

June 30, 2020

ARKEMA

Subject: Week 3, 4 vibration service report

Weekly Peroxide Route Equipment Observations

A/B Concentrator Vacuum Pump 57

Water is back on the pump unit this month. The outboard bearing horizontal vibration has dropped back down to 0.308"/sec velocity peak overall. The vibration is dominated by a 16-order peak, which is most likely vane pass. The vibration will shorten the life of the unit. **Rated a Class II Defect.**

Agitator, Hydrogenator C 7001-01

The highest motor overall is 0.259"/sec velocity peak again for the inboard axial vibration. The motor speed today was read from the data to be about 1,359 RPM. Data shows multiple lower frequency harmonics of shaft speed as well as non-synchronous peaks in the upper frequencies. The bearings and fits in the replacement motor could be in some distress. Other issues could be loose fasteners, cocked bearings, bowed rotor or a coupling and alignment Issue. Inspect the base bolts for proper torque. Motor is still rated a Class II Defect.

C Concentrator Vacuum Pump 2130-1

The pump axial and radial vibrations are acceptable. No action is required.

Flash Vacuum Pump 2130-1

Vibrations appear to be normal this survey. No actions required.

Air Compressor C-201

Rotor bar vibrations are normal for this motor's history. 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 normal for this motor's history. The trend clearly shows that the vibrations vary considerably over time. We will watch this unit closely for changes. No immediate actions required at this time.

Air Compressor C-203

Rotor bar vibrations are normal for this motor's history. 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.

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

Instrument Air Compressor new

The male and female shaft vibrations seem to show gear mesh and harmonics as well as a beat vibration occasionally. We will keep a close eye on this unit going forward. **Rated a Class I Defect for now.**

Air Compressor NASH A 201-08A

Highest vibration is still in the pump itself at just over 0.283"/sec velocity peak for the outboard vertical. **Rated a Class I Defect.**

D Hydrogenator Agitator 9002-10

Vibration data shows a slight change in vibrations this survey. Highest amplitude is up at about 0.323"/sec velocity peak overall for the gearbox top N/S measurement. **Still rated a Class I Defect.**

Monthly Route Equipment Observations

North Cooling Tower South Fan

The motor has a beat vibration near ½ Hertz at about 0.357"/sec velocity peak. Inspect the motor and fan drive train. **Rated a Class II Defect.**

South Cooling Tower South Fan

Multiple remote accelerometer connections appear to be non-functional. Inspect installation for defects as soon as possible.

