HI-SPEED INDUSTRIAL SERVICE

MILLINGTON, TN

September 18, 2019

ARKEMA

Subject: September week 2 vibration service report

## Weekly Equipment

**Agitator, Hydrogenator C 7001-01**
No legitimate vibrations were found to be above 0.148”/sec velocity peak overall. Spectrum appears normal for unit. No action required.

**A/B Concentrator Vacuum Pump 57**
Vibrations increased again for the outboard pump bearing at what looks to be vane pass. Vibration has risen again and is at 0.34”/sec velocity peak overall. No immediate action is required at this time. **Rated a Class I Defect.**

**Flash Vacuum Pump 2130-1**
Vibrations in this unit appear normal. No actions required.

**Air Compressor C-201**
Vibrations appear normal this week. The trend clearly shows that the vibrations vary considerably over time. We still believe these motors have possible weak rotor bar end connections that cause the vibrations to fluctuate higher due to loading. We will continue to monitor this unit for changes No actions required.

**Air Compressor C-202**
Vibrations in this unit appear normal. No actions required.

**Air Compressor C-203**
Vibrations appear normal this week. The trend clearly shows that the vibrations vary considerably over time. We still believe these motors have possible weak rotor bar end connections that cause the vibrations to fluctuate higher due to loading. We will continue to monitor this unit for changes No actions required.

**Air Compressor NASH 201-08**
Vibrations in this unit appear normal. No actions required.

7030 Ryburn Drive
Millington, TN 38053
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**D Hydrogenator Agitator 9002-10**
Data sets for the gearbox bearings show overall vibrations are still near 0.38"/sec velocity peak. Shaft speed fundamental is below the accelerometer high pass filter. Vibrations of interest are around 11.33 and10.52 and 278 HZ (not shown). Modulation is causing a slight beat vibration. Some of these peaks are most likely gear mesh. Gearbox and structure could be resonant. An internal inspection and oil analysis should be considered. Also, check the unit fasteners for tightness. **Rated a Class II Defect.** Please provide detailed information on the gearbox for further analysis.

**Instrument Air Compressor new**
Vibrations in this unit appear normal. No actions required.

**C Concentrator Vacuum Pump 2130-1 old**
Vibrations in this unit appear normal. No actions required.

**Monthly Equipment this Survey on report**

**Middle Mix Bed Water Pump 191-07**
Dominant vibrations are shaft speed and 5X shaft speed. Inspect the coupling and alignment and check to make sure pump is operating in the optimal part of the flow curve. Last, check the pump for wear. **Rated a Class II Defect.**

An Abbreviated Last Measurement Summary follows below:

***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 Specialist
dshook@gohispeed.com
***Hi-Speed*** **Industrial Service**

# Abbreviated Last Measurement Summary

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Database: Arkema.rbm
Station: PEROXIDE
Route No. 4: ARK WK 2
Report Date: 18-Sep-19 07:18

