

October 30, 2020

Arkema

Subject: October week 4 vibration service report

Most of the machines surveyed were found to be in good condition except for the following:

QualiTest® uses a four-step rating system for defects.

<u>Class I:</u> Defect is present, but effect on reliability is not clear; no immediate action is required. Continue to normally monitor.

<u>Class II:</u> Defect (s) present that may cause problem in long term (2-6 months.). Repair during normal maintenance scheduling. Continue to monitor.

<u>Class III</u>: 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.

<u>Class IV;</u> 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

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

Weekly Peroxide Route Critical Equipment Observations

C Concentrator Vacuum Pump 2130-1

Vibrations appear to be normal this survey. No vibration is above 0.164"/sec velocity peak. No actions required.

Agitator, Hydrogenator C 7001-01

The highest motor overall vibrations are 0.130"/sec velocity peak for the inboard vertical. We will continue to monitor this unit but take it off the class list.

A/B Concentrator Vacuum Pump 57

This unit's motor vibration is still below 0.10"/sec velocity peak. The outboard pump bearing overall is 0.221"/sec peak velocity, with a dominant vibration at 16 orders, which is most likely blade pass. We will continue to watch for changes. **Rated a Class I Defect.**

Flash Vacuum Pump 2130-1

Vibrations appear to be normal this survey. All velocity measurements are below 0.10"/sec peak. No actions required.

Air Compressor C-201

Rotor bar vibrations are highest for this motor's history. The trend clearly shows that the vibrations vary considerably over time but have risen considerably. We still believe these motors have possible weak rotor bar end connections that cause the vibrations to fluctuate higher due to loading. There is also an increase in blower case vibrations around 3 KHz. With a wide noise floor. We will continue to monitor this unit for changes. **Rated a Class II Defect**.

Air Compressor C-202

Rotor bar vibrations are high for this motor's history. The trend clearly shows that the vibrations vary considerably over time. We are still watching an increase in acceleration for the compressor section. **Rated a Class II Defect.** No immediate actions required at this time.

Air Compressor C-203

Rotor bar vibrations are normal for this motor's history. The waterfall spectra clearly show 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 There is also an increase in blower case vibrations around 3 KHz. With a wide noise floor. We will continue to monitor this unit for changes. **Rated a Class II Defect**.

Instrument Air Compressor

The male and female shaft vibrations still seem to show gear mesh and harmonics as well as a beat vibration occasionally. The male and female shaft vibrations are up to 11 and 8.5 g's RMS respectfully. The dominant vibration appears to be the second gear mesh harmonic at near 2500 Hz. Two other harmonic vibrations at near 1500 and 1600 Hz are beating near 120 Hz. The beat is strong sometimes since the vibrations are close and of nearly equal amplitude. We are still watching this unit closely and will be going forward. **Rated a Class II Defect for now.**

Air Compressor NASH A 201-08A

Highest vibration is still in the pump itself at just over 0.3"/sec velocity peak for the outboard vertical. The vibration spectrum is still dominated by a 20-order vibration, which is thought to be vane pass. **Rated a Class I Defect.**

D Hydrogenator Agitator 9002-10

Vibration data shows a slight decrease in vibrations this survey. Highest overall vibration is 0.298"/sec velocity peak for the gearbox top output bearing plate in the N/S direction. No issues today.

Monthly Service Units

Middle Mix Bed Pump 191-07

The large vane pass vibration on previous monthly reports has dropped significantly. We assume service was performed on the pump, or process changes were made. The vibration levels are considered normal now. This unit is non-rated now.

