



January 3, 2021

Pennakem

Subject: December vibration service report

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.

This completes our assessment of your equipment for this survey. Thank you for your business and don't hesitate to call if you have any comments or questions.

Sincerely,

David W. Shook
Senior Reliability Specialists
Hi-Speed Industrial Service
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Observations

P 24 Big Blue Water Pump

The pump trend is still high again and is dominated by a shaft speed vibration in the horizontal with the overall above 0.6"/second velocity peak. The pump data still indicates possible looseness in the bearing fits as well as wear in the pump, such as imbalance, and vane pass, which we suspect is 5x RPM. The motor shows a dominant 5x RPM vibration also in the horizontal. **Rated a Class III Defect.**

P24-85 North 85° Water Pump

The pump has a slight shaft speed vibration which is dominant in the axial. There could be wear in the pump. Check all fasteners for now as well as the coupling and shaft run out. **Rated a Class I Defect.**

P 48-7B Roto jet High Pressure Pump

The pump vibration has increased again to over 0.9"/second velocity peak in the time waveform at shaft speed. Clean the pump. **Rated a Class III Defect.**

C42-4 Twin Screw Axial Compressor

Non-synchronous vibration peaks are evident in the compressor bearing data. This is a good indication of early bearing race defects. No immediate action required at this time. **Rated a Class I Defect.**

R53-301 Reactor Agitator Motor and Gearbox

The Motor/Gearbox frame still appears to be cracked at the base on the south side. The agitator adapter shaft appears to have run out which most likely helped in the progression of the fatigue and subsequent crack. Repair the base and correct the shaft run out as soon as possible. **Rated a Class III Defect.**

R55-106 Reactor Agitator Motor Gearbox

Motor/gearbox has a 1xRPM vibration at input speed. Inspect the fasteners, structure, coupling and alignment as time allows. **Rated a Class I Defect.**

B82-101A Forced Draft Fan Outside (Southwest)

Motor has a shaft speed vibration and a few harmonics. Check all fasteners and clean the fan wheel. **Rated a Class I Defect.**

P67-504 Hot Oil Circulation Pump 50 HP

The motor drive end horizontal vibration has jumped up at shaft speed with a few low amplitude harmonics. We still suggest inspecting the unit fasteners, coupling, and alignment. Check for run out. **Rated a Class III Defect.**

R80-10 Agitator Motor and Gearbox

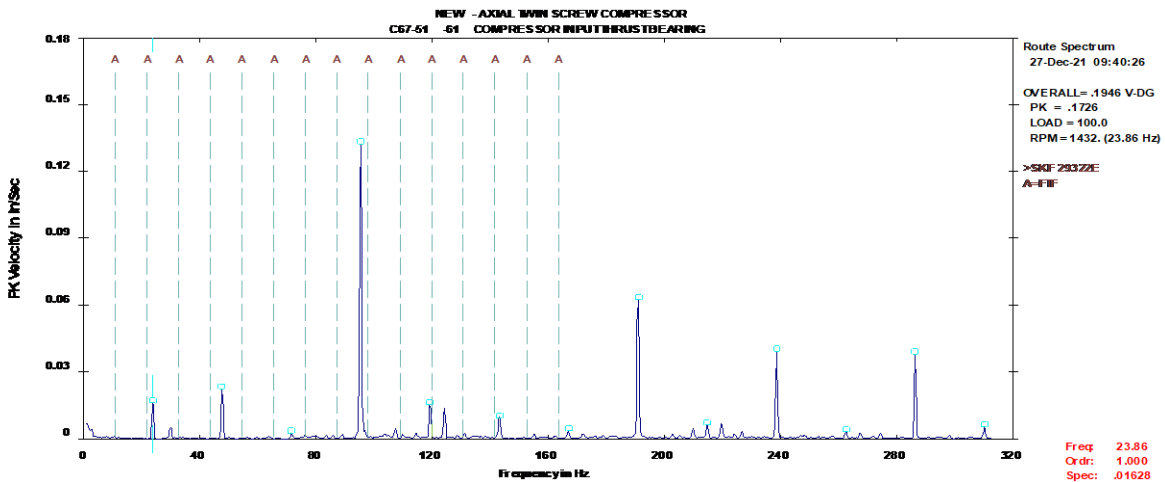
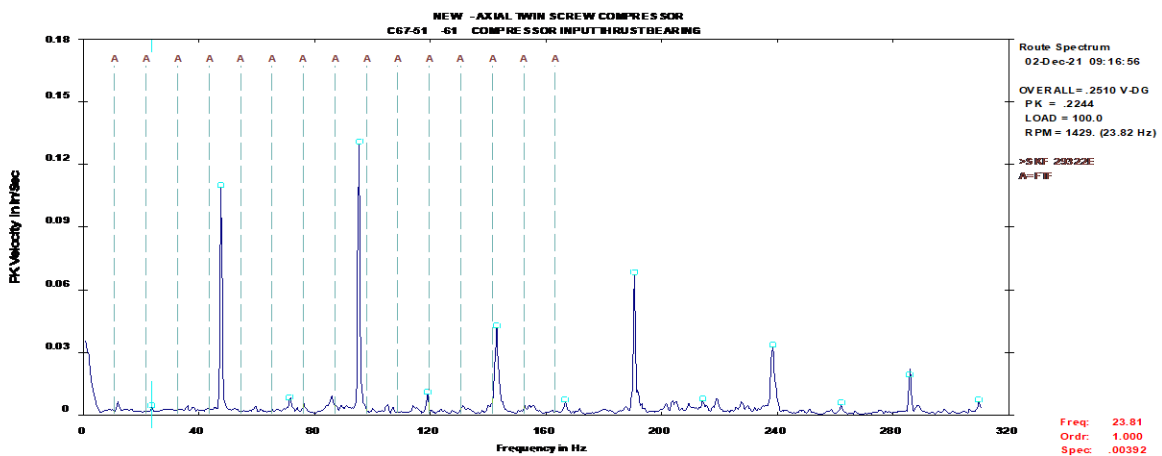
The motor was replaced; however the unit was not in operation during the survey.

