HI-SPEED INDUSTRIAL SERVICE

MILLINGTON, TN

April 23, 2020

Penn A Kem

Subject: April vibration service

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,

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## Detailed Defects

### Axial Twin Screw Compressor C67-51

Low level harmonics, or possibly sidebands of female shaft speed and 2x/4x vibrations of Male shaft speed are evident in the gear end of the Male shaft. No significant bearing defect frequency vibration peaks have suggested distress in the bearings yet. Lobe pass vibrations dominate the data up to our current F-max. We believe the unit is under high load and or the lobe clearances are reduced and allowing possible contact between the rotors. We need to confirm the gear mesh frequency. Please provide tooth count. **Rated a Class II Defect.**

### P4C-102A Boiler Feed Water Pump

The pump bearings seem to be in mechanical distress due to the large jump in harmonics. Inspect the unit bearings as well as all other components for looseness. Seal water also seemed to be leaking profusely. **Rated a Class II Defect.**

## Observations

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

Shaft speed harmonics are still evident.
**Rated a Class I Defect.**

### CHLR45-1 20 Ton Trane Chiller

The West compressor is still 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 at near 0.3”/sec velocity. 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.**

**R55-106 Reactor Agitator Motor Gearbox**
The vibration data still indicates a possible alignment or coupling issue. The outboard motor vibration is at near 0.6”/sec velocity peak. Inspect the coupling and all fasteners and check the alignment at the next opportunity. Pull an oil sample from the gearbox. **Rated a Class II Defect.**
**NOTE: Conduit was hanging loose on the back side of the reactor near the agitator due to a detached hanger.**

**R53-301 Reactor Agitator**
The motor inboard is up again over 0.4”/sec velocity peak. Inspect the motor and coupling and check the shaft alignment as time allows. **Rated a Class II Defect.**

**R80-30 Reactor Agitator Motor and Gearbox**
The motor vibration in the fan end is over 0.45”/sec velocity peak. Inspect the motor fan, feet, fasteners and coupling for wear, damage, or defects. **Rated a Class II Defect.**

**P48-7B Roto Jet High Pressure Pump**
The unit has a high vibration at near 80 Hz which is what we believe to be pump speed. Harmonics can be seen in some data points also. We suspect some wear and looseness in the unit. Inspect as time allows. **Rated a Class II Defect.**

**R48-2 Reactor Agitator**
The possibly bent agitator shaft is causing distress in the drive components. **Rated a Class II Defect.**

## Overall vibrations

**Abbreviated Last Measurement Summary**
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**Database: penn.rbm**
**Station: NEW EQUIPMENT**
**Route No. 4: HYDRO**
**Report Date: 23-Apr-20 10:37**

| MEASUREMENT POINT | OVERALL LEVEL | HFD / VHFD |
|---|---|---|
| C42-4 - AXIAL TWIN SCREW COMPRESSOR | (22-Apr-20) | |
| | OVERALL LEVEL | 1-20 KHZ |
| 11 - MOTOR OUTBOARD HORIZ | .081 In/Sec | .711 G-s |
| 12 - MOTOR OUTBOARD VERT | .077 In/Sec | .351 G-s |
| 13 - MOTOR OUTBOARD AXIAL | .139 In/Sec | .227 G-s |
| 21 - MOTOR INBOARD HORIZ | .082 In/Sec | .806 G-s |
| 22 - MOTOR INBOARD VERT | .089 In/Sec | .947 G-s |
| 23 - MOTOR INBOARD AXIAL | .109 In/Sec | .662 G-s |
| 71 - MALE - CPLG END HORIZ | .079 In/Sec | 1.020 G-s |
| 72 - MALE - CPLG END VERT | .037 In/Sec | .227 G-s |
| 73 - MALE-CPLG END AXIAL | .110 In/Sec | 1.722 G-s |
| 81 - MALE- OPP END HORIZ | .124 In/Sec | .557 G-s |
| 82 - MALE- OPP END VERT | .058 In/Sec | .745 G-s |
| 83 - MALE-OPP END AXIAL | .096 In/Sec | .594 G-s |
| 71F - FEMALE - CPLG END HORIZ | .121 In/Sec | .824 G-s |
| 72F - FEMALE- CPLG END VERT | .066 In/Sec | .581 G-s |
| 73F - FEMALE-CPLG END AXIAL | .132 In/Sec | 1.289 G-s |
| 81F - FEMALE- OPP END HORIZ | .200 In/Sec | .398 G-s |
| 82F - FEMALE- OPP END VERT | .060 In/Sec | 1.045 G-s |
| 83F - FEMALE- OPP END AXIAL | .135 In/Sec | 1.029 G-s |
| P42-4A - CENTRIFUGAL HOT OIL PUMP 5HP | (22-Apr-20) | |
| | OVERALL LEVEL | 1-20 KHZ |
| 11 - MOTOR OUTBOARD HORIZ | .016 In/Sec | .109 G-s |
| 21 - MOTOR INBOARD HORIZ | .012 In/Sec | .066 G-s |
| 23 - MOTOR INBOARD AXIAL | .015 In/Sec | .074 G-s |
| 71 - PUMP COUPLING END HORIZ | .024 In/Sec | .778 G-s |
| 73 - PUMP COUPLING END AXIAL | .016 In/Sec | .193 G-s |
| 81 - PUMP IMPELLER END HORIZ | .024 In/Sec | .565 G-s |
| P42-4B - CENTRIFUGAL HOT OIL PUMP 5HP | (22-Apr-20) | |
| | OVERALL LEVEL | 1-20 KHZ |
| 11 - MOTOR OUTBOARD HORIZ | .057 In/Sec | .029 G-s |
| 21 - MOTOR INBOARD HORIZ | .024 In/Sec | .092 G-s |
| 23 - MOTOR INBOARD AXIAL | .038 In/Sec | .012 G-s |
| 71 - PUMP COUPLING END HORIZ | .030 In/Sec | .033 G-s |
| 73 - PUMP COUPLING END AXIAL | .012 In/Sec | .077 G-s |
| 81 - PUMP IMPELLER END HORIZ | .019 In/Sec | .061 G-s |
| P42-4C - CENTRIFUGAL HOT OIL PMP 15HP | (22-Apr-20) | |
| | OVERALL LEVEL | 1-20 KHZ |
| 11 - MOTOR OUTBOARD HORIZ | .088 In/Sec | 1.518 G-s |

