HI-SPEED INDUSTRIAL SERVICE QualiTest® Diagnostics

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August 22, 2024

Lanxess
Memphis, TN

The following is a summary of findings from the August 2024 quarterly vibration survey at your facility. ***Note that the pre-crusher drive end bearing could not be checked because of the guard in place. Guard needs to be modified to allow for sensor placement on crusher bearings.*** Please let us know if there are any questions or comments.

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

Machine Summary Table

Date Collected													
Month	5	8	1	9	11	4	8						
Day	3	18	10	22	16	22	21						
Year	22	22	23	23	23	24	24						
Item	Condition												
Refrigeration Compressor A						NR							
Refrigeration Compressor B			NR	NR	NR	NR	NR						
East Cooling Tower Pump				NR	NR								
Middle Cooling Tower Pump	NR		NR			NR	NR						
West Cooling Tower Pump		NR											
West Neutralization Pump	NR	NR	NR	NR	NR		NR						
East Neutralization Pump						NR							
KOH Feed Pump													
Peroxide Feed Pump						NR							
Crystallizer Recirc Pump													
Slurry Transfer Pump													
Quench Tank Pump													
Centrifuge Feed Pump													
Caro's Acid Pump													
Scrubber Circulation Pump													
Dust Collector Blower	NA												
Quench Tank Blower													
Vent Scrubber Blower	NA												
Hold Tank Agitator	NA												
Crystallizer Agitator	NA					NR	NR						
Pre-Crusher	NA												
Grinder	NA												
Brine Tank Pump	NR	NR	NR										
Two Stage Water Pump													

Abbreviated Last Measurement Summary

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Database: oxone.rbm
Station: MEMPHIS OXONE

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD

REFGCOMPA - REFRIGERATION COMPRESSOR A (21-Aug-24)

	OVERALL LEVEL	1-20 kHZ
MOH	.067 In/Sec	.477 G-s
MOV	.045 In/Sec	.261 G-s
MOA	.029 In/Sec	.141 G-s
MIH	.055 In/Sec	.781 G-s
MIV	.032 In/Sec	.180 G-s
MIA	.029 In/Sec	.188 G-s
C1H	.034 In/Sec	.297 G-s
C1V	.027 In/Sec	.140 G-s
C1A	.052 In/Sec	.209 G-s
C2H	.039 In/Sec	.580 G-s
C2V	.319 In/Sec	.168 G-s
C2A	.104 In/Sec	.125 G-s
C3H	.065 In/Sec	.396 G-s
C3V	.288 In/Sec	.234 G-s
C3A	.127 In/Sec	.250 G-s
C4H	.052 In/Sec	.849 G-s
C4V	.065 In/Sec	.178 G-s
C4A	.166 In/Sec	.205 G-s

7371-07 - EAST COOLING TOWER PUMP (21-Aug-24)

	OVERALL LEVEL	1-20 kHZ
11	.196 In/Sec	1.620 G-s
12	.103 In/Sec	2.752 G-s
13	.134 In/Sec	.904 G-s
14	.059 In/Sec	.480 G-s

7371-05 - WEST COOLING TOWER PUMP (21-Aug-24)

	OVERALL LEVEL	1-20 kHZ
11	.060 In/Sec	1.341 G-s
12	.071 In/Sec	1.778 G-s
13	.059 In/Sec	2.248 G-s
14	.068 In/Sec	1.879 G-s

X2 - EAST NEUTRALIZATION PUMP (21-Aug-24)

	OVERALL LEVEL	1-20 kHZ
11	.107 In/Sec	.800 G-s
12	.073 In/Sec	.722 G-s

362-13 - KOH FEED PUMP (21-Aug-24)

	OVERALL LEVEL	1-20 kHZ
11	.088 In/Sec	2.187 G-s
21	.069 In/Sec	1.925 G-s
23	.079 In/Sec	.353 G-s
71	.138 In/Sec	2.804 G-s
72	.125 In/Sec	1.912 G-s

357-13 - PEROXIDE FEED PUMP (21-Aug-24)

	OVERALL LEVEL	1-20 kHZ
11	.033 In/Sec	.082 G-s
21	.038 In/Sec	.100 G-s
23	.043 In/Sec	.051 G-s
71	.068 In/Sec	.112 G-s
72	.062 In/Sec	.029 G-s

363-06 - CRYSTALLIZER RECIRC PUMP (21-Aug-24)

	OVERALL LEVEL	1-20 kHZ
11	.015 In/Sec	.296 G-s
21	.014 In/Sec	.540 G-s
23	.014 In/Sec	.042 G-s
71	.032 In/Sec	.071 G-s
72	.024 In/Sec	.021 G-s
81	.025 In/Sec	.092 G-s

363-07A - SLURRY TRANSFER PUMP (21-Aug-24)

	OVERALL LEVEL	1-20 kHZ
11	.079 In/Sec	1.501 G-s
21	.116 In/Sec	1.273 G-s
23	.183 In/Sec	.402 G-s
71	.174 In/Sec	.327 G-s
72	.542 In/Sec	.059 G-s

106-01 - PUMP,#2 QUENCH TANK (21-Aug-24)

	OVERALL LEVEL	1-20 kHZ
11	.045 In/Sec	.637 G-s
21	.053 In/Sec	.531 G-s
23	.122 In/Sec	.112 G-s
71	.618 In/Sec	.773 G-s
72	.251 In/Sec	.551 G-s

363-13 - CENTRIFUGE FEED PUMP (21-Aug-24)

	OVERALL LEVEL	1-20 kHZ
11	.139 In/Sec	.492 G-s
21	.090 In/Sec	.407 G-s
23	.080 In/Sec	.045 G-s
71	.060 In/Sec	.539 G-s
72	.129 In/Sec	.178 G-s

360-05 - CARO'S ACID PUMP (21-Aug-24)