Abbreviated Last Measurement Summary					
	Database: Arkema.rbm				
	Station: PEROXIDE				
	Route No. 4: ARK WK 2				
	Report Date: 30-Oct-20 14:1	1			
	MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD		
213	0-1old - C Concentrator Vacuum Pump	(30-Oct-20)			
		OVERALL LEVEL	1-20 KHz		
11	- Motor OB HOR	.057 In/Sec	.456 G-s		
21	- Motor IB HOR	.077 In/Sec	.496 G-s		
23	- Motor IB AXIAL	.164 In/Sec	.202 G-s		
71	- Compressor IB HOR	.135 In/Sec	1.260 G-s		
81	- Compressor OB Horiz	.160 In/Sec	.789 G-s		
83	- Compressor OB Axial	.081 In/Sec	1.759 G-s		
700	0-01 - AGITATOR, HYDROGENATOR C	(30-Oct-20)			
	,	OVERALL LEVEL	1-20 KHZ		
02	- DRIVESHAFT BRG-EAST-WEST	.046 In/Sec	.075 G-s		
03	- DRIVESHAFT BRG-VERTICAL	.046 In/Sec	.024 G-s		
11	- C Hydro Agitator MOTOR OB HORIZ	.073 In/Sec	.627 G-s		
12	- C Hydro Agitator MOTOR OB VERT	.059 In/Sec	.531 G-s		
13	- C Hydro Agitator Motor OB Axial	.090 In/Sec	.383 G-s		
21	- C Hydro Agitator MOTOR IB HORIZ	.086 In/Sec	.466 G-s		
22	- C Hydro Agitator MOTOR IB VERT	.130 In/Sec	.453 G-s		
23	- C Hydro Agitator Motor IB Axial	.102 In/Sec	.437 G-s		
31	- C Hydro Agitator GrBx In Horizon	.096 In/Sec	.748 G-s		
32	- C Hydro Agitator GrBx In VERT	.083 In/Sec	.817 G-s		
33	- C Hydro Agitator GrBx In Axial	.053 In/Sec	.303 G-s		
41	- C Hydro GrBx shaft 2 Top HZ E-W	.052 In/Sec	.604 G-s		
42	- C Hydro GrBx shaft 2 BOT HZ E-W	.023 In/Sec	.542 G-s		
51	- C Hydro GrBx OUTPUT TOP HZ E-W	.043 In/Sec	.439 G-s		
52	- C Hydro GrBx OUTPUT BOT HZ E-W	.019 In/Sec	.319 G-s		
53	- C Hydro GrBx OUTPUT Top Axial	.050 In/Sec	.476 G-s		
57	- A/B Concentr Vac Pmp-var RPM	(30 - 0ct - 20)			
		OVERALL LEVEL	1-20 KHz		
11	- Motor OB HOR	.055 In/Sec	.210 G-s		
12	- Motor OB VERT	.046 In/Sec	.299 G-s		
21	- Motor IB HOR	.086 In/Sec	.153 G-s		
23	- Motor IB AXIAL	.051 In/Sec	.146 G-s		
71	- Compressor IB HOR	.138 In/Sec	.278 G-s		
81	- Compressor OB Horiz	.221 In/Sec	.715 G-s		
83	- Compressor OB Axial	.067 In/Sec	.665 G-s		
21 2	0-1 - FLACH VAD VAC DIMD-WAY groad	(30-0at-20)			
213	VI FIAM VAF VAC FOMF-VAL SPEEd	OVERALL LEVET	1-20 KH-		
11	- Motor OB HOR	049 Tr/Sec	125 G-e		
12	- Motor OB VEBT	061 Tr/Sec	188 6-9		
21	- Motor IB HOB	039 Tn/Sec	139 C-e		
~ -			. 139 6 3		

22 - Motor IB VERT 23 - Motor IB AXIAL 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 - C-201 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

