

March 12, 2021

Penn A Kem

Subject: March vibration service report

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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.

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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## Detailed Defects

### **B82-101A South (West) FD Fan 10 HP Outside**

The motor axial has seen a large increase in a sub-synchronous non-fractional harmonic vibration; which is either a resonant vibration or possibly a cracked shaft or loose fan hub, or another anomaly.

**Rated a Class II Defect.**

## Observations

### **C42-4 Twin Screw Axial Compressor**

Vibration data for the compressor female shaft input bearing shows synchronous and non-synchronous peaks. We suspect bearing defect frequencies are present. Overall acceleration is over 4 g's RMS. No immediate action is required; however, we are making this a **Class II Defect for now.**

### **C67-51 Twin Screw Axial Compressor**

Vibration data for the inboard motor bearing shows synchronous and non-synchronous peaks. We suspect bearing defect frequencies are present. Overall acceleration is over 4.5 g's RMS. No immediate action is required; however, we are making this a **Class II Defect for now.**

### **Big Blue Water Pump**

The pump data still indicates possible slight 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 data for the inboard bearing shows what we believe to be bearing fundamental outer race defect frequency and harmonics.

**Rated a Class II Defect.**

### **P24-63 Degree Pump North**

The pump axial vibrations still have a slight mound of noise in the spectrum that could be either bearing natural frequencies or some cavitation. We will watch closely going forward. No action required. **Rated a Class I Defect.**

### **P24-85 Degree Pump North**

The pump axial is still elevated. Check the alignment and coupling as time allows. Could be a cocked bearing also. **Rated a Class I Defect.**

### **R48-2 Reactor Agitator Motor and Gearbox**

The apparent bent agitator shaft is still causing distress in the drive components. Motor top bearing vibration is at 0.51"/sec velocity peak. **Rated a Class II Defect.**

### R53-301 Reactor Agitator Motor and Gearbox

The motor outboard horizontal has dropped to .63"/sec velocity peak. We still recommend inspecting the motor and coupling, and check the shaft alignment, fasteners and frame as time allows. The agitator shaft could be bent.

**Rated a Class II Defect.**

### R55 106 Reactor Agitator

The unit vibrations at the motor have dropped to 0.35"/second velocity peak overall. The dominant vibration looks to be near or at shaft speed. Inspect the unit including the unit fasteners, structure, motor cooling fan, coupling, and alignment as time allows. **Rated a Class I Defect.**

### CHLR45-1 20 Ton Trane Chiller

The East compressor was running and vibrating near 1.0"/sec velocity peak at 60 Hz shaft speed. Vibrations at these levels in either unit will likely cause a reduced lifespan. Have the unit checked for compliance with the manufacture's specification. **Rated a Class I Defect**

#### Abbreviated Last Measurement Summary \*\*\*\*\*

Database: penn.rbm  
Station: PENNAKEM NEW CURRENT DATABASE  
Route No. 4: HYDRO  
Report Date: 12-Mar-21 15:09

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD	MACHINE SPEED
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C42-4	- AXIAL TWIN SCREW COMPRESSOR	(08-Mar-21)	
	OVERALL LEVEL	1-20 KHZ	
11	.095 In/Sec	.724 G-s	1750.0 RPM
12	.080 In/Sec	.100 G-s	
13	.104 In/Sec	.430 G-s	
21	.093 In/Sec	.616 G-s	
22	.079 In/Sec	.704 G-s	
23	.084 In/Sec	.243 G-s	
71	.112 In/Sec	4.211 G-s	3570.0 RPM
72	.067 In/Sec	2.465 G-s	
73	.121 In/Sec	4.113 G-s	
71F	.163 In/Sec	2.815 G-s	
72F	.093 In/Sec	3.333 G-s	
73F	.149 In/Sec	4.283 G-s	
81	.122 In/Sec	1.262 G-s	
82	.072 In/Sec	1.335 G-s	
83	.118 In/Sec	1.371 G-s	
81F	.201 In/Sec	.804 G-s	
82F	.070 In/Sec	1.434 G-s	
83F	.115 In/Sec	1.339 G-s	
P42-4A	- CENTRIFUGAL HOT OIL PUMP 5HP	(08-Mar-21)	