	OVERALL LEVEL	1-20 kHZ
11	.055 In/Sec	.510 G-s
21	.061 In/Sec	.674 G-s
23	.062 In/Sec	.178 G-s
71	.115 In/Sec	.250 G-s
72	.114 In/Sec	.108 G-s

363-18 - AGITATOR, HOLD TANK (21-Aug-24)

	OVERALL LEVEL	1-20 kHZ
11	.117 In/Sec	.527 G-s
21	.158 In/Sec	.853 G-s
23	.127 In/Sec	.099 G-s
31	.123 In/Sec	1.460 G-s
32	.066 In/Sec	.448 G-s

106-08 - BLOWER, QUENCH TANK (21-Aug-24)

	OVERALL LEVEL	1-20 kHZ
11	.541 In/Sec	.691 G-s
12	.804 In/Sec	.183 G-s
13	.280 In/Sec	.127 G-s
21	.135 In/Sec	.779 G-s
22	.767 In/Sec	.338 G-s
23	.579 In/Sec	.076 G-s
71	.356 In/Sec	2.178 G-s
81	.461 In/Sec	1.253 G-s

DC BLOWER - BLOWER, DUST COLLECTOR (21-Aug-24)

	OVERALL LEVEL	1-20 kHZ
11	.055 In/Sec	1.440 G-s
12	.067 In/Sec	.214 G-s
13	.064 In/Sec	.468 G-s
21	.062 In/Sec	1.309 G-s
22	.057 In/Sec	.226 G-s
23	.057 In/Sec	.256 G-s
71	.074 In/Sec	.995 G-s
81	.149 In/Sec	2.131 G-s

VNTSCRBBLW - BLOWER, VENT SCRUBBER (21-Aug-24)

	OVERALL LEVEL	1-20 kHZ
11	.115 In/Sec	1.055 G-s
12	.083 In/Sec	.481 G-s
13	.088 In/Sec	.416 G-s
21	.083 In/Sec	1.279 G-s
22	.095 In/Sec	.315 G-s
23	.050 In/Sec	.595 G-s
71	.070 In/Sec	.919 G-s
81	.154 In/Sec	2.228 G-s

370-03 - GRINDER,OXONE (21-Aug-24)

	OVERALL LEVEL	1-20 kHZ
11	.057 In/Sec	.104 G-s
71	.123 In/Sec	.965 G-s

366-41 - SCRUBBER CIRCULATION PUMP (21-Aug-24)

	OVERALL LEVEL	1-20 kHZ
11	.192 In/Sec	3.455 G-s
21	.162 In/Sec	3.228 G-s
23	.145 In/Sec	.997 G-s
71	.246 In/Sec	1.106 G-s
81	.370 In/Sec	.435 G-s

7368-03 - PRECRUSHER OXONE (21-Aug-24)

	OVERALL LEVEL	1-20 kHZ
23	.128 In/Sec	.061 G-s
11	.295 In/Sec	.255 G-s
21	.235 In/Sec	.591 G-s
22	.137 In/Sec	.103 G-s
81	.139 In/Sec	.298 G-s

110-04 - BRINE TANK PUMP (21-Aug-24)

	OVERALL LEVEL	1-20 kHZ
11	.097 In/Sec	.453 G-s
21	.086 In/Sec	.674 G-s
23	.077 In/Sec	.199 G-s
71	.100 In/Sec	.305 G-s
72	.147 In/Sec	.114 G-s

2STAGEWTR - TWO STAGE WATER PUMP (21-Aug-24)

	OVERALL LEVEL	1-20 kHZ
11	.053 In/Sec	.608 G-s
21	.059 In/Sec	.604 G-s
23	.067 In/Sec	.102 G-s
71	.129 In/Sec	2.102 G-s
72	.085 In/Sec	.546 G-s

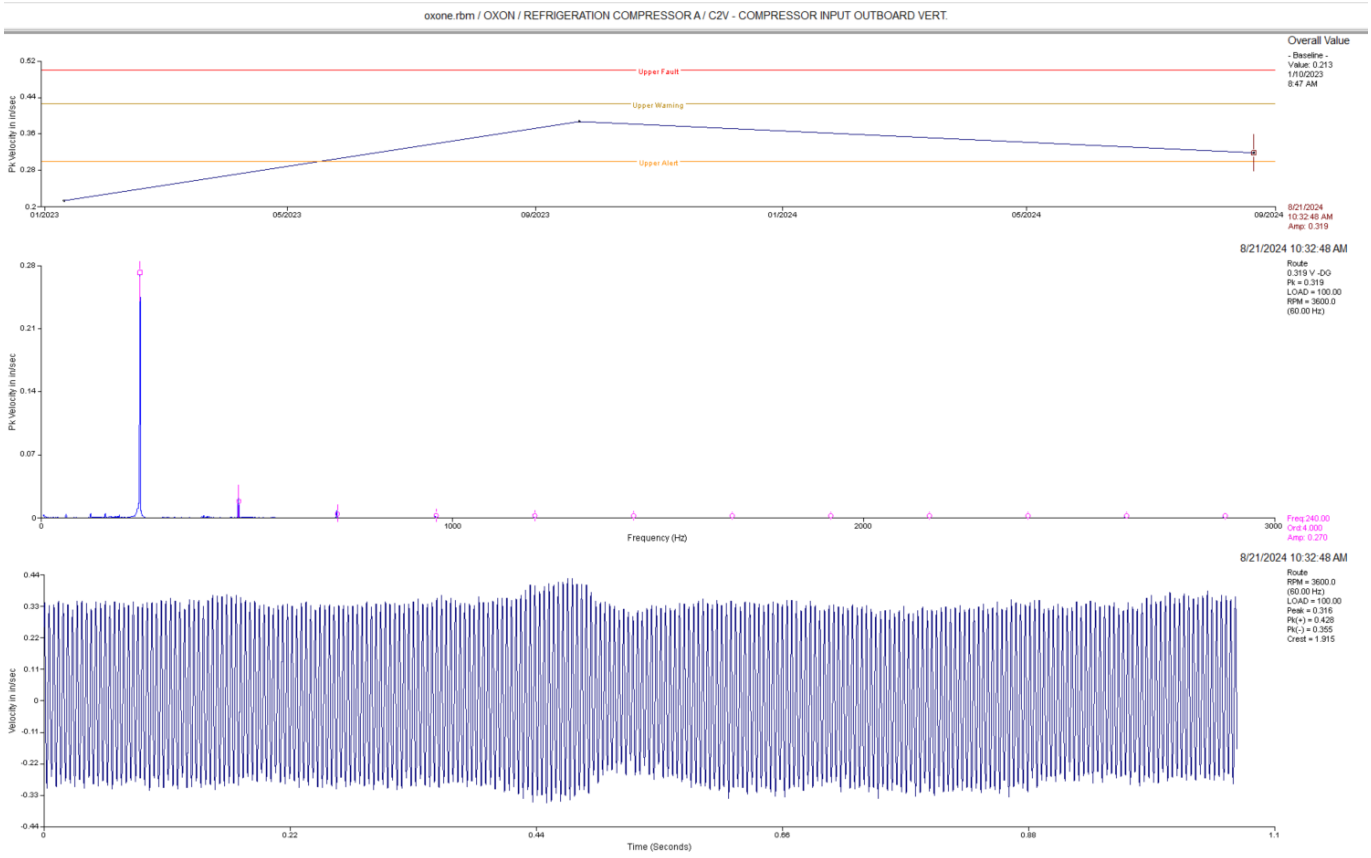
Clarification Of Vibration Units:

Acc --> G-s PK

Vel --> In/Sec PK

Vibration Analysis

Refrigeration Compressor A CLASS I



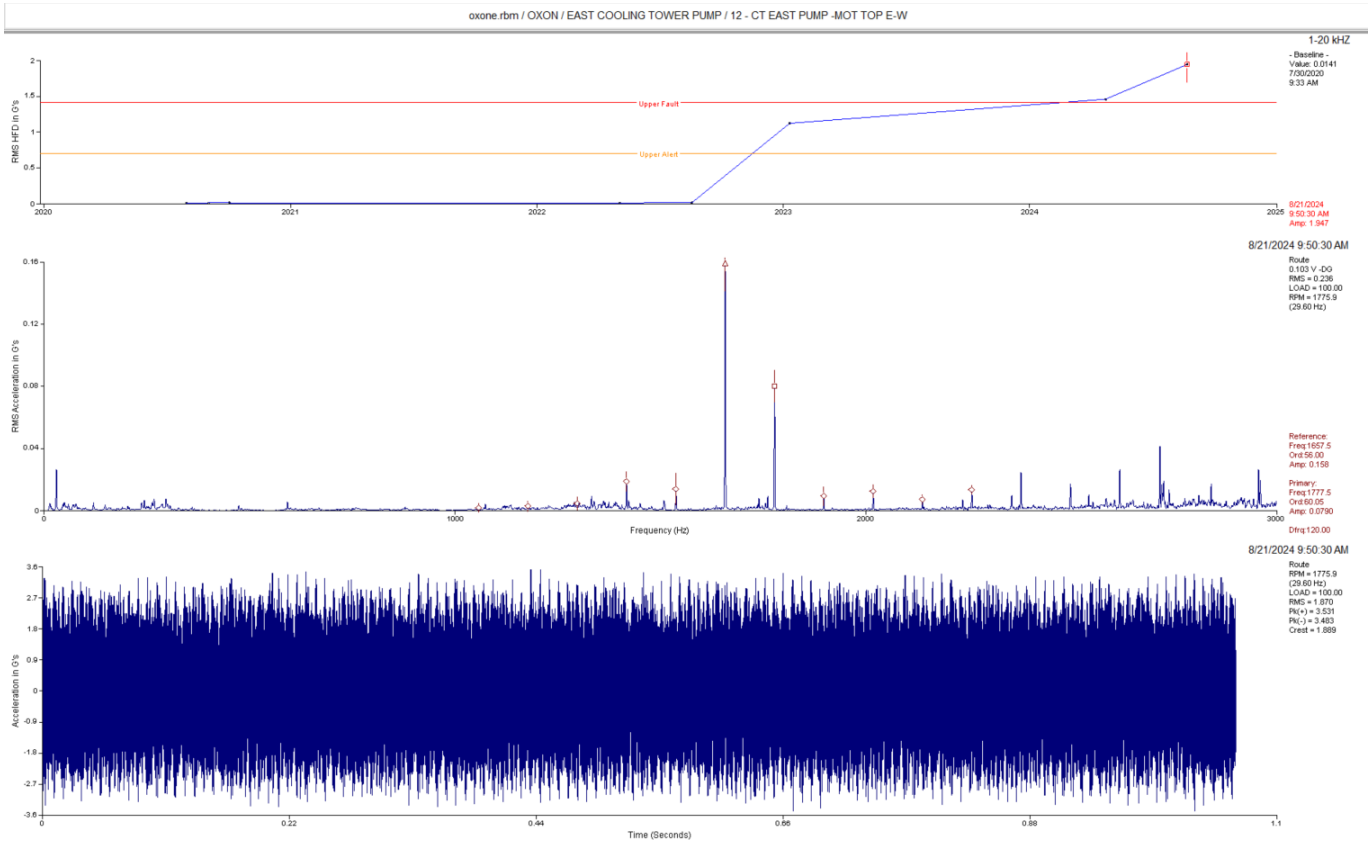
Observation:

Spectral data above shows a peak at 240 HZ which is 4 x rpm. This is most likely vane pass of the compressor. Overall amplitude at the highest vibration point decreased slightly since last collection in September 2023.

