVERALL LEVEL	13-Aug-19) 1K-20KHz
МОН	OVERALL LEVEL .538 In/Sec	1K-20KHz .212 G-s
МОН МІН	OVERALL LEVEL .538 In/Sec .621 In/Sec	1K-20KHz .212 G-s .411 G-s
МОН	OVERALL LEVEL .538 In/Sec	1K-20KHz .212 G-s .411 G-s
MOH MIH PIV	OVERALL LEVEL .538 In/Sec .621 In/Sec .395 In/Sec	1K-20KHz .212 G-s .411 G-s 1.013 G-s
МОН МІН	OVERALL LEVEL .538 In/Sec .621 In/Sec .395 In/Sec	1K-20KHz .212 G-s .411 G-s 1.013 G-s
MOH MIH PIV	OVERALL LEVEL .538 In/Sec .621 In/Sec .395 In/Sec	1K-20KHz .212 G-s .411 G-s 1.013 G-s 13-Aug-19)
MOH MIH PIV 1SUPLYP - #1 Suppl	OVERALL LEVEL .538 In/Sec .621 In/Sec .395 In/Sec Ly Pump (1 OVERALL LEVEL	1K-20KHz .212 G-s .411 G-s 1.013 G-s 13-Aug-19) 1K-20KHz
MOH MIH PIV 1SUPLYP - #1 Suppl MOH	OVERALL LEVEL .538 In/Sec .621 In/Sec .395 In/Sec ly Pump (1 OVERALL LEVEL .063 In/Sec .064 In/Sec .090 In/Sec	1K-20KHz .212 G-s .411 G-s 1.013 G-s 13-Aug-19) 1K-20KHz .289 G-s
MOH MIH PIV 1SUPLYP - #1 Suppl MOH MIH	OVERALL LEVEL .538 In/Sec .621 In/Sec .395 In/Sec VERALL LEVEL .063 In/Sec .064 In/Sec .090 In/Sec .206 In/Sec	1K-20KHz .212 G-s .411 G-s 1.013 G-s 13-Aug-19) 1K-20KHz .289 G-s .245 G-s .129 G-s 1.011 G-s
MOH MIH PIV 1SUPLYP - #1 Suppl MOH MIH MIA PIA PIH	OVERALL LEVEL .538 In/Sec .621 In/Sec .395 In/Sec ly Pump (1 OVERALL LEVEL .063 In/Sec .064 In/Sec .090 In/Sec .206 In/Sec .169 In/Sec	1K-20KHz .212 G-s .411 G-s 1.013 G-s 13-Aug-19) 1K-20KHz .289 G-s .245 G-s .129 G-s 1.011 G-s .742 G-s
MOH MIH PIV 1SUPLYP - #1 Suppl MOH MIH MIA PIA	OVERALL LEVEL .538 In/Sec .621 In/Sec .395 In/Sec VERALL LEVEL .063 In/Sec .064 In/Sec .090 In/Sec .206 In/Sec	1K-20KHz .212 G-s .411 G-s 1.013 G-s 13-Aug-19) 1K-20KHz .289 G-s .245 G-s .129 G-s 1.011 G-s
MOH MIH PIV 1SUPLYP - #1 Suppl MOH MIH MIA PIA PIH POH	OVERALL LEVEL .538 In/Sec .621 In/Sec .395 In/Sec VERALL LEVEL .063 In/Sec .064 In/Sec .090 In/Sec .206 In/Sec .169 In/Sec .195 In/Sec	1K-20KHz .212 G-s .411 G-s 1.013 G-s 13-Aug-19) 1K-20KHz .289 G-s .245 G-s .129 G-s 1.011 G-s .742 G-s .792 G-s
MOH MIH PIV 1SUPLYP - #1 Suppl MOH MIH MIA PIA PIH	OVERALL LEVEL .538 In/Sec .621 In/Sec .395 In/Sec ly Pump (1 OVERALL LEVEL .063 In/Sec .064 In/Sec .090 In/Sec .169 In/Sec .195 In/Sec	1K-20KHz .212 G-s .411 G-s 1.013 G-s 1.013 G-s 13-Aug-19) 1K-20KHz .289 G-s .245 G-s .129 G-s 1.011 G-s .742 G-s .792 G-s 13-Aug-19)