| | | | |
|---|---|---|---|
| 21 - MOTOR INBOARD HORIZ | .092 In/Sec | .438 G-s |
| 23 - MOTOR INBOARD AXIAL | .051 In/Sec | .381 G-s |
| 71 - PUMP COUPLING END HORIZ | .154 In/Sec | .264 G-s |
| 81 - PUMP IMPELLER END HORIZ | .100 In/Sec | .074 G-s |

| P42-4D - CENTRIFUGAL HOT OIL PUMP 5HP | (22-Apr-20) | |
|---|---|---|
| | OVERALL LEVEL | 1-20 KHZ |
| 11 - MOTOR OUTBOARD HORIZ | .074 In/Sec | .232 G-s |
| 21 - MOTOR INBOARD HORIZ | .014 In/Sec | .100 G-s |
| 23 - MOTOR INBOARD AXIAL | .034 In/Sec | .114 G-s |
| 71 - PUMP COUPLING END HORIZ | .025 In/Sec | .032 G-s |
| 81 - PUMP IMPELLER END HORIZ | .021 In/Sec | .109 G-s |

| CHLR67-1N - 240T TRANE CHILLER NORTH | (22-Apr-20) |
|---|---|
| | OVERALL LEVEL |
| 11 - HOTOR OUTBOARD HORIZ | .128 In/Sec |
| 12 - HOTOR OUTBOARD VERT | .114 In/Sec |
| 13 - HOTOR OUTBOARD AXIAL | .055 In/Sec |
| 21 - HOTOR INBOARD HORIZ | .084 In/Sec |
| 22 - HOTOR INBOARD VERT | .100 In/Sec |
| 71 - COMP INBOARD HORIZ | .062 In/Sec |
| 72 - COMP INBOARD VERT | .101 In/Sec |
| 81 - COMP OUTBD HORIZ | .076 In/Sec |
| 82 - COMP OUTBD VERT | .094 In/Sec |
| 83 - COMP OUTBD AXIAL | .051 In/Sec |

| CHLR67-1E - 240T TRANE CHILLER EAST | (22-Apr-20) |
|---|---|
| | OVERALL LEVEL |
| 11 - HOTOR OUTBOARD HORIZ | .087 In/Sec |
| 12 - HOTOR OUTBOARD VERT | .090 In/Sec |
| 13 - HOTOR OUTBOARD AXIAL | .068 In/Sec |
| 21 - HOTOR INBOARD HORIZ | .070 In/Sec |
| 22 - HOTOR INBOARD VERT | .073 In/Sec |
| 71 - COMP INBOARD HORIZ | .061 In/Sec |
| 72 - COMP INBOARD VERT | .054 In/Sec |
| 81 - COMP OUTBD HORIZ | .070 In/Sec |
| 82 - COMP OUTBD VERT | .083 In/Sec |
| 83 - COMP OUTBD AXIAL | .040 In/Sec |

| C67-51 - AXIAL TWIN SCREW COMPRESSOR | (22-Apr-20) | |
|---|---|---|
| | OVERALL LEVEL | 1-20 KHZ |
| 11 - MOTOR OUTBOARD HORIZ | .062 In/Sec | 3.402 G-s |
| 11P - MOTOR OUTBOARD PEAKVUE | .026 In/Sec | |
| 12 - MOTOR OUTBOARD VERT | .070 In/Sec | 3.350 G-s |
| 13 - MOTOR OUTBOARD AXIAL | .162 In/Sec | 2.645 G-s |
| 21 - MOTOR INBOARD HORIZ | .062 In/Sec | 1.843 G-s |
| 21P - MOTOR INBOARD PEAKVUE | .0058 In/Sec | |
| 22 - MOTOR INBOARD VERT | .086 In/Sec | 4.608 G-s |
| 23 - MOTOR INBOARD AXIAL | .117 In/Sec | 2.469 G-s |
| 71 - MALE - CPLG END HORIZ | .161 In/Sec | .657 G-s |
| 71P - COMPRESSOR INPUT INBOARD PEAKVUE | .0033 In/Sec | |
| 72 - MALE - CPLG END VERT | .122 In/Sec | .166 G-s |
| 73 - MALE-CPLG END AXIAL | .133 In/Sec | 1.237 G-s |
| 81 - MALE- OPP END HORIZ | .135 In/Sec | .089 G-s |
| 82 - MALE- OPP END VERT | .344 In/Sec | .018 G-s |
| 83 - MALE-OPP END AXIAL | .151 In/Sec | .467 G-s |
| 71F - FEMALE - CPLG END HORIZ | .269 In/Sec | .408 G-s |

