



MILLINGTON, TN

March 2, 2020

Penn A Kem

Subject: February vibration service

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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**  
[dshook@gohispeed.com](mailto:dshook@gohispeed.com)

## Detailed Defects

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

The data shows a dramatic drop in vibrations for the motor this survey. The pump shows a reduction also in what looks like cavitation. Overall vibrations are less than 0.200"/sec velocity peak. We will keep a close eye on the unit for changes.NR

### **P24-85DEGS: 85 Degree South Circulating Water Pump**

Vibrations associated with vane pass and harmonics have increased in the pump axial. We suspect wear in the pump impeller, housing and wear rings. Operating out of BOP could also be an issue. Check parameters and inspect unit as time allows. **Rated a Class III Defect.**

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

Marked vibration peaks look to be modulated by side bands of cage frequency. This units' bearings are most likely in extreme distress. Shut down and inspect as soon as possible to avoid secondary damage. **Rated a Class IV Defect.**

## Observations

### **CHLR45-1 20 Ton Trane Chiller**

The top measurements are shown in the waterfall data, the West compressor is vibrating near 1.2"/sec velocity peak at 60 Hz shaft speed. Vibrations at these levels in the West unit will likely cause a reduced lifespan. Have the unit checked for compliance with the manufacture's specification. **Rated a Class II Defect for now.**

### **Big Blue Water Pump P24-BigBlue**

The data still indicates possible looseness in the bearing fits as well as wear in the pump. No immediate actions are required at this time. **Rated a Class I Defect.**

### **R55-102 Reactor Agitator**

The unit motor, gearbox or input coupling could still be in distress. Highest velocities are in the coupling end of the motor. Impacting can be seen in the time domain. The gearbox seemed to be generating audible noises too; which also concerns us. Recommend an inspection of the motor, drivetrain and gearbox. Have the oil analyzed for wear particulate. Check the Shaft alignment. **Rated a Class II Defect.**

**P24-85DEGN: 85 Degree North Circulating Water Pump**

The pump vibration data still consists of a shaft speed vibration, harmonics, noise in the spectrums and impacting in time waveforms; (looseness). We suspect the pump bearings and fits could be worn; however, cavitation can sometimes look similar in the data. Inspect the pump and process parameters for issues as time allows. We will watch carefully for changes. **Rated a Class I Defect.**

**P48-7B Rotojet Pump (NOT 7A)**

This pump still has a single high vibration at near 79 Hz. We suspect a resonance in the unit. Inspect the belts and sheaves for wear and alignment. Check the unit for soft foot and loose or missing fasteners. Check the piping for strain. Install flexible isolators near pump if not already equipped. **Rated a Class II Defect.**

**R48-2 Reactor Agitator**

The unit motor, gearbox or input coupling could still be in distress. Highest velocities are in the coupling end of the motor. Impacting can be seen in the time domain. The gearbox seemed to be generating audible noises too; which also concerns us. The mixer shaft seems to be eccentric and should be checked for straightness. Recommend an inspection of the motor, drivetrain and gearbox also. Have the oil analyzed for wear particulate. Check the Shaft alignment. **Rated a Class II Defect.**

**R53-301 Reactor Agitator**

Vibrations have dropped considerably, but we might be able to drop them further. Inspect the motor and coupling and check the shaft alignment as time allows. **Rated a Class I Defect.**

**Reported on last or recent surveys, but not running this survey.****R55-101 Reactor Agitator**

The unit gearbox or input coupling could still be in distress. We recommend an inspection of the drivetrain and oil analysis of the gearbox oil to confirm. Check the Shaft alignment. Impacting can be seen in the time domain. The gearbox seemed to be generating audible noises too; which also concerns us. Inspect as soon as practical. **Rated a Class II Defect.**

**Reactor Agitator Motor Gearbox R55-106**

The vibration data indicates a possible alignment or coupling issue. Inspect the coupling and check the alignment at the next opportunity. **Rated a Class II Defect.**