Recommendation:

The 4 x rpm vibration that can be seen in the outboard end of the compressor in the vertical direction appears to be excited by the very high vibration in the inlet piping of the compressor. The piping vibration is over 1 ips and is highest in the vertical direction. It is unclear if this is a resonance in the piping or if the vibration is being influenced by some type of flow turbulence.

East Cooling Tower Pump MOTOR CLASS I



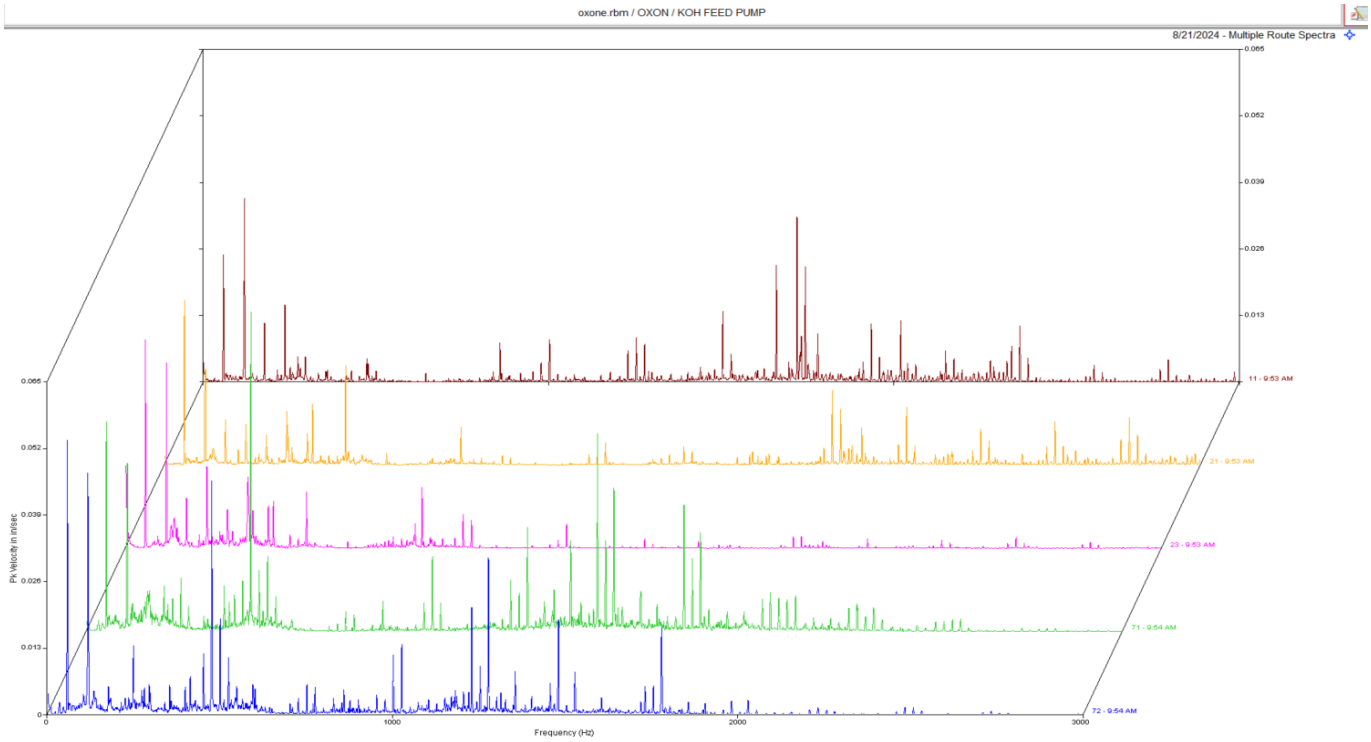
Observation:

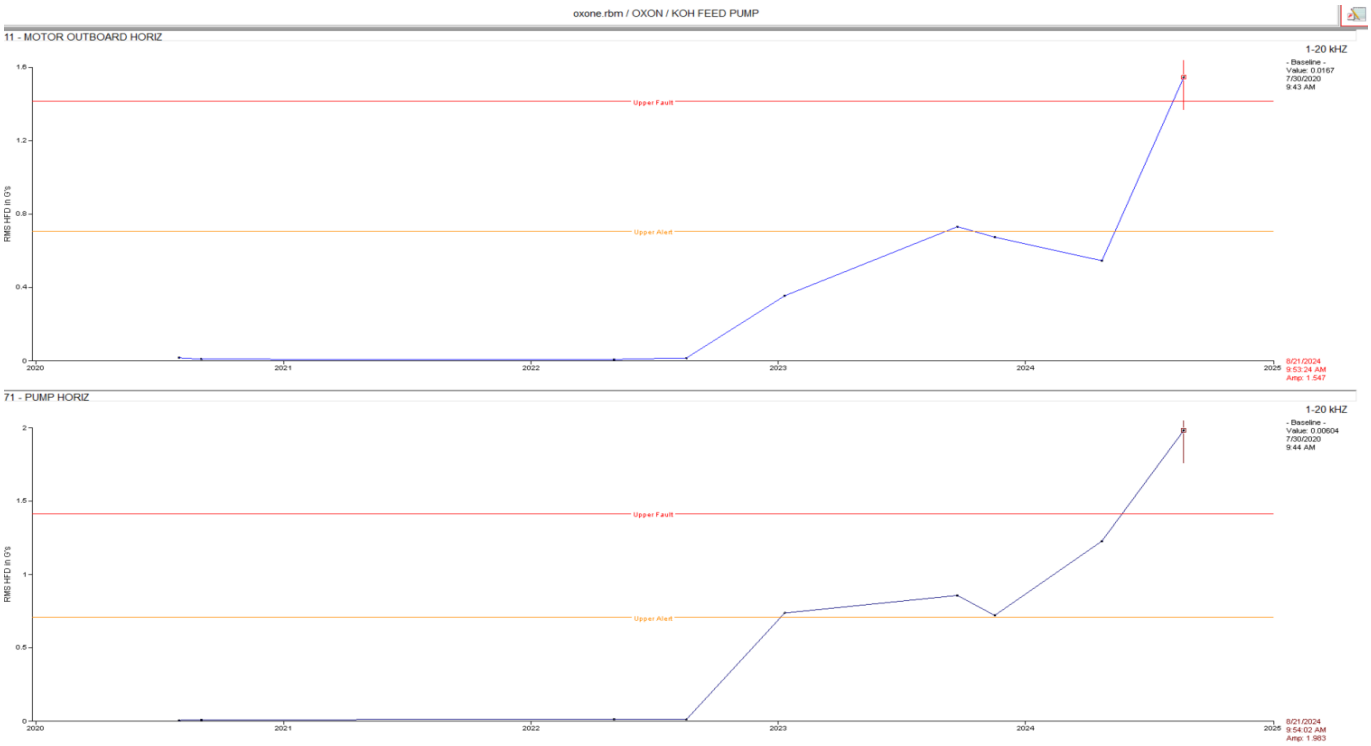
Motor data shows a peak at 56 orders of rpm with 120 HZ. sidebands.