.046	In/Sec			28	35	G-	·s
.054	In/Sec			17	71	G-	·s
.067	In/Sec			70)1	G-	·s
.077	In/Sec			65	56	G-	·s
.080	In/Sec			36	57	G-	·s
.085	In/Sec			33	39	G-	·s
.045	In/Sec			42	27	G-	·s
	,		•			-	-
(30-Oct	-20)						
OVERAL	L LEVEL		1-	20) 1	KHz	
.022	In/Sec			47	72	G-	·s
.121	In/Sec		4.	92	22	G-	·s
.032	In/Sec		1.	09	91	G-	·s
.110	In/Sec		з.	58	37	G-	·s
.027	In/Sec			70)2	G-	·s
OVERAL	L LEVEL		1 -	20) 1	KH7	
.069	In/Sec		4.	79	95	G-	s
069	In/Sec		۰. ٦	00	5	G-	
080	In/Sec		2.	38	34	G-	
088	In/Sec	-	9	38	88	G-	
089	In/Sec		2. २	40	20	с-	
.009			ר. זי	30	55	G-	
074			יר כי	20	20	G-	
152			2. 7	1/	11	G-	3
.155			/. 1	20	±4 > /	G-	· 5
.050	III/Sec		т. -	20	24	G-	· 5
.068	in/sec		۷.	08	50	G-	·s
120 000	201						
OVEDAT	-20) T TEX/ET		1_	20		2U-	
045	TP/SOC		1 – 1	1 :	25		
121			τ.	1.	50	G-	3
.131	In/Sec		· ·	9:	2	G-	·s
2090			2. 7	E (202	G-	· 5
.200	In/Sec		/. 1	2⊿ 70	22	G-	·s
.003	III/Sec		1. 1	12	כי ייי	-9 7117	, s
OVERAL	T 70°°		1 - 1	1/		ЛЛИ	
.057	In/Sec		ι.	10	50	G-	·s
.049	In/Sec		· ·	96	54 7 F	G-	·s
.104	In/Sec	-	2.	20	55	G-	·s
.081	In/Sec		4.	3:	53	G-	·s
.081	In/Sec		3.	10)2	G-	·s
.047	In/Sec		2.	29	92	G-	·s
.058	In/Sec	-	1.	18	31	G-	·s
.118	In/Sec	-	5.	11	10	G-	·s
.065	In/Sec		3.	02	28	G-	·s
.054	In/Sec		1.	32	23	G-	·s
(30-0ct	-20)			~ /			
OVERAL	L LEVEL	-	ц-	20		KHz	
.221	IN/Sec		ช. 7	1.7	1	G-	S
.19/	TU/Sec		/. 1	12	20	G-	S
.100	TU/Sec	•	<u>г</u> .	12	29	G-	·s
.071	IN/Sec		۷.	Τ2	99 77	G-	s
.076	IN/Sec		1.	01	/ <u>1</u>	-G	s
OVERAL	L LEVEL		т –	2(ן ו 	λΗZ	í
.054	In/Sec	-	ц.	45	56	G-	·s
.067	In/Sec	:	2.	68	30	G-	s
.073	In/Sec		1.	16	57	G-	·s

81M - COMP MALE SHAFT OB HOR.120 In/Sec6.896 G-s82M - COMP MALE SHAFT OB VERT.066 In/Sec2.374 G-s71F - COMP FEMALE SHAFT IB HOR.054 In/Sec2.690 G-s72F - COMP FEMALE SHAFT IB VERT.042 In/Sec.591 G-s73F - COMP FEMALE SHAFT IB AXIAL.084 In/Sec4.481 G-s81F - COMP FEMALE SHAFT OB HOR.080 In/Sec2.845 G-s82F - COMP FEMALE SHAFT OB VERT.063 In/Sec1.867 G-s - INSTRUMENT AIR COMPRESSOR (30-Oct-20) new AC
 OVERALL LEVEL
 1-20 KHz