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 Report Date: 30-Jun-20 07:31 HFD / VHFD MEASUREMENT POINT OVERALL LEVEL _____ -----_____ 2130-101d - C Concentrator Vacuum Pump (26-Jun-20) 1-20 KHz OVERALL LEVEL .080 In/Sec .351 G-s 11 - Motor OB HOR 21 - Motor IB HOR .085 In/Sec .459 G-s .272 G-s - Motor IB AXIAL .131 In/Sec 23 .849 G-s 71 - Compressor IB HOR .127 In/Sec .173 In/Sec .795 G-s 81 - Compressor OB Horiz .107 In/Sec 83 - Compressor OB Axial 1.598 G-s 7000-01 - AGITATOR, HYDROGENATOR C (26-Jun-20) OVERALL LEVEL 1-20 KHZ .050 In/Sec .031 G-s 01 - DRIVESHAFT BRG-NORTH-SOUTH .037 G-s 02 - DRIVESHAFT BRG-EAST-WEST .047 In/Sec 03 - DRIVESHAFT BRG-VERTICAL .073 In/Sec .048 G-s .242 In/Sec .179 In/Sec 11 - C Hydro Agitator MOTOR OB HORIZ 1.008 G-s 12 - C Hydro Agitator MOTOR OB VERT 1.065 G-s 13 - C Hydro Agitator Motor OB Axial .149 In/Sec .275 G-s 21 - C Hydro Agitator MOTOR IB HORIZ .208 In/Sec .232 G-s .065 G-s .149 In/Sec 22 - C Hydro Agitator MOTOR IB VERT .211 G-s .259 In/Sec - C Hydro Agitator Motor IB Axial 23 .191 In/Sec .084 In/Sec .065 In/Sec - C Hydro Agitator GrBx In Horizon .763 G-s 31 .888 G-s 32 - C Hydro Agitator GrBx In VERT 33 - C Hydro Agitator GrBx In Axial .590 G-s .201 In/Sec .048 In/Sec .054 In/Sec - C Hydro Agitator GrBx Top HZ E-W 41 .556 G-s .550 G-s 42 - C Hydro Agitator GrBx TOP HZ N-S .375 G-s 51 - C Hydro Agitator GrBx BOT HZ E-W .800 G-s 52 - C Hydro Agitator GrBx BOT HZ N-S .027 In/Sec .077 In/Sec 53 - C Hydro Agitator GrBx Top Axial .462 G-s 57 - A/B Concentr Vac Pmp-var RPM (26-Jun-20) OVERALL LEVEL 1-20 KHz 11 - Motor OB HOR .056 In/Sec .450 G-s .184 G-s 12 - Motor OB VERT .048 In/Sec .295 G-s .060 In/Sec 21 - Motor IB HOR .094 In/Sec .150 G-s 23 - Motor IB AXIAL .681 G-s .139 In/Sec 71 - Compressor IB HOR 81 - Compressor OB Horiz .308 In/Sec .739 G-s .051 In/Sec 83 - Compressor OB Axial .867 G-s 2130-1 - FLASH VAP VAC PUMP-var speed (26-Jun-20) OVERALL LEVEL 1-20 KHz 11 - Motor OB HOR .057 In/Sec .383 G-s 12 - Motor OB VERT .038 In/Sec .255 G-s 21 - Motor IB HOR .040 In/Sec .366 G-s .449 G-s 22 - Motor IB VERT .064 In/Sec 23 - Motor IB AXIAL .064 In/Sec .110 G-s

71 - Compressor IB HOR 72 - Compressor IB VERT 81 - Compressor OB Horiz 82 - Compressor OB VERT 83 - Compressor OB Axial C-203 - C-203 Comp 11 - MOTOR OB HOR 12 - MOTOR OB VERT 21 - MOTOR IB HOR 22 - MOTOR IB VERT 23 - MOTOR IB AXIAL 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 C-202 - C-202 Comp 11 - MOTOR OB HOR 12 - MOTOR OB VERT 21 - MOTOR IB HOR 22 - MOTOR IB VERT 23 - MOTOR IB AXIAL 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 - C-201 Comp C-201 11 - MOTOR OB HOR 12 - MOTOR OB VERT 21 - MOTOR IB HOR 22 - MOTOR IB VERT 23 - MOTOR IB AXIAL 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

