

March 27, 2020

ARKEMA

Subject: March week 4 vibration service report

Weekly Equipment

C Concentrator Vacuum Pump 2130-1

The pump axial vibration has dropped considerably; the outboard radial is steady at 0.177"/sec velocity. No action is required.

Air Compressor C-201

Rotor bar vibrations are under1g RMS. 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

Rotor bar vibrations are under 1g RMS. The trend clearly shows that the vibrations vary considerably over time. No actions required.

Air Compressor C-203

Rotor bar vibrations are up a little to 2.3 g's RMS. 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. No actions required.

Instrument Air Compressor new

Vibration appeared to be about normal at near 0.3"/sec velocity peak for the male shaft. **Rated a Class I Defect.**

Note: The oil device that was leaking was replaced last week and seems to be working properly.

Air Compressor NASH A 201-08A

Vibrations are still down in the motor after the foot bolts were tightened. We recommend a complete cleaning and relubrication of all the foot bolts for the motor and vacuum pump. Pump vibrations are mixed. Check the pump bearing large flange bolts also. Check both shafts for excessive clearance with a lift check and finish with a shaft alignment. The pump is at 0.267"/sec velocity peak, so the unit is still **Rated a Class II Defect.**

7030 Ryburn Drive Millington, TN 38053 P. 901-873-5300 F. 901-873-5301

D Hydrogenator Agitator 9002-10

Vibration data shows a slight change in vibrations this survey. Highest amplitude is at 0.321"/sec velocity peak for the gearbox top E/W measurement. **Still rated a Class I Defect.**

Agitator, Hydrogenator C 7001-01

Out of service.

A/B Concentrator Vacuum Pump 57 Out of service.

Flash Vacuum Pump 2130-1 Out of service.

Monthly Equipment

North Cooling Tower-South Fan Motor

Motor outboard Vibration is at 0.378"/sec velocity peak overall.

The motor 1xRPM (29.8 Hz) vibration appears to be beating with vibration at about 32 Hz; However, it only shows up in the ODE of the motor. Inspect for loose fasteners, structural issues and have the coupling inspected and shaft alignment checked during the next downtime. **Rated a Class I Defect.**

South Cooling Tower-South Fan

Vibration peaks possibly associated with fan shaft and blade pass can be seen in the unit data. The overall vibration is worst in the motor at 0.34"/sec velocity peak. Inspect the fan unit for loose fasteners, structural issues and blade pitch or damage issues at the next downtime. **Rated a Class I Defect.**