B82-101A Southwest FD Fan 10 HP (Outside)

The motor axial vibration has dropped for now.

C67-51 Twin Screw Axial Compressor End

The lobe pass vibrations at 2x and 4x input speed are dominant in the data but have not changed much. Loading could affect vibrations. No indication of cage vibrations in thrust bearing before or after failure. **Rated a Class I Defect.**



Abbreviated Last Measurement Summary

Database: penn.rbm
Station: PENNAKEM NEW CURRENT DATABASE
Report Date: 03-Jan-22 09:37

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD	MACHINE SPEED
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B4C101-877 - ZURN BOILER BLOWER (27-Dec-21)			
	OVERALL LEVEL	1-20 KHZ	
11	.177 In/Sec	.333 G-s	1180.0 RPM
12	.129 In/Sec	.637 G-s	
13	.118 In/Sec	.149 G-s	
21	.182 In/Sec	.777 G-s	
22	.347 In/Sec	1.376 G-s	BAD DATA
23	.119 In/Sec	.688 G-s	
71	.193 In/Sec	.662 G-s	
72	.137 In/Sec	.655 G-s	
73	.155 In/Sec	.839 G-s	
81	.169 In/Sec	.913 G-s	
82	.137 In/Sec	.739 G-s	
P4C-102B - BOILER FEEDWATER PUMP (27-Dec-21)			
	OVERALL LEVEL	1-20 KHZ	
11	.107 In/Sec	.555 G-s	3570.0 RPM
12	.041 In/Sec	1.079 G-s	
21	.075 In/Sec	.372 G-s	
22	.039 In/Sec	.503 G-s	
23	.109 In/Sec	.627 G-s	
71	.090 In/Sec	1.408 G-s	
72	.024 In/Sec	.956 G-s	
73	.045 In/Sec	.671 G-s	
81	.043 In/Sec	.209 G-s	
82	.049 In/Sec	.687 G-s	
83	.162 In/Sec	2.104 G-s	
P24-63DEGS - 63 DEG S WATER PUMP (27-Dec-21)			
	OVERALL LEVEL	1-20 KHZ	
11	.103 In/Sec	.205 G-s	1750.0 RPM
12	.082 In/Sec	.393 G-s	
21	.093 In/Sec	.465 G-s	
22	.049 In/Sec	.582 G-s	
23	.079 In/Sec	.338 G-s	
71	.121 In/Sec	.397 G-s	
72	.066 In/Sec	.554 G-s	
73	.190 In/Sec	1.025 G-s	
81	.123 In/Sec	2.234 G-s	
82	.089 In/Sec	1.312 G-s	
83	.239 In/Sec	2.102 G-s	
P24-85DEGN - 85 DEG N WATER CIRC PUMP 125 (27-Dec-21)			
	OVERALL LEVEL	1-20 KHZ	
11	.088 In/Sec	.759 G-s	1750.0 RPM
12	.060 In/Sec	.626 G-s	