| MEASUREMENT POINT | OVERALL LEVEL | HFD / VHFD |
|---|---|---|
| 7000-01 - AGITATOR,HYDROGENATOR C | (13-Sep-19) | |
| | OVERALL LEVEL | |
| 01 - DRIVESHAFT BRG-NORTH-SOUTH | .048 In/Sec | |
| 02 - DRIVESHAFT BRG-EAST-WEST | .039 In/Sec | |
| 03 - DRIVESHAFT BRG-VERTICAL | .047 In/Sec | |
| 11 - C Hydro Agitator MOTOR OB HORIZ | .048 In/Sec | |
| 11H - MOTOR OB HORIZ - HI FREQ | .047 In/Sec | |
| 12 - C Hydro Agitator MOTOR OB VERT | .047 In/Sec | |
| 12H - MOTOR OB VERT - HI FREQ | .047 In/Sec | |
| 13 - C Hydro Agitator Motor OB Axial | .045 In/Sec | |
| 13H - MOTOR OB AXIAL - HI FREQ | .043 In/Sec | |
| 21 - C Hydro Agitator MOTOR IB HORIZ | .062 In/Sec | |
| 21H - MOTOR IB HORIZ - HI FREQ | .061 In/Sec | |
| 22 - C Hydro Agitator MOTOR IB VERT | .058 In/Sec | |
| 22H - MOTOR IB VERT - HI FREQ | .054 In/Sec | |
| 23 - C Hydro Agitator Motor IB Axial | .062 In/Sec | |
| 23H - MOTOR IB AXIAL - HI FREQ | .066 In/Sec | |
| 31 - C Hydro Agitator GrBx In Horizon | .079 In/Sec | |
| 32 - C Hydro Agitator GrBx In VERT | .071 In/Sec | |
| 33 - C Hydro Agitator GrBx In Axial | .061 In/Sec | |
| 41 - C Hydro Agitator GrBx Top Horizo | .050 In/Sec | |
| 42 - C Hydro Agitator GrBx Top VERT | .042 In/Sec | |
| 53 - C Hydro Agitator GrBx Top Axial | .239 In/Sec | |
| 53L - C Hydro Agitator GrBx Top Axial | .148 In/Sec | |
| 57 - A/B Concentr Vac Pmp-var RPM | (13-Sep-19) | |
| | OVERALL LEVEL | |
| 11 - Motor OB HOR | .043 In/Sec | |
| | OVERALL LEVEL | 1-20 KHz |
| 11H - Motor OB HOR | .046 In/Sec | .327 G-s |
| 12 - Motor OB VERT | .054 In/Sec | |
| 12H - Motor OB VERT | .055 In/Sec | .218 G-s |
| 13 - Motor OB AXIAL | .072 In/Sec | |
| 21 - Motor IB HOR | .063 In/Sec | |
| 23 - Motor IB AXIAL | .070 In/Sec | |
| 71 - Compressor IB HOR | .144 In/Sec | |
| 81 - Compressor OB Horiz | .340 In/Sec | |
| 83 - Compressor OB Axial | .063 In/Sec | |
| 2130-1 - FLASH VAP VAC PUMP-var speed | (13-Sep-19) | |
| | OVERALL LEVEL | |
| 11 - Motor OB HOR | .044 In/Sec | |
| 12 - Motor OB VERT | .034 In/Sec | |
| 21 - Motor IB HOR | .038 In/Sec | |
| 22 - Motor IB VERT | .051 In/Sec | |
| 23 - Motor IB AXIAL | .058 In/Sec | |

| | | | |
|---|---|---|---|
| 71 | - Compressor IB HOR | .057 In/Sec | |
| 72 | - Compressor IB VERT | .070 In/Sec | |
| 81 | - Compressor OB Horiz | .087 In/Sec | |
| 82 | - Compressor OB VERT | .074 In/Sec | |
| 83 | - Compressor OB Axial | .047 In/Sec | |

C-203 - C-203 Comp (Old Joy) (13-Sep-19)

| | | OVERALL LEVEL | 1-20 KHz |
|---|---|---|---|
| 11 | - MOTOR OB HOR | .034 In/Sec | 1.279 G-s |
| 12 | - MOTOR OB VERT | .031 In/Sec | .607 G-s |
| 13 | - MOTOR OB AXIAL | .048 In/Sec | 1.662 G-s |
| 21 | - MOTOR IB HOR | .015 In/Sec | .303 G-s |
| 22 | - MOTOR IB VERT | .026 In/Sec | .582 G-s |
| 23 | - MOTOR IB AXIAL | .033 In/Sec | .123 G-s |
| 71M | - COMP MALE SHAFT IB HOR | .029 In/Sec | |
| 72M | - COMP MALE SHAFT IB VERT | .037 In/Sec | |
| 73M | - COMP MALE SHAFT IB AXIAL | .052 In/Sec | |
| 81M | - COMP MALE SHAFT OB HOR | .054 In/Sec | |
| 82M | - COMP MALE SHAFT OB VERT | .056 In/Sec | |
| 83M | - COMP MALE SHAFT OB AXIAL | .030 In/Sec | |
| 71F | - COMP FEMALE SHAFT IB HOR | .048 In/Sec | |
| 72F | - COMP FEMALE SHAFT IB VERT | .045 In/Sec | |
| 73F | - COMP FEMALE SHAFT IB AXIAL | .055 In/Sec | |
| 81F | - COMP FEMALE SHAFT OB HOR | .043 In/Sec | |
| 82F | - COMP FEMALE SHAFT OB VERT | .026 In/Sec | |
| * 83F | - COMP FEMALE SHAFT OB AXIAL | .059 In/Sec | |