MOH MIH PIV 1SUPLYP - #1 Suppl MOH MIH MIA PIA PIH POH 3SUPLYP - #3 Suppl	OVERALL LEVEL .538 In/Sec .621 In/Sec .395 In/Sec OVERALL LEVEL .063 In/Sec .064 In/Sec .090 In/Sec .169 In/Sec .195 In/Sec	1K-20KHz .212 G-s .411 G-s 1.013 G-s 1.013 G-s 13-Aug-19) 1K-20KHz .289 G-s .245 G-s .129 G-s 1.011 G-s .742 G-s .792 G-s 13-Aug-19) 1K-20KHz
MOH MIH PIV 1SUPLYP - #1 Supp MOH MIH MIA PIA PIH POH 3SUPLYP - #3 Supp	OVERALL LEVEL .538 In/Sec .621 In/Sec .395 In/Sec OVERALL LEVEL .063 In/Sec .064 In/Sec .090 In/Sec .169 In/Sec .169 In/Sec .195 In/Sec ly Pump (1 OVERALL LEVEL .050 In/Sec	1K-20KHz .212 G-s .411 G-s 1.013 G-s 1.013 G-s 13-Aug-19) 1K-20KHz .289 G-s .245 G-s .129 G-s 1.011 G-s .742 G-s .792 G-s 13-Aug-19) 1K-20KHz .939 G-s
MOH MIH PIV 1SUPLYP - #1 Suppl MOH MIH PIA PIA PIH POH 3SUPLYP - #3 Suppl MOH MIH	OVERALL LEVEL .538 In/Sec .621 In/Sec .395 In/Sec OVERALL LEVEL .063 In/Sec .064 In/Sec .090 In/Sec .169 In/Sec .169 In/Sec .195 In/Sec .195 In/Sec .050 In/Sec .063 In/Sec	1K-20KHz .212 G-s .411 G-s 1.013 G-s 1.013 G-s 13-Aug-19) 1K-20KHz .289 G-s .245 G-s .129 G-s 1.011 G-s .742 G-s .792 G-s 13-Aug-19) 1K-20KHz .939 G-s 1.009 G-s
MOH MIH PIV 1SUPLYP - #1 Supp MOH MIH PIA PIA PIA PIA PIA SUPLYP - #3 Supp MOH MIH MIA	OVERALL LEVEL .538 In/Sec .621 In/Sec .395 In/Sec OVERALL LEVEL .063 In/Sec .064 In/Sec .090 In/Sec .169 In/Sec .195 In/Sec .195 In/Sec .050 In/Sec .063 In/Sec .118 In/Sec	1K-20KHz .212 G-s .411 G-s 1.013 G-s 1.013 G-s 13-Aug-19) 1K-20KHz .289 G-s .245 G-s .129 G-s 1.011 G-s .742 G-s .792 G-s 13-Aug-19) 1K-20KHz .939 G-s 1.009 G-s .766 G-s
MOH MIH PIV 1SUPLYP - #1 Supp MOH MIH PIA PIA PIA PIA SUPLYP - #3 Supp 3SUPLYP - #3 Supp	OVERALL LEVEL .538 In/Sec .621 In/Sec .395 In/Sec .395 In/Sec OVERALL LEVEL .063 In/Sec .064 In/Sec .090 In/Sec .109 In/Sec .169 In/Sec .195 In/Sec .195 In/Sec .063 In/Sec .063 In/Sec .118 In/Sec .200 In/Sec	1K-20KHz .212 G-s .411 G-s 1.013 G-s 1.013 G-s 13-Aug-19) 1K-20KHz .289 G-s .245 G-s .129 G-s 1.011 G-s .742 G-s .792 G-s 13-Aug-19) 1K-20KHz .939 G-s 1.009 G-s .766 G-s .685 G-s
MOH MIH PIV 1SUPLYP - #1 Supp MOH MIH PIA PIA PIA PIA PIA SUPLYP - #3 Supp MOH MIH MIA	OVERALL LEVEL .538 In/Sec .621 In/Sec .395 In/Sec OVERALL LEVEL .063 In/Sec .064 In/Sec .090 In/Sec .169 In/Sec .195 In/Sec .195 In/Sec .050 In/Sec .063 In/Sec .118 In/Sec	1K-20KHz .212 G-s .411 G-s 1.013 G-s 1.013 G-s 13-Aug-19) 1K-20KHz .289 G-s .245 G-s .129 G-s 1.011 G-s .742 G-s .792 G-s 13-Aug-19) 1K-20KHz .939 G-s 1.009 G-s .766 G-s