21	.132 In/Sec	1.057 G-s
22	.081 In/Sec	.539 G-s
23	.052 In/Sec	.342 G-s
71	.168 In/Sec	1.515 G-s
72	.237 In/Sec	1.232 G-s
73	.328 In/Sec	1.507 G-s
81	.129 In/Sec	1.105 G-s
82	.195 In/Sec	1.233 G-s
83	.250 In/Sec	1.709 G-s

P24-85DEGS - 85 DEG S WATER CIRC PUMP 125 (27-Dec-21)

	OVERALL LEVEL	1-20 KHZ	
11	.077 In/Sec	1.039 G-s	1750.0 RPM
12	.112 In/Sec	1.063 G-s	
21	.120 In/Sec	.809 G-s	
22	.051 In/Sec	.770 G-s	
23	.072 In/Sec	1.056 G-s	
71	.149 In/Sec	.846 G-s	
72	.113 In/Sec	.604 G-s	
73	.196 In/Sec	1.221 G-s	
81	.098 In/Sec	.778 G-s	
82	.090 In/Sec	.733 G-s	
83	.146 In/Sec	1.097 G-s	

P24BGBL876 - BIG BLUE WATER PUMP-63 DEG (27-Dec-21)

	OVERALL LEVEL	1-20 KHZ	
11	.417 In/Sec	1.248 G-s	1180.0 RPM
12	.124 In/Sec	.735 G-s	
21	.586 In/Sec	.573 G-s	
22	.116 In/Sec	1.238 G-s	
23	.202 In/Sec	.450 G-s	
71	.632 In/Sec	.269 G-s	
72	.128 In/Sec	.492 G-s	
73	.195 In/Sec	.279 G-s	
81	.572 In/Sec	.513 G-s	
82	.213 In/Sec	.444 G-s	
83	.220 In/Sec	.562 G-s	

P36-905A - N COOL TWR-NORTH PUMP (27-Dec-21)

	OVERALL LEVEL	1-20 KHZ	
11	.079 In/Sec	.157 G-s	1780.0 RPM
12	.056 In/Sec	.308 G-s	
21	.074 In/Sec	.582 G-s	
22	.063 In/Sec	.284 G-s	
23	.073 In/Sec	.039 G-s	
71	.094 In/Sec	1.410 G-s	
72	.117 In/Sec	1.163 G-s	
73	.204 In/Sec	.258 G-s	
81	.126 In/Sec	1.651 G-s	
82	.120 In/Sec	1.464 G-s	
83	.189 In/Sec	2.543 G-s	

P36-905C - N COOL TWR-EAST PUMP (27-Dec-21)

	OVERALL LEVEL	1-20 KHZ	
11	.033 In/Sec	.183 G-s	1780.0 RPM
12	.041 In/Sec	.220 G-s	
21	.032 In/Sec	.693 G-s	

22	.022 In/Sec	.227 G-s
23	.035 In/Sec	.018 G-s
71	.103 In/Sec	1.068 G-s
72	.153 In/Sec	1.185 G-s
73	.143 In/Sec	.019 G-s
81	.113 In/Sec	.847 G-s
82	.145 In/Sec	1.130 G-s
83	.122 In/Sec	1.104 G-s

C36-EAST - UTILITY AIRCOMP ROTARY 200HP (27-Dec-21)

	OVERALL LEVEL	1-20 KHZ	
11	.090 In/Sec	.477 G-s	1750.0 RPM
12	.088 In/Sec	.768 G-s	
21	.062 In/Sec	.703 G-s	
22	.080 In/Sec	1.099 G-s	
23	.062 In/Sec	.794 G-s	
71	.120 In/Sec	1.510 G-s	3570.0 RPM
72	.145 In/Sec	2.531 G-s	
73	.173 In/Sec	2.285 G-s	
81	.164 In/Sec	4.994 G-s	
82	.143 In/Sec	7.049 G-s	
71F	.098 In/Sec	3.558 G-s	
72F	.113 In/Sec	2.383 G-s	
81F	.145 In/Sec	9.801 G-s	
82F	.124 In/Sec	5.098 G-s	

P39-4-877 - WELL PUMP #4 (02-Dec-21)