Recommendation:

Motor data shows an increase in high frequency amplitude. The 120 HZ. sidebands are electrical related as well. Motor may have an air gap issue or rotor issue. We will continue to monitor this closely.

KOH Feed Pump CLASS II





Observation:

Multi-spectral waterfall of the motor and pump shows non-synchronous peaks. Trend also shows an increase in high frequency amplitude in G's.

Recommendation:

Motor/Pump data shows some signs of bearing degradation. Motor and Pump will likely need attention in the next few months.

Slurry Transfer Pump CLASS III

Observation:

Pump vertical trend data shows a significant increase in overall vibration amplitude. Spectral data shows a dominant 1 x rpm vibration.

Recommendation:

Pump base appears to be loose. Inspect pump base soon. Ensure all fasteners are tight and no soft base/foot exists. **Motor also has signs of bearing defects/wear. Inspect motor soon**.

Quench Tank Pump CLASS II

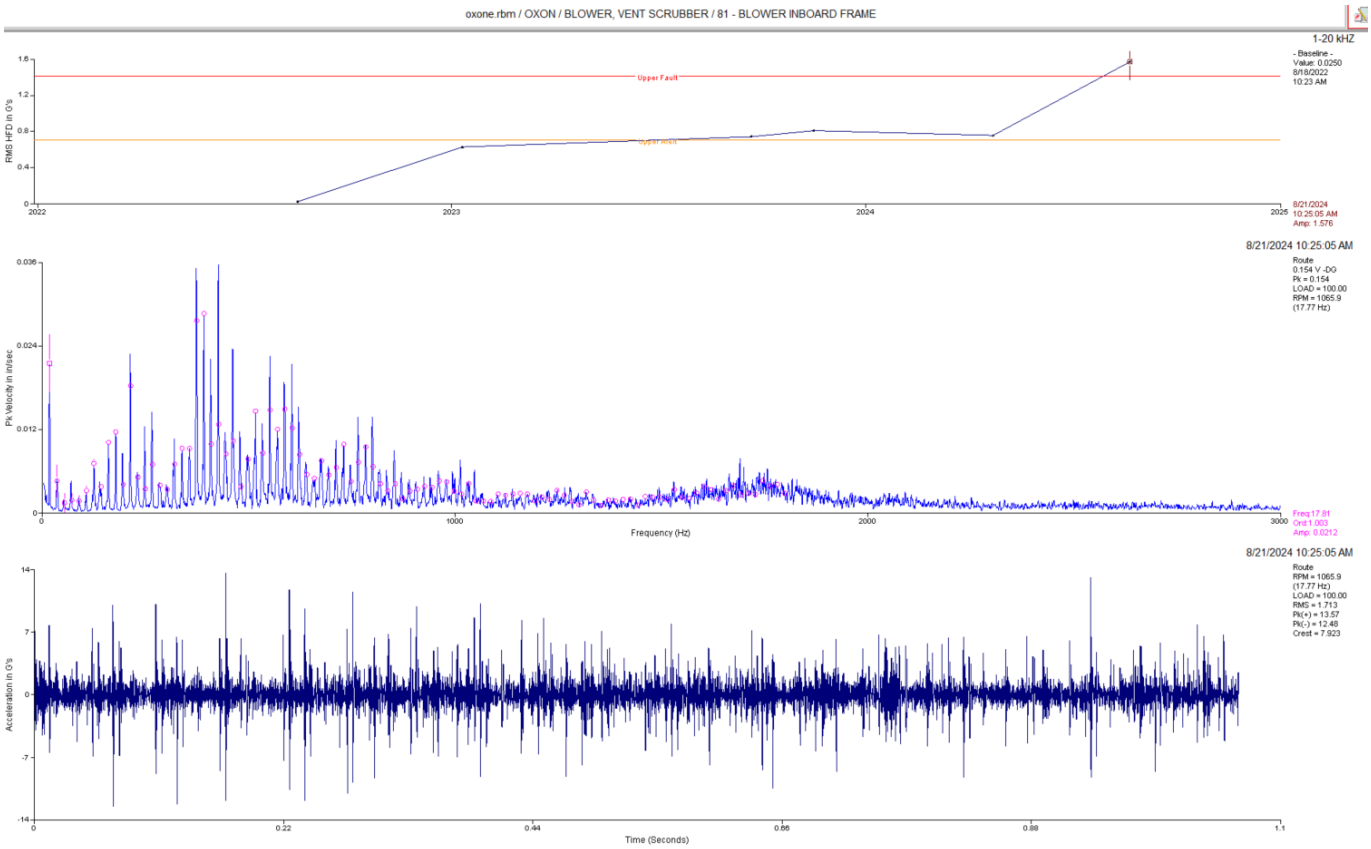
Observation:

Pump horizontal data shows a dominant vibration at 6 x rpm. Trend data shows an increase in overall vibration.