MOH MIH PIV 1SUPLYP - #1 Supp MOH MIH PIA PIA PIA PIA PIA PIA PIA PIA	OVERALL LEVEL .538 In/Sec .621 In/Sec .395 In/Sec ly Pump (OVERALL LEVEL .063 In/Sec .064 In/Sec .090 In/Sec .109 In/Sec .169 In/Sec .195 In/Sec ly Pump (OVERALL LEVEL .050 In/Sec .118 In/Sec .200 In/Sec .157 In/Sec	1K-20KHz .212 G-s .411 G-s 1.013 G-s 1.013 G-s 13-Aug-19) 1K-20KHz .289 G-s .245 G-s .129 G-s 1.011 G-s .742 G-s .792 G-s 13-Aug-19) 1K-20KHz .939 G-s 1.009 G-s .766 G-s .685 G-s .941 G-s
MOH MIH PIV 1SUPLYP - #1 Supp MOH MIH PIA PIA PIA PIA PIA PIA PIA PIA	OVERALL LEVEL .538 In/Sec .621 In/Sec .395 In/Sec ly Pump (OVERALL LEVEL .063 In/Sec .064 In/Sec .064 In/Sec .090 In/Sec .109 In/Sec .169 In/Sec .195 In/Sec .195 In/Sec .063 In/Sec .063 In/Sec .118 In/Sec .200 In/Sec .157 In/Sec .243 In/Sec	1K-20KHz .212 G-s .411 G-s 1.013 G-s 1.013 G-s 13-Aug-19) 1K-20KHz .289 G-s .245 G-s .129 G-s 1.011 G-s .742 G-s .792 G-s 13-Aug-19) 1K-20KHz .939 G-s 1.009 G-s .766 G-s .685 G-s .941 G-s
MOH MIH PIV 1SUPLYP - #1 Supp MOH MIH PIA PIA PIA POH Supply - #3 Supp	OVERALL LEVEL .538 In/Sec .621 In/Sec .395 In/Sec ly Pump (OVERALL LEVEL .063 In/Sec .064 In/Sec .064 In/Sec .090 In/Sec .109 In/Sec .169 In/Sec .195 In/Sec .195 In/Sec .063 In/Sec .063 In/Sec .118 In/Sec .200 In/Sec .157 In/Sec .243 In/Sec	1K-20KHz .212 G-s .411 G-s 1.013 G-s 1.013 G-s 13-Aug-19) 1K-20KHz .289 G-s .245 G-s .129 G-s 1.011 G-s .742 G-s .792 G-s 13-Aug-19) 1K-20KHz .939 G-s 1.009 G-s .766 G-s .685 G-s .941 G-s 1.490 G-s
MOH MIH PIV 1SUPLYP - #1 Supp MOH MIH PIA PIA PIA POH Supply - #3 Supp	OVERALL LEVEL .538 In/Sec .621 In/Sec .395 In/Sec Iy Pump OVERALL LEVEL .063 In/Sec .064 In/Sec .090 In/Sec .206 In/Sec .169 In/Sec .195 In/Sec .195 In/Sec .050 In/Sec .118 In/Sec .200 In/Sec .118 In/Sec .200 In/Sec .157 In/Sec .243 In/Sec .053 In/Sec	1K-20KHz .212 G-s .411 G-s 1.013 G-s 1.013 G-s 13-Aug-19) 1K-20KHz .289 G-s .245 G-s .129 G-s 1.011 G-s .742 G-s .792 G-s 13-Aug-19) 1K-20KHz .939 G-s 1.009 G-s .766 G-s .685 G-s .941 G-s 1.490 G-s 13-Aug-19) 1K-20KHz .767 G-s
MOH MIH PIV 1SUPLYP - 4 4 Suppl MOH MIH PIA PIA PIA PIA PIA PIA PIA PIA PIA PIA	OVERALL LEVEL .538 In/Sec .621 In/Sec .395 In/Sec ly Pump OVERALL LEVEL .063 In/Sec .064 In/Sec .090 In/Sec .206 In/Sec .169 In/Sec .169 In/Sec .169 In/Sec .169 In/Sec .169 In/Sec .169 In/Sec .195 In/Sec ly Pump OVERALL LEVEL .050 In/Sec .118 In/Sec .200 In/Sec .157 In/Sec .157 In/Sec .243 In/Sec ly Pump OVERALL LEVEL .053 In/Sec .047 In/Sec	1K-20KHz .212 G-s .411 G-s 1.013 G-s 1.013 G-s 13-Aug-19) 1K-20KHz .289 G-s .245 G-s .129 G-s 1.011 G-s .742 G-s .792 G-s 13-Aug-19) 1K-20KHz .939 G-s 1.009 G-s .766 G-s .685 G-s .941 G-s 1.490 G-s 13-Aug-19) 1K-20KHz .767 G-s .763 G-s