.061 In/Sec	.353	G-s
.062 In/Sec	.222	G-s
069 In/Sec	.156	G-s
076 TR/Sec	231	G-8
.070 IN/Sec	.231	0.5
.037 In/Sec	.376	G-S
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(26-Jun-20)		
OVERALL LEVEL	1-20 1	KHz
.027 In/Sec	.655	G-s
.096 In/Sec	1.637	G-s
.034 In/Sec	1.176	G-s
.060 In/Sec	2.057	G-s
.049 In/Sec	1.961	G-s
OVERALL LEVEL	1-20	KHZ
	1 840	G-9
	2 242	C-0
	1 0 0 7	6-5
.064 IN/Sec	1.027	G-S
.059 In/Sec	3.022	G-S
.075 In/Sec	3.019	G-s
.045 In/Sec	2.660	G-s
.051 In/Sec	.757	G-s
.092 In/Sec	4.959	G-s
.053 In/Sec	1.481	G-s
.063 In/Sec	1.852	G-s
(26-Jun-20)		
OVERALL LEVEL	1-20 1	KH-
	1-201	C-0
.039 IN/Sec	. 920	G-S
110	500	<u> </u>
.116 In/Sec	. 533	G-s
.116 In/Sec .053 In/Sec	.533 .471	G-s G-s
.116 In/Sec .053 In/Sec .111 In/Sec	.533 .471 2.328	G-s G-s G-s
.116 In/Sec .053 In/Sec .111 In/Sec .042 In/Sec	.533 .471 2.328 .635	G-s G-s G-s G-s
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71F - COMP FEMALE SHAFT IB HOR.055 In/Sec2.114 G-s72F - COMP FEMALE SHAFT IB VERT.048 In/Sec1.541 G-s73F - COMP FEMALE SHAFT IB AXIAL.072 In/Sec4.079 G-s81F - COMP FEMALE SHAFT OB HOR.065 In/Sec2.404 G-s82F - COMP FEMALE SHAFT OB VERT.050 In/Sec1.351 G-s - INSTRUMENT AIR COMPRESSOR (26-Jun-20) new AC OVERALL LEVEL1-20 KHz.126 In/Sec.784 G-s .784 G-s 11 - MOTOR OB HOR 12- MOTOR OB VERT.103 In/Sec.657 G-s13- MOTOR OB AXIAL.062 In/Sec.272 G-s21- MOTOR IB HOR.155 In/Sec1.181 G-s22- MOTOR IB VERT.077 In/Sec.820 G-s23- MOTOR IB VERT.055 In/Sec.689 G-s23- MOTOR IB AXIAL.055 In/Sec.689 G-s71F- COMP FEMALE SHAFT IB HOR.140 In/Sec4.125 G-s72F- COMP FEMALE SHAFT IB VERT.178 In/Sec3.712 G-s73F- COMP FEMALE SHAFT OB HOR.133 In/Sec2.406 G-s82F- COMP FEMALE SHAFT OB HOR.133 In/Sec2.406 G-s82F- COMP FEMALE SHAFT OB VERT.177 In/Sec4.207 G-s83F- COMP FEMALE SHAFT IB HOR.095 In/Sec6.076 G-s71M- COMP MALE SHAFT IB VERT.146 In/Sec4.734 G-s73M- COMP MALE SHAFT IB AXIAL.120 In/Sec5.144 G-s81M- COMP MALE SHAFT OB HOR.186 In/Sec1.456 G-s82M- COMP MALE SHAFT OB VERT.229 In/Sec3.610 G-s83M- COMP MALE SHAFT OB AXIAL.155 In/Sec3.110 G-s .657 G-s .272 G-s .103 In/Sec 12 - MOTOR OB VERT - N CT-SOUTH FAN, N TWR NTC-SF (26-Jun-20) OVERALL LEVEL 1-20 KHz .367 In/Sec .524 G-s - MOTOR OB HORIZ 1

 .367 In/Sec
 .324 G-s

 .171 In/Sec
 .451 G-s

 .162 In/Sec
 .450 G-s

 OVERALL LEVEL
 1-20 KHZ

 .233 In/Sec
 .448 G-s

 .0054 In/Sec
 .0012 G-s

 .266 In/Sec
 .418 G-s

 .250 In/Sec
 .454 G-s

 2 - MOTOR IB HORIZ 3 - MOTOR IB AXIAL 4 - GEARBOX INPUT HORIZONTAL 5 - GEARBOX VERTICAL 6 - GEARBOX AXIAL 6L - GEARBOX AXIAL LOW FREQ (26-Jun-20) NCT - NF - N CT -NORTH FAN, N TWR
 OVERALL LEVEL
 1-20 KHz

 .232 In/Sec
 .375 G-s

 151 Tr (20)
 .375 G-s
 7 - MOTOR OB HORIZ
 .2.52 In/Sec
 .375 G-s

 .151 In/Sec
 .373 G-s

 .141 In/Sec
 .317 G-s

 OVERALL LEVEL
 1-20 KHZ

 .132 In/Sec
 .336 G-s

 .158 In/Sec
 .289 G-s

 .108 In/Sec
 .390 G-s
 8 - MOTOR IB HORIZ 9 - MOTOR IB AXIAL 10 - GEARBOX INPUT HORIZONTAL - GEARBOX VERTICAL 11 12 - GEARBOX AXIAL 530-02 - PUMP, N. COOLING TWR, MIDDLE (26-Jun-20)
 OVERALL LEVEL
 1-20 KHz