Recommendation:

If impeller has 6 vanes, then this vibration is pump vane pass and may be caused by internal pump/impeller issue or pump flow issue. Ensure pump is operating within the proper flow parameters and inspect pump/impeller as scheduling allows.

Vent Scrubber Blower CLASS II



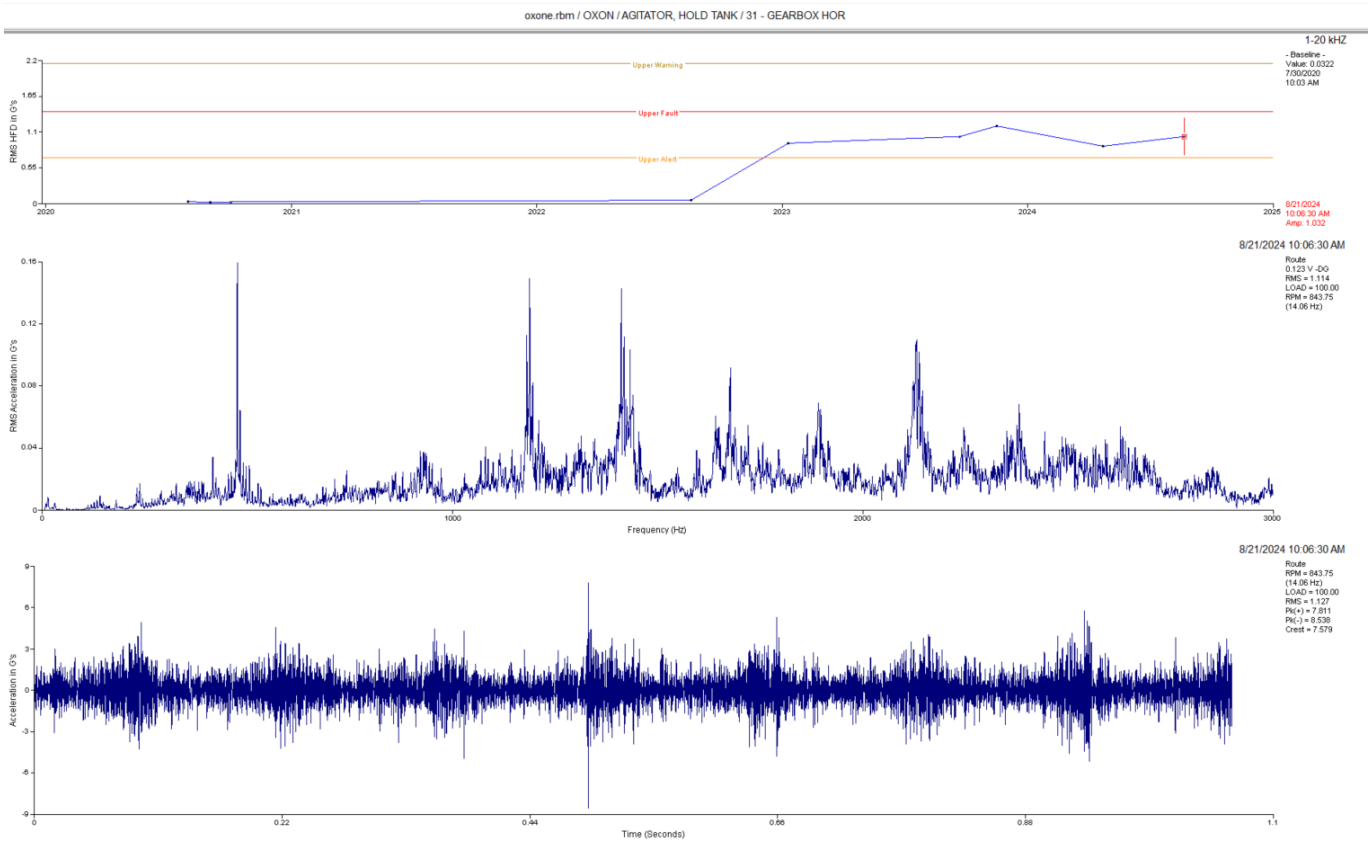
Observation:

Inboard blower data shows synchronous peaks associated bearing fit looseness/wear. Waveform data shows sharp impacting with high crest factor.

Recommendation:

Drive end blower bearing appears to have fit looseness wear. Blower needs attention as soon as scheduling allows.