		OVERALL LEVEL	1-20 KHZ	
11		.013 In/Sec	.074 G-s	1760.0 RPM
21		.012 In/Sec	.070 G-s	
23		.050 In/Sec	.057 G-s	
71		.064 In/Sec	.595 G-s	
73		.014 In/Sec	.240 G-s	
81		.012 In/Sec	.373 G-s	
P42-4B	- CENTRIFUGAL HOT OIL PUMP 5HP	(08-Mar-21)		
		OVERALL LEVEL	1-20 KHZ	
11		.053 In/Sec	.069 G-s	1760.0 RPM
21		.023 In/Sec	.130 G-s	
23		.053 In/Sec	.049 G-s	
71		.038 In/Sec	.105 G-s	
73		.015 In/Sec	.084 G-s	
81		.017 In/Sec	.077 G-s	
P42-4D	- CENTRIFUGAL HOT OIL PUMP 5HP	(08-Mar-21)		
		OVERALL LEVEL	1-20 KHZ	
11		.011 In/Sec	.073 G-s	1760.0 RPM
21		.024 In/Sec	.095 G-s	
23		.035 In/Sec	.067 G-s	
71		.016 In/Sec	.148 G-s	
81		.014 In/Sec	.083 G-s	
CHLR67-1N	- 240T TRANE CHILLER NORTH	(08-Mar-21)		
		OVERALL LEVEL		
11		.143 In/Sec		3570.0 RPM
12		.120 In/Sec		
13		.077 In/Sec		
21		.114 In/Sec		
22		.120 In/Sec		
71		.086 In/Sec		
72		.098 In/Sec		
81		.120 In/Sec		
82		.140 In/Sec		
CHLR67-1W	- 240T TRANE CHILLER WEST	(08-Mar-21)		
		OVERALL LEVEL		
11		.145 In/Sec		3570.0 RPM
12		.154 In/Sec		
13		.167 In/Sec		
21		.116 In/Sec		
22		.141 In/Sec		
71		.080 In/Sec		
72		.089 In/Sec		
81		.094 In/Sec		
82		.169 In/Sec		
CHLR67-1E	- 240T TRANE CHILLER EAST	(08-Mar-21)		
		OVERALL LEVEL		
11		.096 In/Sec		3570.0 RPM
12		.104 In/Sec		
13		.072 In/Sec		
21		.080 In/Sec		
22		.099 In/Sec		
71		.077 In/Sec		

72	.066 In/Sec
81	.065 In/Sec
82	.070 In/Sec

C67-51	- AXIAL TWIN SCREW COMPRESSOR	(08-Mar-21)	
	OVERALL LEVEL	1-20 KHZ	
11	.179 In/Sec	2.358 G-s	1750.0 RPM
12	.124 In/Sec	4.932 G-s	
21	.139 In/Sec	1.249 G-s	
22	.123 In/Sec	4.651 G-s	
23	.132 In/Sec	3.230 G-s	
71	.207 In/Sec	.623 G-s	3570.0 RPM
72	.116 In/Sec	.387 G-s	
73	.138 In/Sec	.789 G-s	
71F	.319 In/Sec	.110 G-s	
72F	.138 In/Sec	.189 G-s	
73F	.110 In/Sec	.597 G-s	
81	.268 In/Sec	.037 G-s	
82	.267 In/Sec	.040 G-s	
83	.114 In/Sec	.933 G-s	
81F	.380 In/Sec	.160 G-s	
82F	.228 In/Sec	.128 G-s	
83F	.139 In/Sec	.546 G-s	

P67-504	- HOT OIL CIRC PMP CENT 50HP	(08-Mar-21)	
	OVERALL LEVEL	1-20 KHZ	
11	.041 In/Sec	.241 G-s	1750.0 RPM
12	.035 In/Sec	.232 G-s	
13	.071 In/Sec	.056 G-s	
21	.058 In/Sec	.255 G-s	
22	.075 In/Sec	.463 G-s	
23	.077 In/Sec	.081 G-s	
71	.144 In/Sec	.131 G-s	
72	.073 In/Sec	.190 G-s	
73	.112 In/Sec	.172 G-s	
81	.081 In/Sec	.263 G-s	
82	.063 In/Sec	.198 G-s	

B82-101A	- FAN FORCED DRAFT 10HP SOUTH	(08-Mar-21)	
	OVERALL LEVEL	1-20 KHZ	
11	.145 In/Sec	.123 G-s	1800.0 RPM
12	.153 In/Sec	.149 G-s	
21	.215 In/Sec	.167 G-s	
22	.357 In/Sec	.148 G-s	
23	.561 In/Sec	.104 G-s	