 .127 In/Sec
 .485 G-s

 .142 In/Sec
 .475 G-s
 .485 G-s 11 - MOT TOP N-S 12 - MOTOR TOP E-W .475 G-s 530-03 - PUMP, N. COOLING TWR, SOUTH (26-Jun-20) OVERALL LEVEL 1-20 KHz .099 In/Sec .520 G-s 11 - MOT TOP N-S

12 - MOTOR TOP E-W	.110 In/Sec	.331 G-s
548-7 - IRON-FREE H2O BOOSTER PUMP	(26-Jun-20)	1 00 ****-
	OVERALL LEVEL	1-20 KHZ
11 - MOTOR OUTBOARD HORIZONTAL	.034 In/Sec	.286 G-s
21 - MOTOR INBOARD HORIZONTAL	.042 In/Sec	.541 G-s
23 - MOTOR INBOARD AXIAL	.051 In/Sec	.252 G-s
71 - PUMP HORIZONTAL	.097 In/Sec	.075 G-s
72 - PUMP VERTICAL	.054 In/Sec	.112 G-s
STC-NF - S CT - NORTH FAN, S TWR	(26-Jun-20)	
	OVERALL LEVEL	1-20 KHz
1 - MOTOR OB HORIZ	.300 In/Sec	.343 G-s
2 - MOTOR IB HORIZ	.222 In/Sec	.186 G-s
3 - MOTOR IB AXIAL	.135 In/Sec	.145 G-s
	OVERALL LEVEL	1-20 KHZ
6 - GEARBOX AXIAL	.172 In/Sec	.364 G-s
4 - GEARBOX INPUT HORIZONTAL	.162 In/Sec	.498 G-s
STC-MF - S CT - MID FAN. S TWR	(26-Jun-20)	
	OVERALL LEVEL	1-20 KHz
1 - MOTOR OB HORIZ	276 In/Sec	442 G-s
2 - MOTOR TB HORTZ	245 In/Sec	121 G-s
3 - MOTOR TE AXIAL	138 Tn/Sec	179 G-s
	OVERALL LEVEL	1-20 KHZ
6 - GEARBOY AVIAL		306 6-8
$\mathbf{A} = \mathbf{GEARDOX} \mathbf{AXIAL}$	169 Jp/Sec	.300 G-S
5 - GEARBOX VERTICAL	086 In/Sec	539 C-e
	.000 11/560	
SCT-1 - SOUTH CT PUMP - EAST	(26-Jun-20)	
	OVERALL LEVEL	1-20 KHz
11 - MOTOR OUTBOARD HORIZONTAL	.041 In/Sec	1.473 G-s
21 - MOTOR INBOARD HORIZONTAL	.048 In/Sec	1.278 G-s
23 - MOTOR INBOARD AXIAL	.071 In/Sec	.314 G-s
71 - PUMP HORIZONTAL	.181 In/Sec	.818 G-s
72 - PUMP VERTICAL	.133 In/Sec	.805 G-s
	$(26 - T_{11} - 20)$	
SCI-Z - SOOTH CI POMP - MID		1 20 84-
	OVERALL LEVEL	
11 - MOTOR OUTBOARD HORIZONTAL	.044 In/Sec	.883 G-S
21 - MOTOR INBOARD HORIZONTAL	.042 In/Sec	.450 G-S
23 - MOTOR INBOARD AXIAL	.093 In/Sec	.165 G-s
71 - PUMP HORIZONTAL	.145 In/Sec	.887 G-s
72 - PUMP VERTICAL	.124 In/Sec	.989 G-s
SCT-3 - SOUTH CT PUMP - WEST	(26-Jun-20)	
	OVERALL LEVEL	1-20 KHz
11 - MOTOR OUTBOARD HORIZONTAL	.037 In/Sec	1.361 G-s
21 - MOTOR INBOARD HORIZONTAL	.060 In/Sec	.931 G-s
23 - MOTOR INBOARD AXIAL	.102 In/Sec	.619 G-s
71 - PUMP HORIZONTAL	.236 In/Sec	.859 G-s
72 - PUMP VERTICAL	.205 In/Sec	.485 G-s