C-201 - C-201 Comp (Old Centac) (13-Sep-19)

| | | OVERALL LEVEL | 1-20 KHz |
|---|---|---|---|
| 11 | - MOTOR OB HOR | .087 In/Sec | .389 G-s |
| 12 | - MOTOR OB VERT | .066 In/Sec | 1.099 G-s |
| 13 | - MOTOR OB AXIAL | .060 In/Sec | 1.276 G-s |
| 21 | - MOTOR IB HOR | .080 In/Sec | .415 G-s |
| 22 | - MOTOR IB VERT | .036 In/Sec | .047 G-s |
| 23 | - MOTOR IB AXIAL | .063 In/Sec | .723 G-s |
| 71M | - COMP MALE SHAFT IB HOR | .028 In/Sec | |
| 72M | - COMP MALE SHAFT IB VERT | .049 In/Sec | |
| 73M | - COMP MALE SHAFT IB AXIAL | .076 In/Sec | |
| 81M | - COMP MALE SHAFT OB HOR | .067 In/Sec | |
| 82M | - COMP MALE SHAFT OB VERT | .051 In/Sec | |
| * 83M | - COMP MALE SHAFT OB AXIAL | .068 In/Sec | |
| 71F | - COMP FEMALE SHAFT IB HOR | .050 In/Sec | |
| 72F | - COMP FEMALE SHAFT IB VERT | .044 In/Sec | |
| 73F | - COMP FEMALE SHAFT IB AXIAL | .058 In/Sec | |
| 81F | - COMP FEMALE SHAFT OB HOR | .039 In/Sec | |
| 82F | - COMP FEMALE SHAFT OB VERT | .052 In/Sec | |
| * 83F | - COMP FEMALE SHAFT OB AXIAL | .064 In/Sec | |

C-202 - C-202 Comp (New Location) (13-Sep-19)

| | | OVERALL LEVEL | 1-20 KHz |
|---|---|---|---|
| 11 | - MOTOR OB HOR | .043 In/Sec | .321 G-s |
| 12 | - MOTOR OB VERT | .108 In/Sec | .282 G-s |
| 13 | - MOTOR OB AXIAL | .065 In/Sec | 1.888 G-s |
| 21 | - MOTOR IB HOR | .053 In/Sec | .082 G-s |
| 22 | - MOTOR IB VERT | .092 In/Sec | .802 G-s |
| 23 | - MOTOR IB AXIAL | .053 In/Sec | .099 G-s |
| 71M | - COMP MALE SHAFT IB HOR | .029 In/Sec | |

| | | |
|---|---|---|
| 72M – COMP MALE SHAFT IB VERT | .047 In/Sec | |
| 73M – COMP MALE SHAFT IB AXIAL | .070 In/Sec | |
| 81M – COMP MALE SHAFT OB HOR | .044 In/Sec | |
| 82M – COMP MALE SHAFT OB VERT | .047 In/Sec | |
| * 83M – COMP MALE SHAFT OB AXIAL | .060 In/Sec | |
| 71F – COMP FEMALE SHAFT IB HOR | .034 In/Sec | |
| 72F – COMP FEMALE SHAFT IB VERT | .063 In/Sec | |
| 73F – COMP FEMALE SHAFT IB AXIAL | .055 In/Sec | |
| 81F – COMP FEMALE SHAFT OB HOR | .047 In/Sec | |
| 82F – COMP FEMALE SHAFT OB VERT | .053 In/Sec | |
| * 83F – COMP FEMALE SHAFT OB AXIAL | .080 In/Sec | |