B82-102	- INDUCED DRAFT 150 HP	(08-Mar-21)	
	OVERALL LEVEL	1-20 KHZ	
11	.041 In/Sec	.222 G-s	1800.0 RPM
12	.031 In/Sec	.093 G-s	
21	.035 In/Sec	.239 G-s	
22	.047 In/Sec	.401 G-s	
23	.039 In/Sec	.188 G-s	
31	.031 In/Sec	.305 G-s	
32	.026 In/Sec	.604 G-s	
41	.024 In/Sec	.201 G-s	
42	.022 In/Sec	.384 G-s	

C53-301A	- C-301A RECIP COMPRESSOR	(08-Mar-21)	
	OVERALL LEVEL	1-20 KHZ	
11	.098 In/Sec	1.580 G-s	1800.0 RPM
12	.095 In/Sec	1.029 G-s	
13	.134 In/Sec	.130 G-s	
21	.101 In/Sec	.449 G-s	
22	.122 In/Sec	1.104 G-s	
23	.184 In/Sec	.355 G-s	
71	.089 In/Sec	.073 G-s	325.0 RPM
72	.074 In/Sec	.089 G-s	
73	.182 In/Sec	.020 G-s	
81	.091 In/Sec	.159 G-s	
82	.077 In/Sec	.114 G-s	
P48-7B	- ROTOJET HIGH PRESS PUMP 15HP	(08-Mar-21)	
	OVERALL LEVEL	1-20 KHZ	
11	.088 In/Sec	.560 G-s	1750.0 RPM
12	.116 In/Sec	.415 G-s	
21	.090 In/Sec	.684 G-s	
22	.143 In/Sec	.629 G-s	
23	.111 In/Sec	.242 G-s	
71	.180 In/Sec	1.008 G-s	
72	.136 In/Sec	1.548 G-s	
73	.071 In/Sec	1.369 G-s	
81	.213 In/Sec	.572 G-s	
82	.111 In/Sec	1.230 G-s	
83	.069 In/Sec	.682 G-s	
R48-2	- AGITATOR GEARBOX FAULK 15HP	(08-Mar-21)	
	OVERALL LEVEL		
11	.477 In/Sec		1760.0 RPM
12	.513 In/Sec		
21	.330 In/Sec		
22	.380 In/Sec		
23	.176 In/Sec		
31	.285 In/Sec		1775.0 RPM
32	.281 In/Sec		1760.0 RPM
41	.263 In/Sec		100.0 RPM
42	.306 In/Sec		
51	.156 In/Sec		
R53-301	- AGITATOR GBX CHEMINEER 15HP	(08-Mar-21)	
	OVERALL LEVEL		
11	.671 In/Sec		1760.0 RPM
12	.279 In/Sec		
21	.630 In/Sec		
22	.276 In/Sec		
23	.321 In/Sec		
31	.369 In/Sec		
32	.126 In/Sec		
33	.340 In/Sec		
41	.262 In/Sec		
42	.068 In/Sec		
51	.274 In/Sec		
61	.184 In/Sec		
63	.080 In/Sec		

71 .050 In/Sec

P53-301 - ANSI CENTRIFUGAL PUMP 50 HP (08-Mar-21)

OVERALL LEVEL 1-20 KHZ

11	.142 In/Sec	.073 G-s	1750.0 RPM
12	.085 In/Sec	.125 G-s	
13	.117 In/Sec	.162 G-s	
21	.115 In/Sec	.569 G-s	
22	.097 In/Sec	.401 G-s	
23	.095 In/Sec	.391 G-s	
71	.086 In/Sec	.436 G-s	
72	.096 In/Sec	.432 G-s	
73	.123 In/Sec	.512 G-s	
81	.053 In/Sec	.377 G-s	
82	.064 In/Sec	.355 G-s	
83	.063 In/Sec	.350 G-s	

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Clarification Of Vibration Units:

Acc --> G-s PK

Vel --> In/Sec PK

Abbreviated Last Measurement

Summary

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Database: penn.rbm

Station: PENNAKEM NEW CURRENT DATABASE

Route No. 6: BOILER

Report Date: 12-Mar-21 15:09

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD	MACHINE SPEED
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B4C101-877 - ZURN BOILER BLOWER (08-Mar-21)

OVERALL LEVEL 1-20 KHZ

11	.171 In/Sec	.386 G-s	1180.0 RPM
12	.132 In/Sec	.248 G-s	
13	.143 In/Sec	.154 G-s	
21	.163 In/Sec	.708 G-s	
22	.136 In/Sec	.518 G-s	
23	.108 In/Sec	.502 G-s	
71	.164 In/Sec	.732 G-s	
72	.119 In/Sec	.722 G-s	
73	.160 In/Sec	.619 G-s	
81	.147 In/Sec	.725 G-s	
82	.112 In/Sec	.297 G-s	