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|---|---|---|---|
| 7FP - COMPRESS INPUT OUTBOARD PEAKVUE | .0046 In/Sec | |
| 72F - FEMALE- CPLG END VERT | .164 In/Sec | .279 G-s |
| 73F - FEMALE-CPLG END AXIAL | .251 In/Sec | .670 G-s |
| 81F - FEMALE- OPP END HORIZ | .323 In/Sec | .176 G-s |
| 82F - FEMALE- OPP END VERT | .337 In/Sec | .082 G-s |
| 83F - FEMALE- OPP END AXIAL | .247 In/Sec | .490 G-s |

| P67-504 - HOT OIL CIRC PMP CENT 50HP | (22-Apr-20) | |
|---|---|---|
| | OVERALL LEVEL | 1-20 KHZ |
| 11 - MOTOR OUTBOARD HORIZ | .037 In/Sec | .257 G-s |
| 12 - MOTOR OUTBOARD VERT | .024 In/Sec | .335 G-s |
| 21 - MOTOR INBOARD HORIZ | .065 In/Sec | .314 G-s |
| 22 - MOTOR INBOARD VERT | .035 In/Sec | .298 G-s |
| 23 - MOTOR INBOARD AXIAL | .046 In/Sec | .038 G-s |
| 71 - PUMP CPLG END HORIZ | .134 In/Sec | .166 G-s |
| 72 - PUMP CPLG END VERT | .055 In/Sec | .186 G-s |
| 73 - PUMP CPLG END AXIAL | .072 In/Sec | .193 G-s |
| 81 - PUMP OPP END HORIZ | .054 In/Sec | .249 G-s |
| 82 - PUMP OPP END VERT | .070 In/Sec | .176 G-s |

| B82-101A - FAN FORCED DRAFT 10HP SOUTH | (22-Apr-20) | |
|---|---|---|
| | OVERALL LEVEL | 1-20 KHZ |
| 11 - MOTOR OUTBOARD HORIZ | .121 In/Sec | .124 G-s |
| 12 - MOTOR OUTBOARD VERT | .175 In/Sec | .111 G-s |
| 21 - MOTOR INBOARD HORIZ | .161 In/Sec | .147 G-s |
| 22 - MOTOR INBOARD VERT | .256 In/Sec | .048 G-s |
| 23 - MOTOR INBOARD AXIAL | .282 In/Sec | .098 G-s |

| B82-102 - INDUCED DRAFT 150 HP | (22-Apr-20) | |
|---|---|---|
| | OVERALL LEVEL | 1-20 KHZ |
| 11 - MOTOR OUTBOARD HORIZ | .040 In/Sec | .175 G-s |
| 12 - MOTOR OUTBOARD VERT | .027 In/Sec | .099 G-s |
| 21 - MOTOR INBOARD HORIZ | .041 In/Sec | .422 G-s |
| 22 - MOTOR INBOARD VERT | .045 In/Sec | .645 G-s |
| 23 - MOTOR INBOARD AXIAL | .069 In/Sec | .158 G-s |
| 31 - FAN INBOARD HORIZONTAL | .025 In/Sec | .376 G-s |
| 41 - FAN OUTBOARD HORIZONTAL | .020 In/Sec | .143 G-s |

| C53-301B - C-301B RECIP COMPRESSOR | (22-Apr-20) | |
|---|---|---|
| | OVERALL LEVEL | 1-20 KHZ |
| 11 - MOTOR OUTBOARD HORIZ | .047 In/Sec | 1.362 G-s |
| 12 - MOTOR OUTBOARD VERT | .077 In/Sec | 1.349 G-s |
| 21 - MOTOR INBOARD HORIZ | .057 In/Sec | .297 G-s |
| 22 - MOTOR INBOARD VERT | .038 In/Sec | 1.407 G-s |
| 23 - MOTOR INBOARD AXIAL | .053 In/Sec | .280 G-s |
| 71 - CRANKSHAFT DRIVE END HORIZ | .045 In/Sec | .079 G-s |
| 72 - CRANKSHAFT DRIVE END VERT | .030 In/Sec | .057 G-s |
| 73 - CRANKSHAFT DRIVE END AXIAL | .083 In/Sec | .079 G-s |
| 81 - CRANKSHAFT OPP END HORIZ | .049 In/Sec | .037 G-s |
| 82 - CRANKSHAFT OPP END VERT | .034 In/Sec | .042 G-s |

| C53-1A-050 - C1-A H2 COMPRESSOR | (22-Apr-20) | |
|---|---|---|
| | OVERALL LEVEL | 1-20 KHZ |
| 11 - MOTOR OUTBOARD HORIZ | .084 In/Sec | 1.432 G-s |
| 12 - MOTOR OUTBOARD VERT | .034 In/Sec | 1.154 G-s |
| 21 - MOTOR INBOARD HORIZ | .095 In/Sec | .728 G-s |
| 22 - MOTOR INBOARD VERT | .069 In/Sec | 1.575 G-s |

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| 23 | - MOTOR INBOARD AXIAL | .072 In/Sec | .565 G-s |
| 71 | - PUMP CPLG END HORIZ | .115 In/Sec | .087 G-s |
| 72 | - PUMP CPLG END VERT | .020 In/Sec | .030 G-s |
| 73 | - PUMP CPLG END AXIAL | .015 In/Sec | .147 G-s |
| 81 | - PUMP OPP END HORIZ | .118 In/Sec | .070 G-s |
| 82 | - PUMP OPP END VERT | .011 In/Sec | .063 G-s |