MOH MIH PIV 1SUPLYP - 4 1 Supp MOH MIH PIA PIA PIA PIA PIA PIA PIA PIA PIA PIA	OVERALL LEVEL .538 In/Sec .621 In/Sec .395 In/Sec ly Pump OVERALL LEVEL .063 In/Sec .064 In/Sec .090 In/Sec .090 In/Sec .169 In/Sec .169 In/Sec .169 In/Sec .169 In/Sec .169 In/Sec .169 In/Sec .195 In/Sec ly Pump OVERALL LEVEL .050 In/Sec .118 In/Sec .200 In/Sec .118 In/Sec .200 In/Sec .157 In/Sec .243 In/Sec ly Pump OVERALL LEVEL .053 In/Sec .047 In/Sec .067 In/Sec	1K-20KHz .212 G-s .411 G-s 1.013 G-s 1.013 G-s 13-Aug-19) 1K-20KHz .289 G-s .245 G-s .129 G-s 1.011 G-s .742 G-s .792 G-s 13-Aug-19) 1K-20KHz .939 G-s 1.009 G-s .766 G-s .685 G-s .941 G-s 1.490 G-s 13-Aug-19) 1K-20KHz .767 G-s .763 G-s .539 G-s
MOH MIH PIV 1SUPLYP - 4 4 Suppl MOH MIH PIA PIA PIA PIA PIA POH 3SUPLYP - 4 4 Suppl ASUPLYP - 4 4 Suppl ASUPLYP - 4 4 Suppl	OVERALL LEVEL .538 In/Sec .621 In/Sec .395 In/Sec ly Pump OVERALL LEVEL .063 In/Sec .064 In/Sec .090 In/Sec .090 In/Sec .109 In/Sec .105 In/Sec .063 In/Sec .018 In/Sec .0200 In/Sec .118 In/Sec .200 In/Sec .118 In/Sec .243 In/Sec ly Pump OVERALL LEVEL .053 In/Sec .047 In/Sec .067 In/Sec .177 In/Sec	1K-20KHz .212 G-s .411 G-s 1.013 G-s 1.013 G-s 13-Aug-19) 1K-20KHz .289 G-s .245 G-s .129 G-s 1.011 G-s .742 G-s .792 G-s 13-Aug-19) 1K-20KHz .939 G-s 1.009 G-s .766 G-s .685 G-s .941 G-s 1.490 G-s 13-Aug-19) 1K-20KHz .767 G-s .763 G-s .539 G-s .722 G-s
MOH MIH PIV 1SUPLYP 7 4 1 Supp MOH MIH PIA PIA PIA PIA PIA PIA PIA PIA PIA PIA	OVERALL LEVEL .538 In/Sec .621 In/Sec .395 In/Sec ly Pump OVERALL LEVEL .063 In/Sec .064 In/Sec .090 In/Sec .090 In/Sec .169 In/Sec .195 In/Sec .195 In/Sec .195 In/Sec .195 In/Sec .195 In/Sec .050 In/Sec .051 In/Sec .053 In/Sec .18 In/Sec .200 In/Sec .157 In/Sec .243 In/Sec .053 In/Sec .047 In/Sec .067 In/Sec .171 In/Sec	1K-20KHz .212 G-s .411 G-s 1.013 G-s 1.013 G-s 13-Aug-19) 1K-20KHz .289 G-s .245 G-s .129 G-s 1.011 G-s .742 G-s .792 G-s 13-Aug-19) 1K-20KHz .939 G-s 1.009 G-s .766 G-s .685 G-s .941 G-s 1.490 G-s 13-Aug-19) 1K-20KHz .767 G-s .763 G-s .539 G-s .722 G-s .828 G-s