Hold Tank Agitator CLASS II



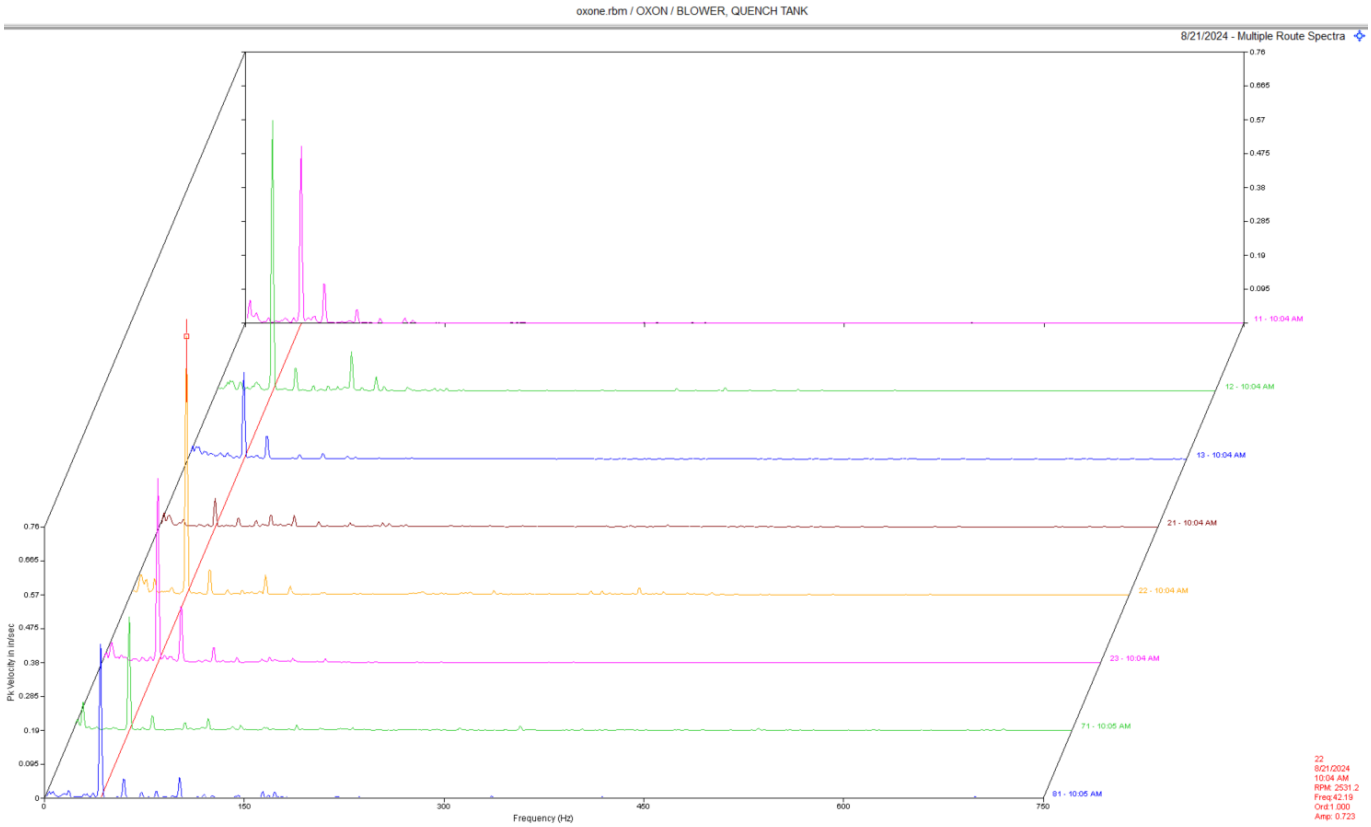
Observation:

Gearbox input side data shows random noise floor with non-synchronous and synchronous peaks associated with bearing and gear frequencies .

Recommendation:

Gearbox data is showing signs of defects and wear being apparent. Gearbox may need a fluid change and an oil analysis to help confirm severity of wear.

Quench Tank Blower CLASS II



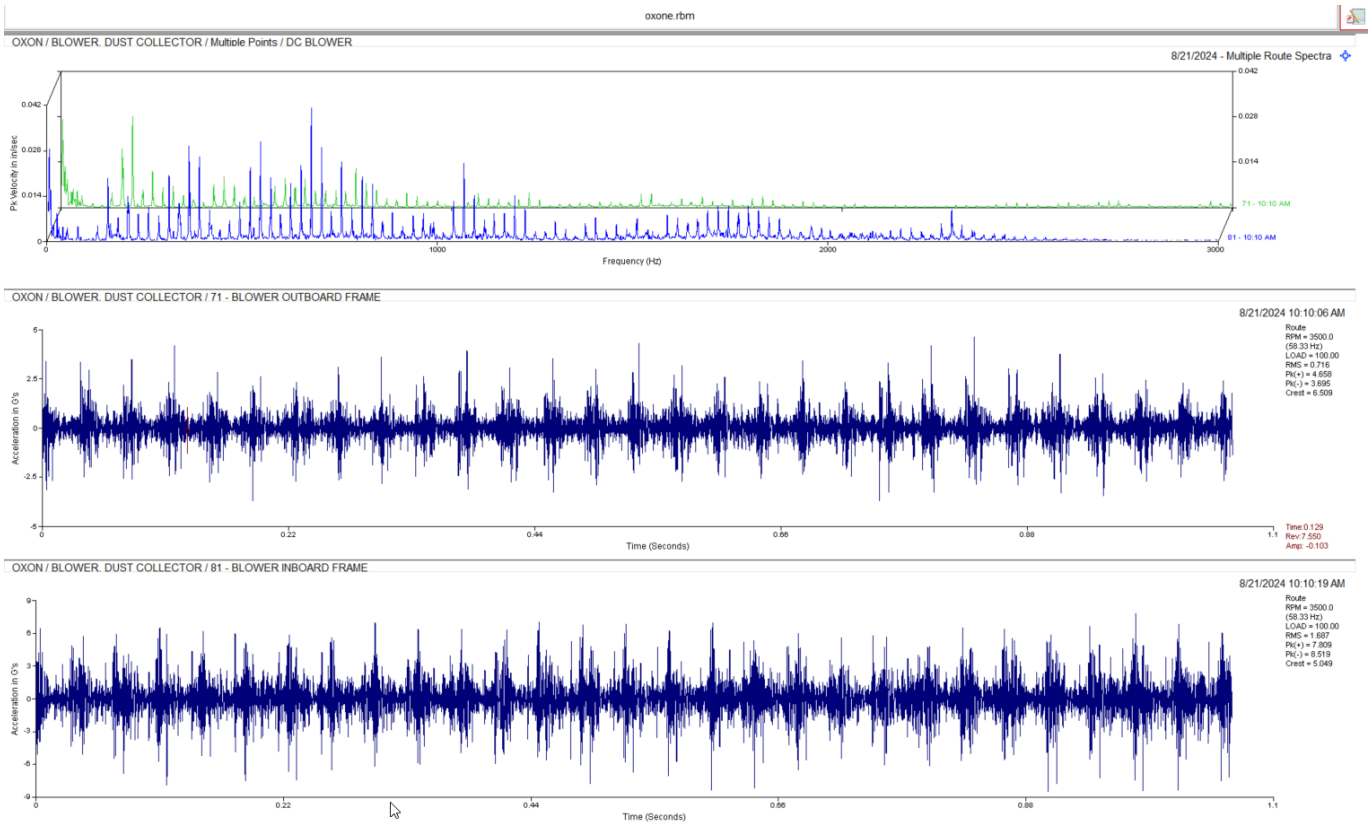
Observation:

Multipoint spectra shows a high vibration throughout the blower and motor. This peak appears to be 1 x blower rpm.

Recommendation:

Data suggests imbalance of the blower or possible sheave issue. Inspect blower wheel for buildup and or damage. Ensure sheaves are in good shape and properly aligned. Check all fasteners and ensure belts are also in good shape.

Dust Collector Blower CLASS III



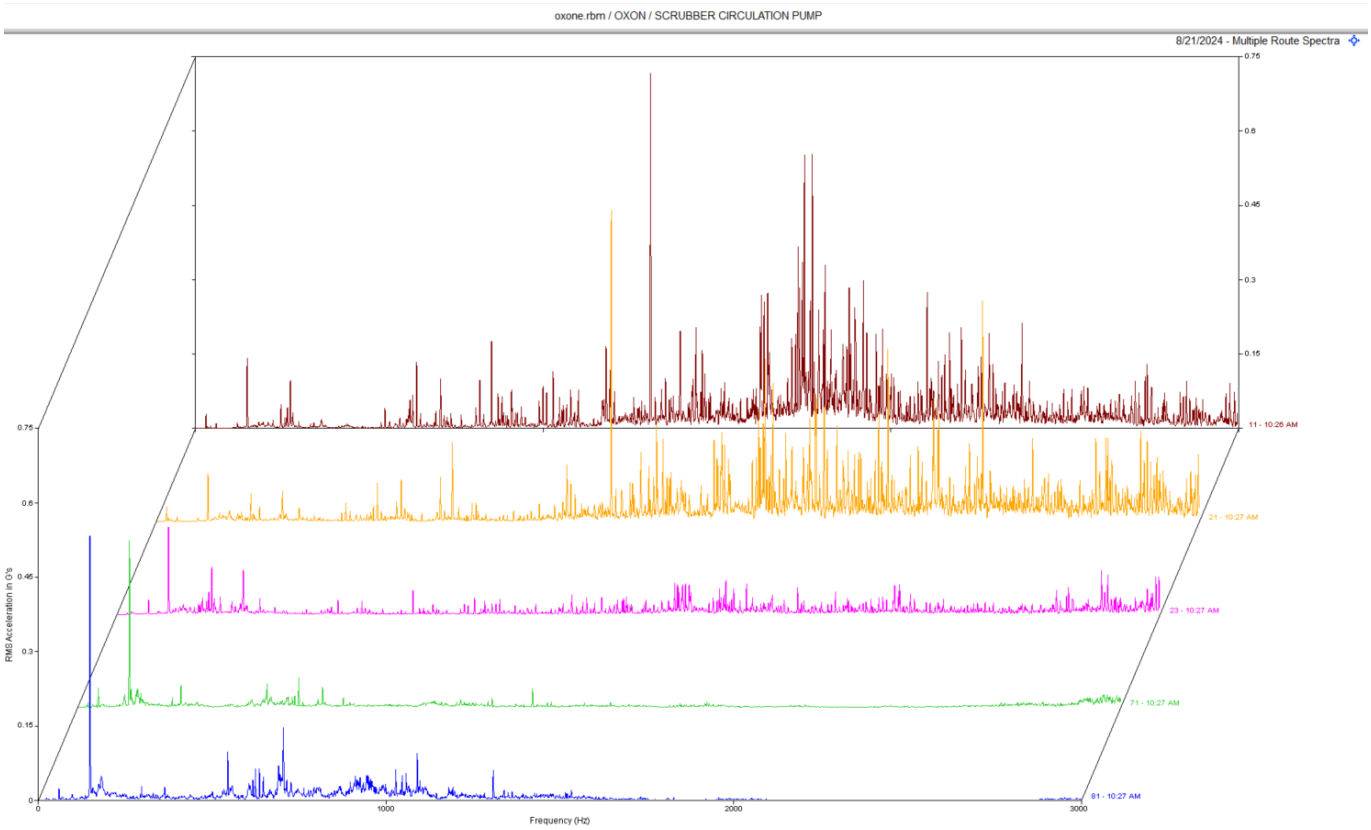
Observation:

Multipoint spectra of the blower show excessive vibration in the blower bearings. Peaks in blower spectra are mostly synchronous which indicate excessive blower shaft and or bearing fit wear. Waveform data shows 8 g's (outboard) and 15 g's (inboard) peak to peak with signs of impacting and pulsing.

Recommendation:

Data indicates defects/wear in the blower bearings and or blower shaft. The blower is very noisy as well and will need attention very soon.

Scrubber Circulation Pump CLASS III



Observation:

Multi-point spectral waterfall shows high amplitude acceleration and non-synchronous peaks in motor spectra.

Recommendation:

Motor bearings are showing signs of defect/wear. We are monitoring this closely. Motor should be replaced at next down time.

As always, it has been a pleasure to serve the Lanxess Oxone Memphis Plant. If there are any comments or questions, do not hesitate to contact us.

Sincerely,

ISO Certified Vibration Analyst, Category III

HI-SPEED INDUSTRIAL SERVICE

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