P48-7B - ROTOJET HIGH PRESS PUMP 15HP (22-Apr-20)

| | | OVERALL LEVEL | 1-20 KHZ |
|---|---|---|---|
| 11 | - MOTOR OUTBOARD HORIZ | .071 In/Sec | .426 G-s |
| 12 | - MOTOR OUTBOARD VERT | .241 In/Sec | .382 G-s |
| 21 | - MOTOR INBOARD HORIZ | .098 In/Sec | .758 G-s |
| 22 | - MOTOR INBOARD VERT | .100 In/Sec | .843 G-s |
| 23 | - MOTOR INBOARD AXIAL | .354 In/Sec | .350 G-s |
| 71 | - PUMP CPLG END HORIZ | .503 In/Sec | 4.134 G-s |
| 72 | - PUMP CPLG END VERT | .179 In/Sec | 4.654 G-s |
| 73 | - PUMP CPLG END AXIAL | .077 In/Sec | 2.146 G-s |
| 81 | - PUMP OPP END HORIZ | .530 In/Sec | 1.951 G-s |
| 82 | - PUMP OPP END VERT | .276 In/Sec | 1.989 G-s |

R48-2 - AGITATOR GEARBOX FAULK 15HP (22-Apr-20)

| | | OVERALL LEVEL |
|---|---|---|
| 11 | - MOTOR OUTBOARD HORIZ | .411 In/Sec |
| 12 | - MOTOR OUTBOARD VERT | .391 In/Sec |
| 21 | - MOTOR INBOARD HORIZ | .314 In/Sec |
| 22 | - MOTOR INBOARD VERT | .307 In/Sec |
| 23 | - MOTOR INBOARD AXIAL | .175 In/Sec |
| 31 | - GEARBOX INPUT SHAFT-INBD HOR | .220 In/Sec |
| 32 | - GEARBOX INPUT SHAFT INBD VERT | .304 In/Sec |
| 41 | - GEARBOX INPUT SHAFT OUTBD HOR | .241 In/Sec |
| 42 | - GEARBOX INPUT SHAFT OUTBD VERT | .174 In/Sec |
| 43 | - GEARBOX INPUT SHAFT OUTBD AXIAL | .061 In/Sec |
| 51 | - GEARBOX OUTPUT SHAFT TOP N-S | .183 In/Sec |

R53-301 - AGITATOR GBX CHEMINEER 15HP (22-Apr-20)

| | | OVERALL LEVEL |
|---|---|---|
| 11 | - MOTOR OUTBOARD HORIZ | .284 In/Sec |
| 12 | - MOTOR OUTBOARD VERT | .202 In/Sec |
| 21 | - MOTOR INBOARD HORIZ | .255 In/Sec |
| 22 | - MOTOR INBOARD VERT | .357 In/Sec |
| 23 | - MOTOR INBOARD AXIAL | .417 In/Sec |
| 31 | - GEARBOX INPUT SHAFT-INBD HOR | .166 In/Sec |
| 32 | - GEARBOX INPUT SHAFT INBD VERT | .052 In/Sec |
| 33 | - GEARBOX INPUT SHAFT INBD AXIAL | .164 In/Sec |
| 41 | - GEARBOX INPUT SHAFT OUTBD HOR | .145 In/Sec |
| 42 | - GEARBOX INPUT SHAFT OUTBD VERT | .073 In/Sec |
| 51 | - GEARBOX OUTPUT SHAFT TOP N-S | .169 In/Sec |
| 53 | - GEARBOX OUTPUT SHAFT TOP VERT | .042 In/Sec |
| 61 | - GEARBOX OUTPUT SHAFT MID N-S | .098 In/Sec |
| 71 | - GEARBOX OUTPUT SHAFT BOT N-S | .028 In/Sec |

P53-310A - GRUNDFOSS VERT PUMP 10HP (22-Apr-20)

| | | OVERALL LEVEL | 1-20 KHZ |
|---|---|---|---|
| 11 | - MOTOR OUTBOARD HORIZ | .141 In/Sec | .070 G-s |
| 12 | - MOTOR OUTBOARD VERT | .093 In/Sec | .118 G-s |
| 21 | - MOTOR INBOARD HORIZ | .033 In/Sec | .207 G-s |
| 22 | - MOTOR INBOARD VERT | .067 In/Sec | .444 G-s |

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| 23 - MOTOR INBOARD AXIAL | | .042 In/Sec | .103 G-s |
| 71 - PUMP CPLG END HORIZ | | .129 In/Sec | .157 G-s |
| 72 - PUMP CPLG END VERT | | .152 In/Sec | .156 G-s |
| 81 - PUMP OPP END HORIZ | | .078 In/Sec | .040 G-s |
| 82 - PUMP OPP END VERT | | .014 In/Sec | .076 G-s |

P53-301 - ANSI CENTRIFUGAL PUMP 50 HP (22-Apr-20)

| | OVERALL LEVEL | 1-20 KHZ |
|---|---|---|
| 11 - MOTOR OUTBOARD HORIZ | .096 In/Sec | .107 G-s |
| 12 - MOTOR OUTBOARD VERT | .080 In/Sec | .149 G-s |
| 21 - MOTOR INBOARD HORIZ | .077 In/Sec | .607 G-s |
| 22 - MOTOR INBOARD VERT | .101 In/Sec | .462 G-s |
| 23 - MOTOR INBOARD AXIAL | .183 In/Sec | .503 G-s |
| 71 - PUMP CPLG END HORIZ | .104 In/Sec | .382 G-s |
| 72 - PUMP CPLG END VERT | .078 In/Sec | .287 G-s |
| 73 - PUMP CPLG END AXIAL | .073 In/Sec | .394 G-s |
| 81 - PUMP OPP END HORIZ | .051 In/Sec | .396 G-s |
| 82 - PUMP OPP END VERT | .058 In/Sec | .284 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: NEW EQUIPMENT
Route No. 6: BOILER
Report Date: 23-Apr-20 10:37

| MEASUREMENT POINT | OVERALL LEVEL | HFD / VHFD |
|---|---|---|

B4C101-877 - ZURN BOILER BLOWER (22-Apr-20)