MOH MIH PIV 1SUPLYP - 4 4 Suppl MOH MIH PIA PIA PIA PIA PIA POH 3SUPLYP - 4 4 Suppl ASUPLYP - 4 4 Suppl ASUPLYP - 4 4 Suppl	OVERALL LEVEL .538 In/Sec .621 In/Sec .395 In/Sec ly Pump OVERALL LEVEL .063 In/Sec .064 In/Sec .090 In/Sec .090 In/Sec .109 In/Sec .105 In/Sec .063 In/Sec .018 In/Sec .0200 In/Sec .118 In/Sec .200 In/Sec .118 In/Sec .243 In/Sec ly Pump OVERALL LEVEL .053 In/Sec .047 In/Sec .067 In/Sec .177 In/Sec	1K-20KHz .212 G-s .411 G-s 1.013 G-s 1.013 G-s 13-Aug-19) 1K-20KHz .289 G-s .245 G-s .129 G-s 1.011 G-s .742 G-s .792 G-s 13-Aug-19) 1K-20KHz .939 G-s 1.009 G-s .766 G-s .685 G-s .941 G-s 1.490 G-s 13-Aug-19) 1K-20KHz .767 G-s .763 G-s .539 G-s .722 G-s

6SUPLYP	- #6 Supply Pump	(13	-Aug-19)
	"	OVERALL LEVEL	
MC	H	.041 In/Sec	
МІ	н	.060 In/Sec	.291 G-s
МІ		.070 In/Sec	.177 G-s
PI			2.157 G-s
PI		.175 In/Sec .214 In/Sec	1.086 G-s
PC	H	.214 In/Sec	1.500 G-s
CBRA	- CASTER BAGHOUSE	REVERSE AIR (13	-Aug-19)
		OVERALL LEVEL	1K-20KHz
MC	H	.045 In/Sec	
MI		.041 In/Sec	.504 G-s
MI	A	.040 In/Sec	.625 G-s
CBID	- CASTER BAGHOUSE	ID FAN (13	-Aug-19)
		OVERALL LEVEL	1K-20KHz
MC	H	.071 In/Sec	.054 G-s
MC	v	.066 In/Sec	.049 G-s
МІ		.074 In/Sec	.084 G-s
МІ		.104 In/Sec	.152 G-s
МІ		.044 In/Sec	.129 G-s
FI		.221 In/Sec	.332 G-s
FI		.089 In/Sec	.589 G-s
FI		•	.639 G-s
FC		.106 In/Sec	.477 G-s
FC	v	.030 In/Sec	.250 G-s
FRAF	- Furnace REVERSE		•
		OVERALL LEVEL	
MC		.027 In/Sec	.122 G-s
МІ		.031 In/Sec	.108 G-s
MI		.024 In/Sec	.182 G-s
FI		.063 In/Sec	.643 G-s
FI		.051 In/Sec	
FC	н	.025 In/Sec	.428 G-S
EFBHF	- East Furnace Ba	g House Fan (13	
		OVERALL LEVEL	1K-20KHz
MC		.046 In/Sec	.672 G-s
MI			
MI		.047 In/Sec	
FI		.059 In/Sec	.427 G-s
FI FC		.096 In/Sec .100 In/Sec	.657 G-s 1.012 G-s
		,	
WFBHF	- WEST Furnace Ba		
		OVERALL LEVEL	
MC		.063 In/Sec	.262 G-s
MI		.072 In/Sec .072 In/Sec	.207 G-S
MI FI		.109 In/Sec	.039 G-S 557 C-s
FI		125 In/Sec	1 007 G-s
FC		.125 In/Sec .075 In/Sec	.550 G-s
NCHYDP	- North CASTER Hy		
	u	OVERALL LEVEL .073 In/Sec	1K-20KHz .302 G-s
MC MI		.0/5 IN/Sec	.302 G-S
PI		.035 In/Sec .080 In/Sec	.270 G-S 379 C-e
SCHYDP	- SOUTH CASTER Hy		
		OVERALL LEVEL	IK-20KHz
MC		.045 In/Sec .023 In/Sec	.184 G-s
MI PI		.124 In/Sec	
FI		.124 11/ 560	./JI G-8
SCEXEAN	- SPRAY CHAMBER E	XHAUST Fan (13	-Aug-19)

SCEXFAN	-	SPRAY	CHAMBER	EXHAUST	Far	ı	(13-Aug-19)	
				OVERA	LL	LEVEL	1K-20KHz	

MOH	.481 In/Sec	.462 G-s	
MIH	.733 In/Sec	.344 G-s	
MIA	.888 In/Sec	.165 G-s	
FIH	.412 In/Sec	.652 G-s	
FOH	.420 In/Sec	.639 G-s	

Clarification Of Vibration Units: Acc --> G-s RMS Vel --> In/Sec PK