	OVERALL LEVEL	1-20 KHZ	
11	.237 In/Sec	.360 G-s	1780.0 RPM
12	.239 In/Sec	.457 G-s	
21	.131 In/Sec	.469 G-s	
22	.117 In/Sec	.322 G-s	
23	.076 In/Sec	.380 G-s	

C42-4 - AXIAL TWIN SCREW COMPRESSOR (27-Dec-21)

	OVERALL LEVEL	1-20 KHZ	
11	.051 In/Sec	1.447 G-s	1185.0 RPM
12	.044 In/Sec	1.262 G-s	1750.0 RPM
21	.055 In/Sec	1.813 G-s	
22	.100 In/Sec	1.395 G-s	
23	.073 In/Sec	1.328 G-s	
71	.064 In/Sec	2.806 G-s	3570.0 RPM
72	.061 In/Sec	1.401 G-s	
73	.067 In/Sec	3.236 G-s	
81	.053 In/Sec	4.101 G-s	
82	.045 In/Sec	.473 G-s	
83	.051 In/Sec	5.284 G-s	
71F	.068 In/Sec	2.676 G-s	
72F	.046 In/Sec	2.118 G-s	
73F	.067 In/Sec	3.076 G-s	
81F	.070 In/Sec	1.293 G-s	
82F	.056 In/Sec	.243 G-s	
83F	.060 In/Sec	4.176 G-s	

P42-4A - CENTRIFUGAL HOT OIL PUMP 5HP (27-Dec-21)

	OVERALL LEVEL	1-20 KHZ	
11	.014 In/Sec	.086 G-s	1760.0 RPM

21	.011 In/Sec	.037 G-s	
23	.012 In/Sec	.029 G-s	
71	.018 In/Sec	.136 G-s	
73	.012 In/Sec	.083 G-s	
81	.011 In/Sec	.165 G-s	
P42-4B	- CENTRIFUGAL HOT OIL PUMP 5HP (27-Dec-21)		
	OVERALL LEVEL	1-20 KHZ	
11	.029 In/Sec	.055 G-s	1760.0 RPM
21	.027 In/Sec	.098 G-s	
23	.045 In/Sec	.071 G-s	
71	.028 In/Sec	.169 G-s	
73	.014 In/Sec	.131 G-s	
81	.018 In/Sec	.103 G-s	
P42-4D	- CENTRIFUGAL HOT OIL PUMP 5HP (27-Dec-21)		
	OVERALL LEVEL	1-20 KHZ	
11	.015 In/Sec	.084 G-s	1760.0 RPM
21	.044 In/Sec	.094 G-s	
23	.019 In/Sec	.069 G-s	
71	.028 In/Sec	.174 G-s	
81	.031 In/Sec	.126 G-s	
P45-VAC	- NEW VACUUM PUMP PILOT PLANT (02-Dec-21)		
	OVERALL LEVEL	1-20 KHZ	
11	.196 In/Sec	.515 G-s	1760.0 RPM
21	.149 In/Sec	.768 G-s	
23	.164 In/Sec	.493 G-s	
71M	.123 In/Sec	.307 G-s	
71F	.129 In/Sec	.393 G-s	
73M	.101 In/Sec	.414 G-s	
81M	.113 In/Sec	.601 G-s	
81F	.110 In/Sec	.499 G-s	
P48-7B	- ROTOJET HIGH PRESS PUMP 15HP (27-Dec-21)		
	OVERALL LEVEL	1-20 KHZ	
11	.168 In/Sec	.496 G-s	1750.0 RPM
12	.406 In/Sec	.503 G-s	
21	.195 In/Sec	.642 G-s	
22	.323 In/Sec	.361 G-s	
23	.152 In/Sec	.451 G-s	
71	.635 In/Sec	1.473 G-s	
72	.369 In/Sec	1.202 G-s	
73	.229 In/Sec	.855 G-s	
81	.849 In/Sec	.658 G-s	
82	.450 In/Sec	.757 G-s	
83	.184 In/Sec	.953 G-s	
C53-301B	- C-301B RECIP COMPRESSOR (27-Dec-21)		
	OVERALL LEVEL	1-20 KHZ	
11	.045 In/Sec	.238 G-s	1800.0 RPM
12	.050 In/Sec	.580 G-s	
21	.063 In/Sec	.201 G-s	
22	.046 In/Sec	.638 G-s	
23	.069 In/Sec	.158 G-s	
71	.053 In/Sec	.148 G-s	237.0 RPM
72	.027 In/Sec	.104 G-s	