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 ****** Database: Arkema.rbm Station: PEROXIDE Route No. 5: ARK WK 3/4 Report Date: 27-Mar-20 13:01 MEASUREMENT POINT OVERALL LEVEL HFD / VHFD _____ _____ _____ 2130-1old - C Concentrator Vacuum Pump (27-Mar-20) OVERALL LEVEL 1-20 KHz 11 - Motor OB HOR .069 In/Sec 21 - Motor IB HOR .069 In/Sec 23 - Motor IB AXIAL .184 In/Sec 71 - Compressor IB HOR .137 In/Sec .162 In/Sec 81 - Compressor OB Horiz .083 In/Sec 83 - Compressor OB Axial C-203 - C-203 Comp (27-Mar-20) OVERALL LEVEL 1-20 KHz .234 G-s .021 In/Sec 11 - MOTOR OB HOR 12 - MOTOR OB VERT .646 G-s .037 In/Sec 2.313 G-s 21 - MOTOR IB HOR .080 In/Sec .978 G-s 22 - MOTOR IB VERT .043 In/Sec .032 In/Sec 23 - MOTOR IB AXIAL 1.180 G-s .032 In/Sec .031 In/Sec .036 In/Sec .056 In/Sec .054 In/Sec .052 In/Sec .034 In/Sec .067 In/Sec .037 In/Sec .038 In/Sec 71M - COMP MALE SHAFT IB HOR 72M - COMP MALE SHAFT IB VERT 73M - COMP MALE SHAFT IB AXIAL 81M - COMP MALE SHAFT OB HOR 82M - COMP MALE SHAFT OB VERT 71F - COMP FEMALE SHAFT IB HOR 72F - COMP FEMALE SHAFT IB VERT 73F - COMP FEMALE SHAFT IB AXIAL 81F - COMP FEMALE SHAFT OB HOR 82F - COMP FEMALE SHAFT OB VERT .038 In/Sec C-202 - C-202 Comp (27-Mar-20) 1-20 KHz OVERALL LEVEL 11 - MOTOR OB HOR .048 In/Sec .145 G-s 12 - MOTOR OB VERT .106 In/Sec .447 G-s 21 - MOTOR IB HOR .061 In/Sec .606 G-s .089 In/Sec 22 - MOTOR IB VERT .766 G-s 23 - MOTOR IB AXIAL .049 In/Sec .325 G-s .048 In/Sec 71M - COMP MALE SHAFT IB HOR .053 In/Sec 72M - COMP MALE SHAFT IB VERT .098 111, 2 .046 In/Sec .098 In/Sec 73M - COMP MALE SHAFT IB AXIAL 81M - COMP MALE SHAFT OB HOR .045 In/Sec .038 In/Sec .068 In/Sec .061 In/Sec .044 In/Sec .053 In/Sec 82M - COMP MALE SHAFT OB VERT 71F - COMP FEMALE SHAFT IB HOR 72F - COMP FEMALE SHAFT IB VERT 73F - COMP FEMALE SHAFT IB AXIAL 81F - COMP FEMALE SHAFT OB HOR 82F - COMP FEMALE SHAFT OB VERT .053 In/Sec

C-201 - C-201 Comp (27-Mar-20) OVERALL LEVEL 1-20 KHz .072 In/Sec .410 G-s 11- MOTOR OB HOR.072 In/Sec12- MOTOR OB VERT.020 In/Sec21- MOTOR IB HOR.100 In/Sec22- MOTOR IB VERT.070 In/Sec23- MOTOR IB VERT.070 In/Sec23- MOTOR IB AXIAL.044 In/Sec71M- COMP MALE SHAFT IB HOR.044 In/Sec72M- COMP MALE SHAFT IB VERT.072 In/Sec73M- COMP MALE SHAFT IB AXIAL.055 In/Sec81M- COMP MALE SHAFT OB HOR.058 In/Sec82M- COMP MALE SHAFT OB VERT.064 In/Sec71F- COMP FEMALE SHAFT IB HOR.053 In/Sec72F- COMP FEMALE SHAFT IB VERT.080 In/Sec73F- COMP FEMALE SHAFT IB AXIAL.043 In/Sec81F- COMP FEMALE SHAFT OB HOR.089 In/Sec82F- COMP FEMALE SHAFT OB VERT.073 In/Sec 11 - MOTOR OB HOR .358 G-s .496 G-s .246 G-s .642 G-s new AC - INSTRUMENT AIR COMPRESSOR (27-Mar-20)
 OVERALL LEVEL
 1-20 KHz