| | OVERALL LEVEL | 1-20 KHZ |
|---|---|---|
| 11 - MOTOR OUTBOARD HORIZ | .174 In/Sec | .692 G-s |
| 12 - MOTOR OUTBOARD VERT | .115 In/Sec | .176 G-s |
| 13 - MOTOR OUTBOARD AXIAL | .166 In/Sec | .094 G-s |
| 21 - MOTOR INBOARD HORIZ | .169 In/Sec | .897 G-s |
| 22 - MOTOR INBOARD VERT | .142 In/Sec | 2.288 G-s |
| 23 - MOTOR INBOARD AXIAL | .111 In/Sec | .831 G-s |
| 71 - BLOWER INBOARD HORIZ | .160 In/Sec | .922 G-s |
| 72 - BLOWER INBOARD VERT | .117 In/Sec | .657 G-s |
| 73 - BLOWER INBOARD AXIAL | .153 In/Sec | .605 G-s |
| 81 - BLOWER WHEEL END HORIZ | .152 In/Sec | .850 G-s |
| 82 - BLOWER WHEEL END VERT | .126 In/Sec | .308 G-s |

P4C-102A - BOILER FEEDWATER PUMP (22-Apr-20)

| | OVERALL LEVEL | 1-20 KHZ |
|---|---|---|
| 11 - MOTOR OUTBOARD HORIZ | .083 In/Sec | .378 G-s |
| 12 - MOTOR OUTBOARD VERT | .044 In/Sec | .270 G-s |
| 21 - MOTOR INBOARD HORIZ | .047 In/Sec | .853 G-s |
| 22 - MOTOR INBOARD VERT | .036 In/Sec | .637 G-s |
| 23 - MOTOR INBOARD AXIAL | .048 In/Sec | .502 G-s |
| 71 - PUMP CPLG END HORIZ | .054 In/Sec | 1.255 G-s |
| 72 - PUMP CPLG END VERT | .038 In/Sec | 1.292 G-s |

| | | | |
|---|---|---|---|
| 81 | - PUMP OPP END HORIZ | .084 In/Sec | 3.102 G-s |
| 82 | - PUMP OPP END VERT | .070 In/Sec | 6.951 G-s |

P24-63DEGN - 63 DEG N WATER PUMP (22-Apr-20)

| | | OVERALL LEVEL | 1-20 KHZ |
|---|---|---|---|
| 11 | - MOTOR OUTBOARD HORIZ | .061 In/Sec | .195 G-s |
| 12 | - MOTOR OUTBOARD VERT | .052 In/Sec | .319 G-s |
| 21 | - MOTOR INBOARD HORIZ | .060 In/Sec | .436 G-s |
| 22 | - MOTOR INBOARD VERT | .053 In/Sec | .485 G-s |
| 23 | - MOTOR INBOARD AXIAL | .043 In/Sec | .829 G-s |
| 71 | - PUMP CPLG END HORIZ | .067 In/Sec | .971 G-s |
| 72 | - PUMP CPLG END VERT | .066 In/Sec | .894 G-s |
| 73 | - PUMP CPLG END AXIAL | .136 In/Sec | 3.296 G-s |
| 81 | - PUMP OPP END HORIZ | .094 In/Sec | .682 G-s |
| 82 | - PUMP OPP END VERT | .035 In/Sec | 1.423 G-s |
| 83 | - PUMP OPP END AXIAL | .113 In/Sec | 2.719 G-s |

P24-63DEGS - 63 DEG S WATER PUMP (22-Apr-20)

| | | OVERALL LEVEL | 1-20 KHZ |
|---|---|---|---|
| 11 | - MOTOR OUTBOARD HORIZ | .098 In/Sec | .577 G-s |
| 12 | - MOTOR OUTBOARD VERT | .069 In/Sec | .323 G-s |
| 21 | - MOTOR INBOARD HORIZ | .129 In/Sec | .854 G-s |
| 22 | - MOTOR INBOARD VERT | .050 In/Sec | .335 G-s |
| 23 | - MOTOR INBOARD AXIAL | .145 In/Sec | .477 G-s |
| 71 | - PUMP CPLG END HORIZ | .104 In/Sec | .335 G-s |
| 72 | - PUMP CPLG END VERT | .074 In/Sec | .555 G-s |
| 73 | - PUMP CPLG END AXIAL | .077 In/Sec | 1.529 G-s |
| 81 | - PUMP OPP END HORIZ | .082 In/Sec | .462 G-s |
| 82 | - PUMP OPP END VERT | .040 In/Sec | .837 G-s |
| 83 | - PUMP OPP END AXIAL | .141 In/Sec | 1.109 G-s |

P24-85DEGN - 85 DEG N WATER CIRC PUMP 125 (22-Apr-20)

| | | OVERALL LEVEL | 1-20 KHZ |
|---|---|---|---|
| 11 | - MOTOR OUTBOARD HORIZ | .103 In/Sec | .769 G-s |
| 12 | - MOTOR OUTBOARD VERT | .047 In/Sec | .197 G-s |
| 21 | - MOTOR INBOARD HORIZ | .088 In/Sec | 1.568 G-s |
| 22 | - MOTOR INBOARD VERT | .047 In/Sec | .885 G-s |
| 23 | - MOTOR INBOARD AXIAL | .046 In/Sec | .625 G-s |
| 71 | - PUMP CPLG END HORIZ | .170 In/Sec | .957 G-s |
| 72 | - PUMP CPLG END VERT | .134 In/Sec | 1.211 G-s |
| 73 | - PUMP CPLG END AXIAL | .251 In/Sec | 1.041 G-s |
| 81 | - PUMP OPP END HORIZ | .217 In/Sec | 1.323 G-s |
| 82 | - PUMP OPP END VERT | .144 In/Sec | 1.467 G-s |
| 83 | - PUMP OPP END AXIAL | .234 In/Sec | .829 G-s |