73	.080 In/Sec	.090 G-s
81	.053 In/Sec	.099 G-s
82	.031 In/Sec	.098 G-s

P53-301 - ANSI CENTRIFUGAL PUMP 50 HP (27-Dec-21)

	OVERALL LEVEL	1-20 KHZ	
11	.104 In/Sec	.239 G-s	1750.0 RPM
12	.084 In/Sec	.203 G-s	
21	.101 In/Sec	.350 G-s	
22	.088 In/Sec	.401 G-s	
23	.074 In/Sec	1.469 G-s	
71	.109 In/Sec	.372 G-s	
72	.140 In/Sec	.350 G-s	
73	.106 In/Sec	.799 G-s	
81	.082 In/Sec	.645 G-s	
82	.096 In/Sec	.543 G-s	

R53-301 - AGITATOR GBX CHEMINEER 15HP (27-Dec-21)

	OVERALL LEVEL	
11	.520 In/Sec	1760.0 RPM
12	.236 In/Sec	
21	.442 In/Sec	
22	.305 In/Sec	
23	.504 In/Sec	
31	.360 In/Sec	
32	.050 In/Sec	
33	.164 In/Sec	
41	.240 In/Sec	
42	.154 In/Sec	
51	.339 In/Sec	
61	.216 In/Sec	
63	.099 In/Sec	
71	.062 In/Sec	

P53-310A - GRUNDFOSS VERT PUMP 10HP (27-Dec-21)

	OVERALL LEVEL	1-20 KHZ	
11	.085 In/Sec	.093 G-s	1750.0 RPM
12	.083 In/Sec	.220 G-s	
21	.088 In/Sec	.293 G-s	
22	.064 In/Sec	.481 G-s	
23	.023 In/Sec	.042 G-s	
71	.081 In/Sec	.194 G-s	
72	.085 In/Sec	.155 G-s	
73	.026 In/Sec	.070 G-s	
81	.026 In/Sec	.087 G-s	
82	.038 In/Sec	.072 G-s	

C54--115 - COMP 2CYL 2 STAGE 75 HP (27-Dec-21)

	OVERALL LEVEL	1-20 KHZ	
11	.083 In/Sec	.569 G-s	1800.0 RPM
12	.150 In/Sec	.471 G-s	
21	.080 In/Sec	.610 G-s	
22	.060 In/Sec	.378 G-s	
23	.155 In/Sec	.231 G-s	
71	.042 In/Sec	.066 G-s	
72	.022 In/Sec	.060 G-s	
73	.044 In/Sec	.048 G-s	

81	.028 In/Sec	.056 G-s	
82	.023 In/Sec	.043 G-s	
P54-112 - CANNED MOTOR CENTRIFUG PUMP (27-Dec-21)			
	OVERALL LEVEL	1-20 KHZ	
11	.075 In/Sec	.019 G-s	1800.0 RPM
12	.026 In/Sec	.017 G-s	
13	.047 In/Sec	.065 G-s	
21	.028 In/Sec	.176 G-s	
22	.030 In/Sec	.222 G-s	
71	.040 In/Sec	.139 G-s	
72	.062 In/Sec	.138 G-s	
81	.054 In/Sec	.081 G-s	
82	.018 In/Sec	.061 G-s	
R55-102 - REACTOR AGIT R-102 (27-Dec-21)			
	OVERALL LEVEL		
11	.072 In/Sec		1760.0 RPM
12	.060 In/Sec		
21	.074 In/Sec		
22	.089 In/Sec		
23	.146 In/Sec		
31	.154 In/Sec		
32	.231 In/Sec		
33	.191 In/Sec		
41	.089 In/Sec		
42	.093 In/Sec		
51	.055 In/Sec		
61	.076 In/Sec		
63	.042 In/Sec		
71	.025 In/Sec		
R55-106 - REACTOR AGIT R-106 (27-Dec-21)			
	OVERALL LEVEL	1-20 KHZ	
11	.188 In/Sec	.209 G-s	1760.0 RPM
12	.262 In/Sec		
21	.125 In/Sec	.181 G-s	
22	.086 In/Sec	.365 G-s	
23	.264 In/Sec	.011 G-s	
31	.217 In/Sec		
32	.063 In/Sec		
33	.180 In/Sec		
41	.299 In/Sec		
42	.076 In/Sec		
51	.239 In/Sec		
61	.190 In/Sec		
63	.056 In/Sec		
71	.026 In/Sec		
C67-51 - AXIAL TWIN SCREW COMPRESSOR (27-Dec-21)			
	OVERALL LEVEL	1-20 KHZ	
11	.072 In/Sec	4.182 G-s	1750.0 RPM
11P	.0025 In/Sec		
12	.042 In/Sec	4.918 G-s	
* 13	.094 In/Sec	.661 G-s	
21	.073 In/Sec	.922 G-s	
21P	.0015 In/Sec		