P4C-102A - BOILER FEEDWATER PUMP (08-Mar-21)

OVERALL LEVEL 1-20 KHZ

11	.050 In/Sec	.264 G-s	3570.0 RPM
12	.035 In/Sec	.999 G-s	
21	.056 In/Sec	.534 G-s	
22	.044 In/Sec	.464 G-s	
23	.049 In/Sec	.686 G-s	
71	.079 In/Sec	.591 G-s	
72	.022 In/Sec	.819 G-s	
73	.056 In/Sec	.372 G-s	
81	.057 In/Sec	.596 G-s	

82	.026 In/Sec	.685 G-s	
83	.031 In/Sec	.467 G-s	
P24-63DEGN - 63 DEG N WATER PUMP		(08-Mar-21)	
	OVERALL LEVEL	1-20 KHZ	
11	.073 In/Sec	.316 G-s	1750.0 RPM
12	.054 In/Sec	.237 G-s	
21	.071 In/Sec	.675 G-s	
22	.065 In/Sec	.489 G-s	
23	.044 In/Sec	1.074 G-s	
71	.094 In/Sec	.842 G-s	
72	.045 In/Sec	1.190 G-s	
73	.153 In/Sec	2.804 G-s	
81	.076 In/Sec	.929 G-s	
82	.037 In/Sec	1.071 G-s	
83	.114 In/Sec	1.875 G-s	
P24-63DEGS - 63 DEG S WATER PUMP		(08-Mar-21)	
	OVERALL LEVEL	1-20 KHZ	
11	.150 In/Sec	.686 G-s	1750.0 RPM
12	.098 In/Sec	.428 G-s	
21	.134 In/Sec	.823 G-s	
22	.054 In/Sec	.909 G-s	
23	.208 In/Sec	.416 G-s	
71	.139 In/Sec	.321 G-s	
72	.089 In/Sec	.639 G-s	
73	.073 In/Sec	1.278 G-s	
81	.060 In/Sec	.538 G-s	
82	.066 In/Sec	.649 G-s	
83	.114 In/Sec	1.340 G-s	
P24-85DEGN - 85 DEG N WATER CIRC PUMP 125		(08-Mar-21)	
	OVERALL LEVEL	1-20 KHZ	
11	.085 In/Sec	.586 G-s	1750.0 RPM
12	.056 In/Sec	1.191 G-s	
21	.083 In/Sec	1.014 G-s	
22	.287 In/Sec	.994 G-s	
23	.321 In/Sec	1.420 G-s	
71	.129 In/Sec	.840 G-s	
72	.327 In/Sec	1.178 G-s	
73	.336 In/Sec	1.056 G-s	
81	.104 In/Sec	.792 G-s	
82	.124 In/Sec	1.132 G-s	
83	.321 In/Sec	1.445 G-s	
P24BGBL876 - BIG BLUE WATER PUMP-63 DEG		(08-Mar-21)	
	OVERALL LEVEL	1-20 KHZ	
11	.229 In/Sec	1.139 G-s	1180.0 RPM
12	.047 In/Sec	1.847 G-s	
21	.248 In/Sec	2.282 G-s	
22	.066 In/Sec	2.427 G-s	
23	.105 In/Sec	.623 G-s	
71	.393 In/Sec	.448 G-s	
72	.175 In/Sec	.551 G-s	
73	.214 In/Sec	.292 G-s	
81	.287 In/Sec	.766 G-s	
82	.179 In/Sec	.884 G-s	



83	.111 In/Sec	.988 G-s	
P24-102B	- JOCKEY FIRE FLANGE PUMP HZ	(08-Mar-21)	
	OVERALL LEVEL	1-20 KHZ	
11	.082 In/Sec	.576 G-s	1785.0 RPM
12	.107 In/Sec	.662 G-s	
21	.055 In/Sec	.133 G-s	
22	.066 In/Sec	.204 G-s	
23	.057 In/Sec	.150 G-s	

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Clarification Of Vibration Units:

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

Abbreviated Last Measurement Summary

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Database: penn.rbm  
Station: PENNAKEM NEW CURRENT DATABASE  
Route No. 7: B55-FINE CHME  
Report Date: 12-Mar-21 15:09