## Overall vibrations

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

Database: penn.rbm  
Station: NEW EQUIPMENT  
Report Date: 02-Mar-20 12:00

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD	MACHINE SPEED
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B4C101-877 - ZURN BOILER BLOWER		(26-Feb-20)	
	OVERALL LEVEL		
11	.169 In/Sec		1180.0 RPM
12	.097 In/Sec		
21	.182 In/Sec		
22	.134 In/Sec		
23	.109 In/Sec		
71	.153 In/Sec		
72	.110 In/Sec		
73	.148 In/Sec		
81	.148 In/Sec		
82	.117 In/Sec		
P4C-102A - BOILER FEEDWATER PUMP		(26-Feb-20)	
	OVERALL LEVEL		
11	.052 In/Sec		3570.0 RPM
12	.051 In/Sec		
21	.051 In/Sec		
22	.035 In/Sec		
23	.037 In/Sec		
71	.046 In/Sec		
72	.051 In/Sec		
73	.067 In/Sec		
81	.125 In/Sec		
82	.070 In/Sec		
P24-102B - JOCKEY FIRE PUMP VERTICAL		(26-Feb-20)	
	OVERALL LEVEL		
11	.094 In/Sec		1785.0 RPM
12	.082 In/Sec		
21	.067 In/Sec		
22	.071 In/Sec		
23	.071 In/Sec		
P24-63DEGN - 63 DEG N WATER PUMP		(26-Feb-20)	
	OVERALL LEVEL		
11	.061 In/Sec		1750.0 RPM
12	.080 In/Sec		
21	.079 In/Sec		
22	.053 In/Sec		
23	.056 In/Sec		
71	.079 In/Sec		
72	.046 In/Sec		

73	.182 In/Sec
81	.069 In/Sec
82	.041 In/Sec
83	.172 In/Sec

P24-63DEGS - 63 DEG S WATER PUMP (26-Feb-20)

	OVERALL LEVEL	
11	.137 In/Sec	1750.0 RPM
12	.081 In/Sec	
21	.114 In/Sec	
22	.047 In/Sec	
23	.148 In/Sec	
71	.092 In/Sec	
72	.101 In/Sec	
73	.088 In/Sec	
81	.066 In/Sec	
82	.042 In/Sec	
83	.156 In/Sec	

P24-85DEGN - 85 DEG N WATER CIRC PUMP 125 (26-Feb-20)

	OVERALL LEVEL	
11	.092 In/Sec	1750.0 RPM
12	.045 In/Sec	
21	.071 In/Sec	
22	.056 In/Sec	
23	.054 In/Sec	
71	.218 In/Sec	
72	.186 In/Sec	
73	.239 In/Sec	
81	.362 In/Sec	
82	.099 In/Sec	
83	.146 In/Sec	

P24-85DEGS - 85 DEG S WATER CIRC PUMP 125 (26-Feb-20)

	OVERALL LEVEL	
11	.081 In/Sec	1750.0 RPM
12	.244 In/Sec	
21	.075 In/Sec	
22	.077 In/Sec	
23	.079 In/Sec	
71	.266 In/Sec	
72	.388 In/Sec	
73	.920 In/Sec	
81	.283 In/Sec	
82	.362 In/Sec	
83	.669 In/Sec	

P24BGBL876 - BIG BLUE WATER PUMP-63 DEG (26-Feb-20)

	OVERALL LEVEL	
11	.184 In/Sec	1180.0 RPM
11H	.088 In/Sec	
12	.045 In/Sec	
21	.222 In/Sec	
22	.081 In/Sec	
23	.087 In/Sec	
71	.292 In/Sec	
72	.145 In/Sec	

73	.230 In/Sec
81	.255 In/Sec
82	.199 In/Sec
83	.204 In/Sec

P36-905A - N COOL TWR-NORTH PUMP (26-Feb-20)

OVERALL LEVEL		
11	.088 In/Sec	1780.0 RPM
12	.037 In/Sec	
21	.073 In/Sec	
22	.091 In/Sec	
23	.091 In/Sec	
71	.095 In/Sec	
72	.083 In/Sec	
73	.166 In/Sec	
81	.125 In/Sec	
82	.095 In/Sec	
83	.180 In/Sec	

C36-EAST - UTILITY AIRCOMP ROTARY 200HP (26-Feb-20)

OVERALL LEVEL		
11	.044 In/Sec	1750.0 RPM
12	.045 In/Sec	
21	.145 In/Sec	
22	.096 In/Sec	
23	.092 In/Sec	
71	.118 In/Sec	3570.0 RPM
72	.088 In/Sec	
73	.115 In/Sec	
81	.118 In/Sec	
82	.096 In/Sec	
71F	.155 In/Sec	
72F	.099 In/Sec	
73F	.138 In/Sec	
81F	.091 In/Sec	
82F	.201 In/Sec	
83F	.090 In/Sec	