new AC – INSTRUMENT AIR COMPRESSOR (13-Sep-19)

| | OVERALL LEVEL | 1-20 KHz |
|---|---|---|
| 11 – MOTOR OB HOR | .113 In/Sec | 1.244 G-s |
| 12 – MOTOR OB VERT | .092 In/Sec | 1.100 G-s |
| 13 – MOTOR OB AXIAL | .066 In/Sec | 1.282 G-s |
| 21 – MOTOR IB HOR | .127 In/Sec | 1.469 G-s |
| 22 – MOTOR IB VERT | .096 In/Sec | .416 G-s |
| 23 – MOTOR IB AXIAL | .099 In/Sec | .247 G-s |

| | |
|---|---|
| 71M – COMP MALE SHAFT IB HOR | .195 In/Sec |
| 72M – COMP MALE SHAFT IB VERT | .286 In/Sec |
| 73M – COMP MALE SHAFT IB AXIAL | .265 In/Sec |
| 81M – COMP MALE SHAFT OB HOR | .213 In/Sec |
| 82M – COMP MALE SHAFT OB VERT | .260 In/Sec |
| 83M – COMP MALE SHAFT OB AXIAL | .285 In/Sec |
| 71F – COMP FEMALE SHAFT IB HOR | .154 In/Sec |
| 72F – COMP FEMALE SHAFT IB VERT | .159 In/Sec |
| 73F – COMP FEMALE SHAFT IB AXIAL | .143 In/Sec |
| 81F – COMP FEMALE SHAFT OB HOR | .126 In/Sec |
| 82F – COMP FEMALE SHAFT OB VERT | .232 In/Sec |
| 83F – COMP FEMALE SHAFT OB AXIAL | .195 In/Sec |

201-08A – COMPRESSOR,NASH A 201-08A (13-Sep-19)

| | OVERALL LEVEL |
|---|---|
| 11 – Nash Compr A Motor OB Horiz | .051 In/Sec |
| 12 – Nash Compr A Motor OB Vertical | .062 In/Sec |
| 12H – Nash Compr A Motor OB Vertical | .063 In/Sec |
| 13 – Nash Compr A Motor OB Axial | .111 In/Sec |
| 21 – Nash Compr A Motor IB Horiz | .075 In/Sec |
| 22 – Nash Compr A Motor IB VERT | .085 In/Sec |
| 23 – Nash Compr A Motor IB AXIAL | .135 In/Sec |
| 71 – Nash Compr A COMP IB HORIZ | .133 In/Sec |
| 72 – Nash Compr A Compressor IB Verti | .179 In/Sec |
| 72H – Nash Compr A COMP IB Vertical | .174 In/Sec |
| 73 – Nash Compr A COMP IB AXIAL | .102 In/Sec |
| 81 – Nash Compr A COMP OB HORIZ | .154 In/Sec |
| 82 – Nash Compr A Compressor OB Verti | .223 In/Sec |
| 82H – Nash Compr A COMP OB Vertical | .229 In/Sec |
| 83 – Nash Compr A Compressor OB Axial | .106 In/Sec |
| 83H – Nash Compr A COMP OB AXIAL | .114 In/Sec |