Clarification Of Vibration Units: Acc --> G-s PK

Vel --> In/Sec PK Abbreviated Last Measurement Summary ********** Database: Arkema.rbm Station: PEROXIDE Report Date: 30-Jun-20 07:34 MEASUREMENT POINT HFD / VHFD OVERALL LEVEL _____ ----------201-08A - COMPRESSOR, NASH A 201-08A (26-Jun-20) OVERALL LEVEL1-20 KHz11- Nash Compr A Motor OB Horiz.077 In/Sec.101 G-s12- Nash Compr A Motor OB Vertical.072 In/Sec.110 G-s13- Nash Compr A Motor OB Axial.159 In/Sec.081 G-s21- Nash Compr A Motor IB Horiz.088 In/Sec.133 G-s22- Nash Compr A Motor IB VERT.111 In/Sec.091 G-s23- Nash Compr A Motor IB AXIAL.142 In/Sec.132 G-s71- Nash Compr A Compressor IB Verti.239 In/Sec1.056 G-s72- Nash Compr A COMP IB AXIAL.143 In/Sec.295 G-s81- Nash Compr A Compressor OB Verti.283 In/Sec.553 G-s83- Nash Compr A Compressor OB Axial.168 In/Sec.411 G-s OVERALL LEVEL 1-20 KHz _____ Clarification Of Vibration Units: Acc --> G-s PK Vel --> In/Sec PK Abbreviated Last Measurement Summary ********************************** Database: Arkema.rbm Station: PEROXIDE Report Date: 30-Jun-20 07:34 HFD / VHFD MEASUREMENT POINT OVERALL LEVEL ---------------9002-10 - D-HYDROGENATOR AGITATOR (26-Jun-20) OVERALL LEVEL 1-20 KHz .095 In/Sec .111 G-s 11 - MOTOR OUTBOARD HORIZONTAL

 .095 In/Sec
 .111 G-s

 .078 In/Sec
 .101 G-s

 .059 In/Sec
 .096 G-s

 .254 In/Sec
 .618 G-s

 OVERALL LEVEL
 1-20 KHZ

 .197 In/Sec
 .645 G-s

 OVERALL LEVEL
 1-20 KHZ

 .250 In/Sec
 .245 G-s

 OVERALL LEVEL
 1-20 KHZ

 .197 In/Sec
 .141 G-s

 OVERALL LEVEL
 1-20 KHZ

 .323 In/Sec
 .353 G-s

 OVERALL LEVEL
 1-20 KHZ

 .246 In/Sec
 .262 G-s

 OVERALL LEVEL
 1-20 KHZ

 21 - MOTOR INBOARD HORIZONTAL .101 G-s .078 In/Sec 23 - MOTOR INBOARD AXIAL 31 - GEARBOX INPUT SHAFT -HORIZONTAL * 31L - GEARBOX INPUT SHAFT-N-S-LOW FRQ 51 - GEARBOX TOP PLATE- E-W * 51L - GEARBOX TOP PLATE E-W-LOW FRQ 52 - GEARBOX TOP PLATE- N-S * 52L - GEARBOX TOP PLATE N-S-LOW FRO

	53 - GEARBOX OUTPUT TOP -VER	TICAL	.148 1	n/Sec	.639 G-s
	61 - GEARBOX BOTTOM E-W-HORI	ZONTAL	.158 1	n/Sec	.165 G-s
			OVERALI	LEVEL	1-20 KHZ
*	61L - GEARBOX BOTTOM-E-W-LOW	FRQ	.322 1	n/Sec	.120 G-s
			OVERALI	LEVEL	1-20 KHz
	81 - AGIT INTERMED BRG @ SEA	L- N-S	.054 1	n/Sec	.027 G-s
	82 - AGIT INTERMED BRG @ SEA	L- E-W	.050 1	n/Sec	.043 G-s
	83 - AGIT INTERMED BRG @ SEA	L- VERT	.042 1	n/Sec	.153 G-s
	Clarification Of Vibration Un	its:			
	Acc> G-s PK				
	Vel> In/Sec PK				
	* - Indicates Data Has Date	/Time Differen	t From M	lachine 1	Date/Time