 .169 In/Sec
 1.959 G-s

 .107 In/Sec
 .794 G-s
 --20 KHz 1.959 G-s .107 In/Sec .794 G-s .073 In/Sec .590 G-s .073 In/Sec .590 G-s .073 In/Sec .590 G-s .073 In/Sec 1.882 G-s .090 In/Sec 1.067 G-s .23 - MOTOR IB VERT .090 In/Sec 1.067 G-s .1811 G-s .1811 G-s .1811 G-s .1811 G-s .1811 G-s .1817 - COMP FEMALE SHAFT IB HOR .222 In/Sec .227 - COMP FEMALE SHAFT IB VERT .170 In/Sec 81F - COMP FEMALE SHAFT OB HOR .151 In/Sec 82F - COMP FEMALE SHAFT OB VERT .270 In/Sec 83F - COMP FEMALE SHAFT OB VERT .101 In/Sec .181 G-s .181 OVERALL LEVEL11- Nash Compr A Motor OB Horiz.068 In/Sec12- Nash Compr A Motor OB Vertical.073 In/Sec13- Nash Compr A Motor OB Axial.141 In/Sec21- Nash Compr A Motor IB Horiz.078 In/Sec22- Nash Compr A Motor IB VERT.116 In/Sec23- Nash Compr A Motor IB AXIAL.151 In/Sec71- Nash Compr A Compressor IB Verti.150 In/Sec72- Nash Compr A Compressor IB Verti.221 In/Sec73- Nash Compr A COMP IB AXIAL.131 In/Sec81- Nash Compr A Compressor OB Verti.267 In/Sec82- Nash Compr A Compressor OB Axial.122 In/Sec 11 - Nash Compr A Motor OB Horiz
12 - Nash Compr A Motor OB Vertical
13 - Nash Compr A Motor OB Axial 9002-10 - D-HYDROGENATOR AGITATOR (27-Mar-20) OVERALL LEVEL 1-20 KHz .081 In/Sec 11 - MOTOR OUTBOARD HORIZONTAL

21 - MOTOR INBOARD HORIZONTAL - MOTOR INBOARD HORIZONTAL .073 In,Sec - motor inboard axial .051 In/Sec - GEARBOX INPUT SHAFT -HORIZONTAL .198 In/Sec - GEARBOX INPUT SHAFT-N-S-LOW FRQ .193 In/Sec .074 In/Sec 31 .193 In/Sec51L - GEARBOX OUTPUT SHAFT-E-W-LOW FRQ.271 In/Sec52 - GEARBOX TOP PLATE- N-S.318 In/Sec52L - GEARBOX OUTPUT SHAFT-E-W-LOW FRQ.238 In/Sec53 - GEARBOX OUTPUT SHAFT-E-W-LOW FRQ.130 In/Sec61 - GEARBOX OUTPUT SHAFT-HORIZONTAL.188 In/Sec61L - GEARBOX OUTPUT SHAFT-E-W-LOW FRQ.161 In/Sec61L - GEARBOX OUTPUT SHAFT-E-W-LOW FRQ.161 In/Sec61L - GEARBOX OUTPUT SHAFT-E-W-LOW FRQ.044 In/Sec81 - AGIT INTERMED BRG @ SEAL- N-S.043 In/Sec83 - AGIT INTERMED BRG @ SEAL- UPDET.043 In/Sec 31L - GEARBOX INPUT SHAFT-N-S-LOW FRQ NTC-SF - N CT-SOUTH FAN, N TWR (27-Mar-20) OVERALL LEVEL 1-20 KHz - MOTOR OB HORIZ .378 In/Sec 1 .208 In/Sec .208 In/Sec .190 In/Sec .201 In/Sec .0063 In/Sec 2 - MOTOR IB HORIZ - MOTOR IB AXIAL 3 - MOTOR IB AXIAL - GEARBOX INPUT HORIZONTAL 4 5 - GEARBOX VERTICAL .266 In/Sec .271 In/Sec - GEARBOX AXIAL 6 6L – GEARBOX AXIAL LOW FREQ NCT - NF - N CT -NORTH FAN, N TWR (27-Mar-20) OVERALL LEVEL 1-20 KHz .221 In/Sec 7 - MOTOR OB HORIZ .178 In/Sec 8 - MOTOR IB HORIZ .164 In/Sec - MOTOR IB AXIAL 9 10 - GEARBOX INPUT HORIZONTAL .142 In/Sec - GEARBOX VERTICAL .150 In/Sec 11 12 - GEARBOX AXIAL .137 In/Sec 530-02 - PUMP, N. COOLING TWR, MIDDLE (27-Mar-20) OVERALL LEVEL 1-20 KHz 11 - MOT TOP N-S .113 In/Sec 12 - MOTOR TOP E-W .178 In/Sec 530-03 - PUMP, N. COOLING TWR, SOUTH (27-Mar-20) OVERALL LEVEL 1-20 KHz 11 - MOT TOP N-S .185 In/Sec 12 - MOTOR TOP E-W .109 In/Sec 548-7 - IRON-FREE H2O BOOSTER PUMP (27-Mar-20) OVERALL LEVEL 1-20 KHz 11 - MOTOR OUTBOARD HORIZONTAL .022 In/Sec .023 In/Sec .058 In/Sec .046 In/Sec 21 - MOTOR INBOARD HORIZONTAL 23 - MOTOR INBOARD AXIAL 71 - PUMP HORIZONTAL 72 - PUMP VERTICAL .023 In/Sec STC-NF - S CT - NORTH FAN, S TWR (27-Mar-20) OVERALL LEVEL 1-20 KHz .341 In/Sec 1 - MOTOR OB HORIZ 2 - MOTOR IB HORIZ .291 In/Sec 3 - MOTOR IB AXIAL .217 In/Sec