P24-85DEGS - 85 DEG S WATER CIRC PUMP 125 (22-Apr-20)

| | | OVERALL LEVEL | 1-20 KHZ |
|---|---|---|---|
| 11 | - MOTOR OUTBOARD HORIZ | .109 In/Sec | .756 G-s |
| 12 | - MOTOR OUTBOARD VERT | .186 In/Sec | 1.055 G-s |
| 21 | - MOTOR INBOARD HORIZ | .077 In/Sec | .882 G-s |
| 22 | - MOTOR INBOARD VERT | .092 In/Sec | .464 G-s |
| 23 | - MOTOR INBOARD AXIAL | .095 In/Sec | .741 G-s |
| 71 | - PUMP CPLG END HORIZ | .234 In/Sec | 1.739 G-s |
| 72 | - PUMP CPLG END VERT | .234 In/Sec | 1.851 G-s |
| 73 | - PUMP CPLG END AXIAL | .409 In/Sec | 4.772 G-s |
| 81 | - PUMP OPP END HORIZ | .209 In/Sec | 1.855 G-s |
| 82 | - PUMP OPP END VERT | .221 In/Sec | 1.837 G-s |

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   83  - PUMP OPP END AXIAL                        .370 In/Sec      3.884 G-s

   P24BGBL876 - BIG BLUE WATER PUMP-63 DEG    (22-Apr-20)
                                               OVERALL LEVEL     1-20 KHZ
   11  - MOTOR OUTBOARD HORIZ                    .178 In/Sec      2.180 G-s
   12  - MOTOR OUTBOARD VERT                     .050 In/Sec      1.210 G-s
   21  - MOTOR INBOARD HORIZ                     .258 In/Sec      2.280 G-s
   22  - MOTOR INBOARD VERT                      .065 In/Sec      1.926 G-s
   23  - MOTOR INBOARD AXIAL                     .111 In/Sec      1.380 G-s
   71  - PUMP CPLG END HORIZ                     .306 In/Sec       .493 G-s
   72  - PUMP CPLG END VERT                      .141 In/Sec       .524 G-s
   73  - PUMP CPLG END AXIAL                     .257 In/Sec       .430 G-s
   81  - PUMP OPP END HORIZ                      .267 In/Sec      1.096 G-s
   82  - PUMP OPP END VERT                       .193 In/Sec      1.533 G-s
   83  - PUMP OPP END AXIAL                      .194 In/Sec       .609 G-s

   P24-102B   - JOCKEY FIRE FLANGE PUMP HZ    (22-Apr-20)
                                               OVERALL LEVEL     1-20 KHZ
   11  - MOTOR OUTBOARD HORIZ                    .105 In/Sec       .168 G-s
   12  - MOTOR OUTBOARD VERT                     .135 In/Sec       .210 G-s
   21  - MOTOR INBOARD HORIZ                     .080 In/Sec       .039 G-s
   22  - MOTOR INBOARD VERT                      .030 In/Sec       .064 G-s
   23  - MOTOR INBOARD AXIAL                     .043 In/Sec       .012 G-s

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   Clarification Of Vibration Units:
      Acc      -->  G-s      PK
      Vel      -->  In/Sec   PK                      Abbreviated Last Measurement
Summary
                    ***********************************

               Database:  penn.rbm
               Station:   NEW EQUIPMENT
               Route No.  7:  B55-FINE CHME
               Report Date:  23-Apr-20   10:38

         MEASUREMENT POINT                    OVERALL LEVEL       HFD / VHFD
         -----------------                    -------------       ----------

   R55-102    - REACTOR AGIT R-102            (22-Apr-20)
                                               OVERALL LEVEL     1-20 KHZ
   11  - MOTOR OUTBOARD HORIZ                    .109 In/Sec       .104 G-s
   12  - MOTOR OUTBOARD VERT                     .122 In/Sec       .154 G-s
   21  - MOTOR INBOARD HORIZ                     .087 In/Sec       .411 G-s
   22  - MOTOR INBOARD VERT                      .264 In/Sec       .291 G-s
   23  - MOTOR INBOARD AXIAL                     .108 In/Sec       .163 G-s
   31  - GEARBOX INPUT SHAFT-INBD HOR            .095 In/Sec
   32  - GEARBOX INPUT SHAFT INBD VERT           .057 In/Sec
   33  - GEARBOX INPUT SHAFT INBD AXIAL          .122 In/Sec
   41  - GEARBOX INPUT SHAFT OUTBD HOR           .133 In/Sec
   42  - GEARBOX INPUT SHAFT OUTBD VERT          .057 In/Sec
   51  - GEARBOX OUTPUT SHAFT TOP PERP           .084 In/Sec
   51L - GEARBOX OUTPUT SHAFT TOP PERP           .057 In/Sec
   52  - GEARBOX OUTPUT SHAFT TOP MA             .075 In/Sec
   52L - GEARBOX OUTPUT SHAFT TOP PERP           .056 In/Sec
   53  - GEARBOX OUTPUT SHAFT TOP VERT           .084 In/Sec
   53L - GEARBOX OUTPUT SHAFT TOP PERP           .057 In/Sec
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| | | | |
|---|---|---|---|
| 61 | - GEARBOX OUTPUT SHAFT MID PERP | .047 In/Sec | |
| 61L | - GEARBOX OUTPUT SHAFT BOT PERP | .051 In/Sec | |