22	.078 In/Sec	1.077 G-s	
23	.082 In/Sec	1.341 G-s	
61	.195 In/Sec	.159 G-s	1500.0 RPM
71	.160 In/Sec	.094 G-s	3570.0 RPM
72	.116 In/Sec	.086 G-s	
73	.132 In/Sec	.563 G-s	
81	.182 In/Sec	.067 G-s	
82	.135 In/Sec	.028 G-s	
83	.200 In/Sec	.211 G-s	
71F	.280 In/Sec	.176 G-s	
72F	.200 In/Sec	.081 G-s	
73F	.141 In/Sec	.600 G-s	
81F	.312 In/Sec	.059 G-s	
82F	.255 In/Sec	.0077 G-s	
83F	.138 In/Sec	.786 G-s	

P67-54 - HOT OIL CIRC PMP CENT 15HP (27-Dec-21)

OVERALL LEVEL 1-20 KHZ

11	.166 In/Sec	.408 G-s	1750.0 RPM
12	.037 In/Sec	.287 G-s	
21	.145 In/Sec	.180 G-s	
22	.037 In/Sec	.207 G-s	
23	.084 In/Sec	.114 G-s	
71	.058 In/Sec	.319 G-s	
72	.043 In/Sec	.376 G-s	
73	.060 In/Sec	.325 G-s	
81	.050 In/Sec	.380 G-s	
82	.041 In/Sec	.159 G-s	

P67-504 - HOT OIL CIRC PMP CENT 50HP (27-Dec-21)

OVERALL LEVEL 1-20 KHZ

11	.424 In/Sec	.089 G-s	1750.0 RPM
12	.083 In/Sec	.330 G-s	
21	.518 In/Sec	.251 G-s	
22	.257 In/Sec	.259 G-s	
23	.174 In/Sec	.171 G-s	
71	.276 In/Sec	.382 G-s	
72	.390 In/Sec	.455 G-s	
73	.156 In/Sec	.194 G-s	
81	.155 In/Sec	.259 G-s	
82	.360 In/Sec	.271 G-s	

R80-30 - AGITATOR GBX 15HP CHEMINEER (27-Dec-21)

OVERALL LEVEL

11	.123 In/Sec		1760.0 RPM
12	.193 In/Sec		
21	.082 In/Sec		
22	.105 In/Sec		
23	.111 In/Sec		
31	.057 In/Sec		
32	.024 In/Sec		
33	.072 In/Sec		
41	.048 In/Sec		
42	.022 In/Sec		
51	.044 In/Sec		
61	.039 In/Sec		
63	.027 In/Sec		

71	.018 In/Sec		
B82-101A - FAN FORCED DRAFT 10HP SOUTH (27-Dec-21)			
	OVERALL LEVEL	1-20 KHZ	
11	.146 In/Sec	.165 G-s	1800.0 RPM
12	.163 In/Sec	.211 G-s	
* 13	.264 In/Sec	.091 G-s	
21	.198 In/Sec	.159 G-s	
22	.299 In/Sec	.214 G-s	
23	.142 In/Sec	.262 G-s	
B82-102 - INDUCED DRAFT 150 HP (27-Dec-21)			
	OVERALL LEVEL	1-20 KHZ	
11	.031 In/Sec	.099 G-s	1800.0 RPM
12	.035 In/Sec	.109 G-s	
21	.041 In/Sec	.398 G-s	
22	.056 In/Sec	.492 G-s	
23	.047 In/Sec	.173 G-s	
31	.056 In/Sec	.207 G-s	
32	.044 In/Sec	.110 G-s	
41	.031 In/Sec	.139 G-s	
42	.043 In/Sec	.080 G-s	
CHLR45-1 - 20T TRANE CHILLER (02-Dec-21)			
	OVERALL LEVEL		
11W	.204 In/Sec		3570.0 RPM
12W	.234 In/Sec		
13W	.176 In/Sec		
11E	1.258 In/Sec		
12E	.633 In/Sec		
13E	.185 In/Sec		

Clarification Of Vibration Units:

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

* - Indicates Data Has Date/Time Different From Machine Date/Time