.211 In/Sec 4 - GEARBOX INPUT HORIZONTAL 6 - GEARBOX AXIAL .273 In/Sec STC-MF - S CT - MID FAN, S TWR (27-Mar-20) OVERALL LEVEL 1-20 KHz .265 In/Sec - MOTOR OB HORIZ 1 .242 In/Sec .126 In/Sec .132 In/Sec .116 In/Sec .105 In/Sec - MOTOR IB HORIZ 2 3 - MOTOR IB AXIAL 4 - GEARBOX INPUT HORIZONTAL 5 - GEARBOX VERTICAL 6 - GEARBOX AXIAL STC-SF - S CT - SOUTH FAN, S TWR (27-Mar-20) OVERALL LEVEL 1-20 KHz .246 In/Sec 1 - MOTOR OB HORIZ .278 In/Sec 2 - MOTOR IB HORIZ .269 In/Sec 3 - MOTOR IB AXIAL - GEARBOX INPUT HORIZONTAL .130 In/Sec 4 .251 In/Sec - GEARBOX VERTICAL 5 6 - GEARBOX AXIAL .279 In/Sec SCT-1 - SOUTH CT PUMP - EAST (27-Mar-20) OVERALL LEVEL 1-20 KHz .037 In/Sec .042 In/Sec 11 - MOTOR OUTBOARD HORIZONTAL 21 - MOTOR INBOARD HORIZONTAL 23 - MOTOR INBOARD AXIAL .075 In/Sec 71 - PUMP HORIZONTAL .176 In/Sec 72 - PUMP VERTICAL .108 In/Sec (27-Mar-20) SCT-2 - SOUTH CT PUMP - MID OVERALL LEVEL 1-20 KHz 11 - MOTOR OUTBOARD HORIZONTAL21 - MOTOR INBOARD HORIZONTAL .037 In/Sec .036 In/Sec .060 In/Sec 23 - MOTOR INBOARD AXIAL 71 - PUMP HORIZONTAL .151 In/Sec 72 - PUMP VERTICAL .113 In/Sec (27-Mar-20) SCT-3 - SOUTH CT PUMP - WEST OVERALL LEVEL 1-20 KHz .047 In/Sec 11 - MOTOR OUTBOARD HORIZONTAL 21 - MOTOR INBOARD HORIZONTAL .043 In/Sec .078 In/Sec 23 - MOTOR INBOARD AXIAL .207 In/Sec 71 - PUMP HORIZONTAL 72 - PUMP VERTICAL .155 In/Sec _____

Clarification Of Vibration Units:

Jarricat.	TOUL OF	VIDIALIC	JII UIII
Acc	>	G-s	PK
Vel	>	In/Sec	PK