C36-SOUTH - UTILITY AIRCOMP ROTARY 150HP (26-Feb-20)

OVERALL LEVEL		
11	.127 In/Sec	1750.0 RPM
12	.093 In/Sec	
13	.130 In/Sec	
21	.102 In/Sec	
22	.062 In/Sec	
23	.152 In/Sec	
71	.202 In/Sec	3570.0 RPM
72	.158 In/Sec	
73	.215 In/Sec	
81	.175 In/Sec	
82	.156 In/Sec	
83	.238 In/Sec	
71F	.201 In/Sec	
72F	.136 In/Sec	
73F	.241 In/Sec	
81F	.210 In/Sec	
82F	.158 In/Sec	

83F	.185 In/Sec	
C36-WEST - UTILITY AIRCOMP ROTARY 150HP (26-Feb-20)		
	OVERALL LEVEL	
11	.056 In/Sec	1750.0 RPM
12	.055 In/Sec	
13	.102 In/Sec	
21	.055 In/Sec	
22	.073 In/Sec	
23	.077 In/Sec	
71	.079 In/Sec	3570.0 RPM
72	.101 In/Sec	
73	.154 In/Sec	
81	.099 In/Sec	
82	.119 In/Sec	
83	.134 In/Sec	
71F	.089 In/Sec	
72F	.104 In/Sec	
73F	.104 In/Sec	
81F	.096 In/Sec	
82F	.102 In/Sec	
83F	.131 In/Sec	
P39-4-877 - WELL PUMP #4 (26-Feb-20)		
	OVERALL LEVEL	
11	.301 In/Sec	1780.0 RPM
12	.204 In/Sec	
13	.046 In/Sec	
21	.142 In/Sec	
22	.103 In/Sec	
23	.083 In/Sec	
C42-4 - AXIAL TWIN SCREW COMPRESSOR (26-Feb-20)		
	OVERALL LEVEL	
11	.100 In/Sec	1750.0 RPM
12	.067 In/Sec	
13	.154 In/Sec	
21	.092 In/Sec	
22	.084 In/Sec	
23	.138 In/Sec	
71	.101 In/Sec	3570.0 RPM
72	.098 In/Sec	
73	.133 In/Sec	
81	.139 In/Sec	
82	.123 In/Sec	
83	.136 In/Sec	
71F	.177 In/Sec	
72F	.088 In/Sec	
73F	.189 In/Sec	
81F	.284 In/Sec	
82F	.114 In/Sec	
83F	.196 In/Sec	
P42-4A - CENTRIFUGAL HOT OIL PUMP 5HP (26-Feb-20)		
	OVERALL LEVEL	
11	.038 In/Sec	1760.0 RPM
12	.028 In/Sec	

13	.018 In/Sec
21	.011 In/Sec
22	.035 In/Sec
23	.015 In/Sec
71	.072 In/Sec
72	.031 In/Sec
73	.010 In/Sec
81	.023 In/Sec
82	.010 In/Sec

P42-4B - CENTRIFUGAL HOT OIL PUMP 5HP (26-Feb-20)

OVERALL LEVEL

11	.023 In/Sec	1760.0 RPM
12	.020 In/Sec	
21	.014 In/Sec	
22	.022 In/Sec	
23	.048 In/Sec	
71	.029 In/Sec	
72	.0095 In/Sec	
73	.013 In/Sec	
81	.013 In/Sec	
82	.0092 In/Sec	

P42-4C - CENTRIFUGAL HOT OIL PMP 15HP (26-Feb-20)

OVERALL LEVEL

11	.083 In/Sec	1760.0 RPM
12	.076 In/Sec	
21	.071 In/Sec	
22	.038 In/Sec	
23	.052 In/Sec	
71	.108 In/Sec	
72	.098 In/Sec	
73	.061 In/Sec	
81	.052 In/Sec	
82	.034 In/Sec	

P42-4D - CENTRIFUGAL HOT OIL PUMP 5HP (26-Feb-20)

OVERALL LEVEL

11	.034 In/Sec	1760.0 RPM
12	.0093 In/Sec	
21	.011 In/Sec	
22	.013 In/Sec	
23	.028 In/Sec	
71	.014 In/Sec	
72	.011 In/Sec	
73	.042 In/Sec	
81	.013 In/Sec	
82	.0087 In/Sec	

P48-7B - ROTOJET HIGH PRESS PUMP 15HP (26-Feb-20)