9002-10 – D-HYDROGENATOR AGITATOR (13-Sep-19)

| | OVERALL LEVEL |
|---|---|
| 11 – MOTOR OUTBOARD HORIZONTAL | .089 In/Sec |
| 21 – MOTOR INBOARD HORIZONTAL | .063 In/Sec |
| 23 – motor inboard axial | .060 In/Sec |

| | | |
|---|---|---|
| 31 | - GEARBOX INPUT SHAFT -HORIZONTAL | .269 In/Sec |
| 31H | - GEARBOX INPUT SHAFT -HORIZONTAL | .173 In/Sec |
| 31L | - GEARBOX INPUT SHAFT-N-S-LOW FRQ | .261 In/Sec |
| 51 | - GEARBOX TOP PLATE- E-W | .370 In/Sec |
| 51L | - GEARBOX OUTPUT SHAFT-E-W-LOW FRQ | .342 In/Sec |
| 52 | - GEARBOX TOP PLATE- N-S | .417 In/Sec |
| 52L | - GEARBOX OUTPUT SHAFT-E-W-LOW FRQ | .367 In/Sec |
| 53 | - GEARBOX OUTPUT SHAFT -VERTICAL | .141 In/Sec |
| 61 | - GEARBOX OUTPUT SHAFT-HORIZONTAL | .176 In/Sec |
| 61L | - GEARBOX OUTPUT SHAFT-E-W-LOW FRQ | .235 In/Sec |
| 81 | - AGIT INTERMED BRG @ SEAL- N-S | .041 In/Sec |
| 82 | - AGIT INTERMED BRG @ SEAL- E-W | .041 In/Sec |
| 83 | - AGIT INTERMED BRG @ SEAL- VERT | .047 In/Sec |

| 9003-01 | - D-HYDRO PRIMARY FILT FD PUMP | (13-Sep-19) |
|---|---|---|
| | | OVERALL LEVEL |
| 11 | - MOTOR OUTBOARD HORIZONTAL | .056 In/Sec |
| 21 | - MOTOR INBOARD HORIZONTAL | .047 In/Sec |
| 23 | - MOTOR INBOARD AXIAL | .050 In/Sec |
| 71 | - PUMP HORIZONTAL | .080 In/Sec |
| 72 | - PUMP VERTICAL | .126 In/Sec |

| 9001-01 | - D-HYDRO SECOND. FILT FD PUMP | (13-Sep-19) |
|---|---|---|
| | | OVERALL LEVEL |
| 11 | - MOTOR OUTBOARD HORIZONTAL | .056 In/Sec |
| 21 | - MOTOR INBOARD HORIZONTAL | .046 In/Sec |
| 23 | - MOTOR INBOARD AXIAL | .047 In/Sec |
| 71 | - PUMP HORIZONTAL | .098 In/Sec |
| 72 | - PUMP VERTICAL | .103 In/Sec |

| 192-03 | - Two Stage Water Pump A-WEST | (13-Sep-19) |
|---|---|---|
| | | OVERALL LEVEL |
| 11 | - MOTOR OUTBOARD HORIZONTAL | .068 In/Sec |
| 21 | - MOTOR IB HORIZ | .076 In/Sec |
| 23 | - motor  inboard axial | .050 In/Sec |
| 71 | - PUMP HORIZONTAL | .180 In/Sec |
| 72 | - PUMP VERTICAL | .063 In/Sec |

| 191-07 | - M MIX BED WATER PUMP 191-07 | (13-Sep-19) |
|---|---|---|
| | | OVERALL LEVEL |
| 11 | - Chilled H2O Pump Motor OB Horizo | .150 In/Sec |
| 21 | - Chilled H2O Pump Motor IB Horizo | .128 In/Sec |
| 23 | - MOTOR INBOARD | .053 In/Sec |
| 71 | - Chilled H2O Pump IB Horizontal | .424 In/Sec |
| 72 | - PUMP VERTICAL | .313 In/Sec |

| 2130-1old | - C Concentrator Vacuum Pump | (13-Sep-19) |
|---|---|---|
| | | OVERALL LEVEL |
| 11 | - Motor OB HOR | .055 In/Sec |
| 21 | - Motor IB HOR | .064 In/Sec |
| 23 | - Motor IB AXIAL | .145 In/Sec |
| 71 | - Compressor IB HOR | .122 In/Sec |
| 81 | - Compressor OB Horiz | .161 In/Sec |
| 83 | - Compressor OB Axial | .065 In/Sec |

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Clarification Of Vibration Units:

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

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