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD	MACHINE SPEED
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R55-106	- REACTOR AGIT R-106	(08-Mar-21)	
	OVERALL LEVEL	1-20 KHZ	
11	.351 In/Sec	.370 G-s	1760.0 RPM
12	.229 In/Sec	.311 G-s	
21	.298 In/Sec	.233 G-s	
22	.198 In/Sec	.195 G-s	
23	.151 In/Sec	.281 G-s	
31	.172 In/Sec		
32	.060 In/Sec		
33	.165 In/Sec		
41	.189 In/Sec		
42	.069 In/Sec		
51	.156 In/Sec		
51L	.171 In/Sec		56.00 RPM
61	.114 In/Sec		1760.0 RPM
63	.081 In/Sec		
71	.039 In/Sec		
P36-905C	- N COOL TWR-EAST PUMP	(08-Mar-21)	
	OVERALL LEVEL	1-20 KHZ	
11	.039 In/Sec	.123 G-s	1780.0 RPM
12	.035 In/Sec	.075 G-s	
21	.043 In/Sec	.279 G-s	
22	.028 In/Sec	.107 G-s	
23	.026 In/Sec	.041 G-s	
71	.206 In/Sec	1.950 G-s	
72	.130 In/Sec	2.442 G-s	
73	.251 In/Sec	.368 G-s	
81	.192 In/Sec	1.227 G-s	
82	.113 In/Sec	1.154 G-s	
83	.162 In/Sec	1.676 G-s	

P36-905A	- N COOL TWR-NORTH PUMP	(08-Mar-21)	
	OVERALL LEVEL	1-20 KHZ	
11	.073 In/Sec	.203 G-s	1780.0 RPM
12	.053 In/Sec	.068 G-s	
21	.065 In/Sec	1.248 G-s	
22	.062 In/Sec	.301 G-s	
23	.066 In/Sec	.033 G-s	
71	.099 In/Sec	1.072 G-s	
72	.094 In/Sec	1.652 G-s	
73	.169 In/Sec	.401 G-s	
81	.112 In/Sec	1.176 G-s	
82	.118 In/Sec	1.567 G-s	
83	.145 In/Sec	2.543 G-s	

C36-WEST	- UTILITY AIRCOMP ROTARY 150HP	(08-Mar-21)	
	OVERALL LEVEL	1-20 KHZ	
11	.064 In/Sec	1.076 G-s	1750.0 RPM
12	.060 In/Sec	2.190 G-s	
21	.051 In/Sec	1.332 G-s	
22	.083 In/Sec	2.156 G-s	
23	.126 In/Sec	1.036 G-s	
71	.078 In/Sec	.766 G-s	3570.0 RPM
72	.133 In/Sec	1.468 G-s	
73	.195 In/Sec	.930 G-s	
81	.092 In/Sec	1.078 G-s	
82	.084 In/Sec	1.579 G-s	
71F	.073 In/Sec	1.965 G-s	
72F	.090 In/Sec	2.183 G-s	
81F	.096 In/Sec	1.388 G-s	
82F	.125 In/Sec	1.674 G-s	

R80-10	- AGITATOR GBX	(08-Mar-21)	
	OVERALL LEVEL		
11	.133 In/Sec		1760.0 RPM
12	.203 In/Sec		
13	.082 In/Sec		
21	.102 In/Sec		
22	.121 In/Sec		
23	.083 In/Sec		
31	.100 In/Sec		
32	.093 In/Sec		
33	.085 In/Sec		
41	.090 In/Sec		
42	.097 In/Sec		
43	.059 In/Sec		
51	.079 In/Sec		
52	.107 In/Sec		
61	.066 In/Sec		
62	.088 In/Sec		

R80-30	- AGITATOR GBX 15HP CHEMINEER	(08-Mar-21)	
	OVERALL LEVEL		
11	.122 In/Sec		1760.0 RPM
12	.302 In/Sec		
21	.111 In/Sec		
22	.156 In/Sec		
23	.197 In/Sec		

31	.058 In/Sec
32	.021 In/Sec
33	.092 In/Sec
41	.044 In/Sec
42	.030 In/Sec
51	.053 In/Sec
61	.033 In/Sec
63	.024 In/Sec
71	.017 In/Sec

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Clarification Of Vibration Units:

Acc --> G-s PK

Vel --> In/Sec PK

Abbreviated Last Measurement

Summary

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Database: penn.rbm

Station: PENNAKEM NEW CURRENT DATABASE

Route No. 8: PILOT-GUARD

Report Date: 12-Mar-21 15:09

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD	MACHINE SPEED
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CHLR45-1 - 20T TRANE CHILLER		(08-Mar-21)	
	OVERALL LEVEL		
11E	1.071 In/Sec		3570.0 RPM
12E	.725 In/Sec		
13E	.193 In/Sec		

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Clarification Of Vibration Units:

Vel --> In/Sec PK