OVERALL LEVEL

11	.167 In/Sec	1750.0 RPM
12	.275 In/Sec	
21	.139 In/Sec	
22	.297 In/Sec	
23	.185 In/Sec	
71	.519 In/Sec	



72	.197 In/Sec
73	.197 In/Sec
81	.507 In/Sec
82	.284 In/Sec

R48-2 - AGITATOR GEARBOX FAULK 15HP (26-Feb-20)

OVERALL LEVEL

11	.451 In/Sec	1760.0 RPM
12	.334 In/Sec	
21	.305 In/Sec	
22	.247 In/Sec	
23	.072 In/Sec	
31	.243 In/Sec	
32	.217 In/Sec	
33	.098 In/Sec	
71	.200 In/Sec	
72	.209 In/Sec	
73	.088 In/Sec	

C53-301A - C-301A RECIP COMPRESSOR (26-Feb-20)

OVERALL LEVEL

11	.080 In/Sec	1800.0 RPM
12	.074 In/Sec	
21	.089 In/Sec	
22	.142 In/Sec	
23	.167 In/Sec	
71	.085 In/Sec	325.0 RPM
72	.069 In/Sec	
73	.186 In/Sec	
81	.087 In/Sec	
82	.080 In/Sec	

P53-301 - ANSI CENTRIFUGAL PUMP 50 HP (26-Feb-20)

OVERALL LEVEL

11	.102 In/Sec	1750.0 RPM
12	.083 In/Sec	
21	.074 In/Sec	
22	.075 In/Sec	
23	.177 In/Sec	
71	.082 In/Sec	
72	.082 In/Sec	
73	.046 In/Sec	
81	.062 In/Sec	
82	.056 In/Sec	

R53-301 - AGITATOR GBX CHEMINEER 15HP (26-Feb-20)

OVERALL LEVEL

11	.332 In/Sec	1760.0 RPM
12	.167 In/Sec	
21	.274 In/Sec	
22	.273 In/Sec	
23	.298 In/Sec	
31	.209 In/Sec	
32	.063 In/Sec	
33	.118 In/Sec	
41	.172 In/Sec	
42	.044 In/Sec	

51	.182 In/Sec	
53	.035 In/Sec	
71	.121 In/Sec	
73	.093 In/Sec	
C54--115	- COMP 2CYL 2 STAGE 75 HP	(26-Feb-20)
	OVERALL LEVEL	
11	.054 In/Sec	1800.0 RPM
12	.139 In/Sec	
21	.050 In/Sec	
22	.045 In/Sec	
23	.150 In/Sec	
71	.023 In/Sec	
72	.027 In/Sec	
73	.037 In/Sec	
81	.048 In/Sec	
82	.019 In/Sec	
P54-112	- CANNED MOTOR CENTRIFUG PUMP	(26-Feb-20)
	OVERALL LEVEL	
11	.068 In/Sec	1800.0 RPM
12	.050 In/Sec	
13	.030 In/Sec	
21	.045 In/Sec	
22	.013 In/Sec	
23	.047 In/Sec	
71	.039 In/Sec	
72	.019 In/Sec	
81	.036 In/Sec	
82	.048 In/Sec	
R55-102	- REACTOR AGIT R-102	(26-Feb-20)
	OVERALL LEVEL	
11	.137 In/Sec	1760.0 RPM
12	.131 In/Sec	
21	.105 In/Sec	
22	.373 In/Sec	
23	.294 In/Sec	
31	.093 In/Sec	
32	.091 In/Sec	
33	.166 In/Sec	
41	.134 In/Sec	
42	.100 In/Sec	
43	.175 In/Sec	
51	.085 In/Sec	
51L	.042 In/Sec	56.00 RPM
52	.113 In/Sec	1760.0 RPM
61	.085 In/Sec	
62	.099 In/Sec	
71	.063 In/Sec	
73	.122 In/Sec	
R55-104	- REACTOR AGIT R-104 (B55)	(26-Feb-20)
	OVERALL LEVEL	
11	.055 In/Sec	1760.0 RPM
12	.040 In/Sec	
21	.053 In/Sec	

22	.037 In/Sec
23	.029 In/Sec
31	.039 In/Sec
32	.015 In/Sec
33	.038 In/Sec
41	.041 In/Sec
42	.019 In/Sec
43	.034 In/Sec
51	.038 In/Sec
52	.018 In/Sec
53	.014 In/Sec
61	.046 In/Sec
71	.057 In/Sec
73	.011 In/Sec