| R55-106 | - REACTOR AGIT R-106 | (22-Apr-20) | |
|---|---|---|---|
| | | OVERALL LEVEL | 1-20 KHZ |
| 11 | - MOTOR OUTBOARD HORIZ | .283 In/Sec | .482 G-s |
| 12 | - MOTOR OUTBOARD VERT | .579 In/Sec | .181 G-s |
| 21 | - MOTOR INBOARD HORIZ | .268 In/Sec | .352 G-s |
| 22 | - MOTOR INBOARD VERT | .242 In/Sec | .369 G-s |
| 23 | - MOTOR INBOARD AXIAL | .429 In/Sec | .143 G-s |
| 31 | - GEARBOX INPUT SHAFT-INBD HOR | .144 In/Sec | |
| 32 | - GEARBOX INPUT SHAFT INBD VERT | .113 In/Sec | |
| 33 | - GEARBOX INPUT SHAFT INBD AXIAL | .122 In/Sec | |
| 41 | - GEARBOX INPUT SHAFT OUTBD HOR | .125 In/Sec | |
| 42 | - GEARBOX INPUT SHAFT OUTBD VERT | .064 In/Sec | |
| 51 | - GEARBOX OUTPUT SHAFT TOP PERP | .162 In/Sec | |
| 51L | - GEARBOX OUTPUT SHAFT TOP PERP | .143 In/Sec | |
| 53 | - GEARBOX OUTPUT SHAFT TOP VERT | .085 In/Sec | |
| 61 | - GEARBOX OUTPUT SHAFT MID PERP | .098 In/Sec | |
| 63 | - GEARBOX OUTPUT SHAFT MID VERT | .094 In/Sec | |
| 71 | - GEARBOX OUTPUT SHAFT BOT PERP | .036 In/Sec | |

| P36-905A | - N COOL TWR-NORTH PUMP | (22-Apr-20) | |
|---|---|---|---|
| | | OVERALL LEVEL | 1-20 KHZ |
| 11 | - MOTOR OUTBOARD HORIZ | .068 In/Sec | .208 G-s |
| 12 | - MOTOR OUTBOARD VERT | .051 In/Sec | .342 G-s |
| 21 | - MOTOR INBOARD HORIZ | .063 In/Sec | 1.922 G-s |
| 22 | - MOTOR INBOARD VERT | .067 In/Sec | .366 G-s |
| 23 | - MOTOR INBOARD AXIAL | .054 In/Sec | .061 G-s |
| 71 | - PUMP CPLG END HORIZ | .082 In/Sec | 1.621 G-s |
| 72 | - PUMP CPLG END VERT | .069 In/Sec | 1.880 G-s |
| 73 | - PUMP CPLG END AXIAL | .123 In/Sec | .082 G-s |
| 81 | - PUMP OPP END HORIZ | .095 In/Sec | 1.701 G-s |
| 82 | - PUMP OPP END VERT | .091 In/Sec | 1.816 G-s |
| 83 | - PUMP OPP END AXIAL | .154 In/Sec | 2.076 G-s |

| C36-EAST | - UTILITY AIRCOMP ROTARY 200HP | (22-Apr-20) | |
|---|---|---|---|
| | | OVERALL LEVEL | 1-20 KHZ |
| 11 | - MOTOR OUTBOARD HORIZ | .056 In/Sec | .871 G-s |
| 12 | - MOTOR OUTBOARD VERT | .075 In/Sec | .647 G-s |
| 21 | - MOTOR INBOARD HORIZ | .081 In/Sec | 1.558 G-s |
| 22 | - MOTOR INBOARD VERT | .087 In/Sec | 1.289 G-s |
| 23 | - MOTOR INBOARD AXIAL | .082 In/Sec | .253 G-s |
| 71 | - MALE - CPLG END HORIZ | .126 In/Sec | 3.338 G-s |
| 72 | - MALE - CPLG END VERT | .082 In/Sec | 1.363 G-s |
| 73 | - MALE-CPLG END AXIAL | .117 In/Sec | .933 G-s |
| 81 | - MALE- OPP END HORIZ | .126 In/Sec | 3.942 G-s |
| 82 | - MALE- OPP END VERT | .115 In/Sec | 2.500 G-s |
| 71F | - FEMALE - CPLG END HORIZ | .142 In/Sec | .989 G-s |
| 72F | - FEMALE- CPLG END VERT | .085 In/Sec | 1.640 G-s |
| 81F | - FEMALE- OPP END HORIZ | .116 In/Sec | 2.314 G-s |
| 82F | - FEMALE- OPP END VERT | .146 In/Sec | .572 G-s |

| C36-SOUTH | - UTILITY AIRCOMP ROTARY 150HP | (22-Apr-20) | |
|---|---|---|---|
| | | OVERALL LEVEL | 1-20 KHZ |
| 11 | - MOTOR OUTBOARD HORIZ | .104 In/Sec | .609 G-s |
| 12 | - MOTOR OUTBOARD VERT | .089 In/Sec | .670 G-s |

| | | | |
|---|---|---|---|
| 21 - MOTOR INBOARD HORIZ | .101 In/Sec | .965 G-s |
| 22 - MOTOR INBOARD VERT | .078 In/Sec | 1.146 G-s |
| 23 - MOTOR INBOARD AXIAL | .136 In/Sec | .895 G-s |
| 71 - MALE - CPLG END HORIZ | .189 In/Sec | 2.590 G-s |
| 72 - MALE - CPLG END VERT | .160 In/Sec | 1.196 G-s |
| 73 - MALE-CPLG END AXIAL | .246 In/Sec | 1.386 G-s |
| 81 - MALE- OPP END HORIZ | .159 In/Sec | 1.286 G-s |
| 82 - MALE- OPP END VERT | .152 In/Sec | 1.908 G-s |
| 72F - FEMALE- CPLG END VERT | .138 In/Sec | 2.219 G-s |
| 81F - FEMALE- OPP END HORIZ | .213 In/Sec | 1.525 G-s |
| 82F - FEMALE- OPP END VERT | .164 In/Sec | 1.901 G-s |