C67-51 - AXIAL TWIN SCREW COMPRESSOR (26-Feb-20)

OVERALL LEVEL

11	.074 In/Sec	1750.0 RPM
12	.069 In/Sec	
21	.099 In/Sec	
22	.083 In/Sec	
23	.187 In/Sec	
71	.334 In/Sec	3570.0 RPM
72	.340 In/Sec	
73	.558 In/Sec	
81	.358 In/Sec	
82	.279 In/Sec	
83	.323 In/Sec	
71F	.337 In/Sec	
72F	.192 In/Sec	
73F	.353 In/Sec	
81F	.329 In/Sec	
82F	.238 In/Sec	
83F	.352 In/Sec	

R78-201 - AGITATOR GBX (26-Feb-20)

OVERALL LEVEL

11	.079 In/Sec	1760.0 RPM
12	.038 In/Sec	
21	.058 In/Sec	
22	.040 In/Sec	
23	.079 In/Sec	
31	.052 In/Sec	
32	.032 In/Sec	
33	.047 In/Sec	
41	.049 In/Sec	
42	.021 In/Sec	
51	.044 In/Sec	
53	.014 In/Sec	
71	.058 In/Sec	
73	.021 In/Sec	

R80-10 - AGITATOR GBX (26-Feb-20)

OVERALL LEVEL

11	.085 In/Sec	1760.0 RPM
12	.122 In/Sec	
21	.063 In/Sec	

22	.056 In/Sec
23	.068 In/Sec
31	.061 In/Sec
32	.068 In/Sec
33	.041 In/Sec
41	.059 In/Sec
42	.072 In/Sec
43	.040 In/Sec
51	.072 In/Sec
52	.051 In/Sec
53	.039 In/Sec
71	.068 In/Sec
72	.055 In/Sec
73	.038 In/Sec

R80-30 - AGITATOR GBX 15HP CHEMINEER (26-Feb-20)

OVERALL LEVEL

11	.073 In/Sec	1760.0 RPM
12	.146 In/Sec	
21	.109 In/Sec	
22	.122 In/Sec	
23	.115 In/Sec	
31	.079 In/Sec	
32	.051 In/Sec	
33	.129 In/Sec	
41	.062 In/Sec	
42	.029 In/Sec	
43	.143 In/Sec	
51	.075 In/Sec	
53	.017 In/Sec	
71	.054 In/Sec	
73	.035 In/Sec	

B82-101A - FAN FORCED DRAFT 10HP SOUTH (26-Feb-20)

OVERALL LEVEL

11	.161 In/Sec	1800.0 RPM
12	.132 In/Sec	
21	.159 In/Sec	
22	.235 In/Sec	
23	.412 In/Sec	

B82-102 - INDUCED DRAFT 150 HP (26-Feb-20)

OVERALL LEVEL

11	.034 In/Sec	1800.0 RPM
12	.036 In/Sec	
21	.033 In/Sec	
22	.045 In/Sec	
23	.039 In/Sec	

CHLR67-1N - 240T TRANE CHILLER NORTH (26-Feb-20)

OVERALL LEVEL

11	.155 In/Sec	3570.0 RPM
12	.145 In/Sec	
13	.087 In/Sec	
21	.141 In/Sec	
22	.124 In/Sec	
71	.053 In/Sec	

72	.084 In/Sec
81	.122 In/Sec
82	.180 In/Sec
83	.060 In/Sec

CHLR67-1W - 240T TRANE CHILLER WEST (26-Feb-20)

OVERALL LEVEL

11	.196 In/Sec	3570.0 RPM
12	.185 In/Sec	
13	.112 In/Sec	
21	.122 In/Sec	
22	.175 In/Sec	
71	.065 In/Sec	
72	.135 In/Sec	
81	.224 In/Sec	
82	.180 In/Sec	
83	.101 In/Sec	

CHLR45-1 - 20T TRANE CHILLER (26-Feb-20)

OVERALL LEVEL

11E	.332 In/Sec	3570.0 RPM
12E	.334 In/Sec	
13E	.155 In/Sec	
11W	1.188 In/Sec	
12W	.579 In/Sec	
13W	.236 In/Sec	

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Clarification Of Vibration Units:

Vel	-->	In/Sec	PK
Vel	-->	In/Sec	PK