C36-WEST - UTILITY AIRCOMP ROTARY 150HP (22-Apr-20)

| | OVERALL LEVEL | 1-20 KHZ |
|---|---|---|
| 11 - MOTOR OUTBOARD HORIZ | .065 In/Sec | .674 G-s |
| 12 - MOTOR OUTBOARD VERT | .045 In/Sec | .819 G-s |
| 21 - MOTOR INBOARD HORIZ | .036 In/Sec | .970 G-s |
| 22 - MOTOR INBOARD VERT | .058 In/Sec | 2.198 G-s |
| 23 - MOTOR INBOARD AXIAL | .109 In/Sec | 1.551 G-s |
| 71 - MALE - CPLG END HORIZ | .060 In/Sec | .405 G-s |
| 72 - MALE - CPLG END VERT | .085 In/Sec | 1.678 G-s |
| 81 - MALE- OPP END HORIZ | .109 In/Sec | 1.206 G-s |
| 82 - MALE- OPP END VERT | .082 In/Sec | 1.170 G-s |
| 71F - FEMALE - CPLG END HORIZ | .071 In/Sec | 1.307 G-s |
| 72F - FEMALE- CPLG END VERT | .093 In/Sec | 1.526 G-s |
| 81F - FEMALE- OPP END HORIZ | .099 In/Sec | 1.372 G-s |
| 82F - FEMALE- OPP END VERT | .116 In/Sec | 1.618 G-s |

R80-30 - AGITATOR GBX (22-Apr-20)

| | OVERALL LEVEL |
|---|---|
| 11 - MOTOR OUTBOARD HORIZ | .091 In/Sec |
| 12 - MOTOR OUTBOARD VERT | .461 In/Sec |
| 21 - MOTOR INBOARD HORIZ | .088 In/Sec |
| 22 - MOTOR INBOARD VERT | .203 In/Sec |
| 23 - MOTOR INBOARD AXIAL | .185 In/Sec |
| 31 - GEARBOX INPUT SHAFT-INBD HOR | .091 In/Sec |
| 32 - GEARBOX INPUT SHAFT INBD VERT | .024 In/Sec |
| 33 - GEARBOX INPUT SHAFT INBD AXIAL | .214 In/Sec |
| 41 - GEARBOX INPUT SHAFT OUTBD HOR | .072 In/Sec |
| 42 - GEARBOX INPUT SHAFT OUTBD VERT | .044 In/Sec |
| 51 - GEARBOX OUTPUT SHAFT TOP N-S | .075 In/Sec |
| 52 - GEARBOX OUTPUT SHAFT TOP E-W | .020 In/Sec |
| 53 - GEARBOX OUTPUT SHAFT TOP VERT | .032 In/Sec |
| 61 - GEARBOX OUTPUT SHAFT MID N-S | .060 In/Sec |
| 71 - GEARBOX OUTPUT SHAFT BOT N-S | .020 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: NEW EQUIPMENT
Route No. 8: PILOT-GUARD
Report Date: 23-Apr-20 10:38

| MEASUREMENT POINT | OVERALL LEVEL | HFD / VHFD |
|---|---|---|
| CHLR45-1 - 20T TRANE CHILLER | (22-Apr-20) | |
| | OVERALL LEVEL | |
| 11W - WEST MOTOR OUTBOARD HORIZ | 1.290 In/Sec | |
| 12W - WEST MOTOR OUTBOARD VERT | .498 In/Sec | |
| 13W - WEST MOTOR OUTBOARD AXIAL | .248 In/Sec | |
| 11E - EASTMOTOR OUTBOARD HORIZ | .049 In/Sec | |
| 12E - EAST MOTOR OUTBOARD VERT | .280 In/Sec | |
| 13E - EAST MOTOR OUTBOARD AXIAL | .100 In/Sec | |
| P45-VAC - NEW VACUUM PUMP PILOT PLANT | (22-Apr-20) | |
| | OVERALL LEVEL | 1-20 KHZ |
| 11 - MOTOR OUTBOARD HORIZ | .082 In/Sec | .087 G-s |
| 21 - MOTOR INBOARD HORIZ | .044 In/Sec | .537 G-s |
| 23 - MOTOR INBOARD AXIAL | .132 In/Sec | .757 G-s |
| 71M - PUMP MALE INPUT END HORIZONTAL | .050 In/Sec | .335 G-s |
| 71F - PUMP INPUT END FEMALE HZ | .044 In/Sec | .321 G-s |
| 73M - PUMP INPUT END MALE AXIAL | .023 In/Sec | .435 G-s |
| 81M - PUMP MALE INPUT OPPOSITE END HZ | .070 In/Sec | .528 G-s |
| 81F - PUMP FEMALE OPPOSITE END HZ | .061 In/Sec | .360 G-s |
| P39-4-877 - WELL PUMP #4 | (22-Apr-20) | |
| | OVERALL LEVEL | 1-20 KHZ |
| 11 - MOTOR TOP N-S | .209 In/Sec | .384 G-s |
| 12 - MOTOR TOP E-W | .184 In/Sec | .286 G-s |
| 21 - MOTOR BOTTOM N-S | .126 In/Sec | .637 G-s |
| 22 - MOTOR BOTTOM E-W | .097 In/Sec | .185 G-s |
| 23 - MOTOR BOTTOM VERT | .044 In/Sec | .494 G-s |

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Clarification Of Vibration Units:

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