 .162 In/Sec
 1.061 G-s

 .104 In/Sec
 .623 G-s
11- MOTOR OB HOR.162 In/Sec1.061 G-s12- MOTOR OB VERT.104 In/Sec.623 G-s13- MOTOR OB AXIAL.082 In/Sec.487 G-s21- MOTOR IB HOR.169 In/Sec1.301 G-s22- MOTOR IB VERT.093 In/Sec.320 G-s23- MOTOR IB AXIAL.053 In/Sec.686 G-sOVERALL LEVEL71F- COMP FEMALE SHAFT IB HOR.228 In/Sec72F- COMP FEMALE SHAFT IB VERT.155 In/Sec2.311 G-s73F- COMP FEMALE SHAFT OB HOR.144 In/Sec2.502 G-s81F- COMP FEMALE SHAFT OB VERT.324 In/Sec8.522 G-s83F- COMP FEMALE SHAFT IB HOR.124 In/Sec4.256 G-s71M- COMP MALE SHAFT IB VERT.189 In/Sec5.636 G-s71M- COMP MALE SHAFT IB HOR.124 In/Sec5.200 G-s81F- COMP MALE SHAFT IB HOR.124 In/Sec5.636 G-s71M- COMP MALE SHAFT IB VERT.189 In/Sec5.636 G-s73M- COMP MALE SHAFT IB VERT.189 In/Sec5.636 G-s73M- COMP MALE SHAFT OB HOR.234 In/Sec7.394 G-s82M- COMP MALE SHAFT OB VERT.285 In/Sec5.480 G-s83M- COMP MALE SHAFT OB AXIAL.333 In/Sec11.07 G-s 11 - MOTOR OB HOR 201-08A- COMPRESSOR, NASH A 201-08A(30-Oct-20)
OVERALL LEVEL1-20 KHz11- Nash Compr A Motor OB Horiz.076 In/Sec.098 G-s12- Nash Compr A Motor OB Vertical.085 In/Sec.159 G-s13- Nash Compr A Motor OB Axial.166 In/Sec.103 G-s21- Nash Compr A Motor IB Horiz.065 In/Sec.153 G-s22- Nash Compr A Motor IB VERT.100 In/Sec.106 G-s23- Nash Compr A Motor IB AXIAL.150 In/Sec.094 G-s71- Nash Compr A COMP IB HORIZ.168 In/Sec1.173 G-s72- Nash Compr A COMP IB HORIZ.168 In/Sec1.192 G-s73- Nash Compr A COMP IB AXIAL.155 In/Sec.326 G-s81- Nash Compr A Compressor OB Verti.311 In/Sec.315 G-s83- Nash Compr A Compressor OB Axial.169 In/Sec.159 G-s 202-05 - NASH SEAL LIQUID PUMP-A (30-Oct-20)
 OVERALL LEVEL
 1-20 KHz

 .029 In/Sec
 .092 G-s

 .015 In/Sec
 .322 G-s
11 - MOTOR OUTBOARD HORIZ 21 - MOTOR INBOARD HORIZ23 - MOTOR INBOARD AXIAL .015 In/Sec .322 G-s .111 G-s .015 In/Sec .029 In/Sec .11-.058 G-s .028 In/Sec 71 - PUMP HORIZ 72 - PUMP VERT .016 In/Sec .040 G-s 9002-10 - D-HYDROGENATOR AGITATOR (30-Oct-20) OVERALL LEVEL1-20 KHz11 - MOTOR OUTBOARD HORIZONTAL.082 In/Sec.070 G-s21 - MOTOR INBOARD HORIZONTAL.071 In/Sec.046 G-s

23	- MOTOR INBOARD AXIAL	.055 In/Sec	.089 G-s
31	- GEARBOX INPUT SHAFT -HORIZONTAL	.207 In/Sec	.682 G-s
51	- GEARBOX TOP PLATE- E-W	.215 In/Sec	.208 G-s
52	- GEARBOX TOP PLATE- N-S	.298 In/Sec	.291 G-s
53	- GEARBOX OUTPUT TOP -VERTICAL	.104 In/Sec	.728 G-s
61	- GEARBOX BOTTOM E-W-HORIZONTAL	.115 In/Sec	.119 G-s
81	- AGIT INTERMED BRG @ SEAL- N-S	.039 In/Sec	.026 G-s
82	- AGIT INTERMED BRG @ SEAL- E-W	.037 In/Sec	.031 G-s
83	- AGIT INTERMED BRG @ SEAL- VERT	.039 In/Sec	.180 G-s
		(20.0++ 20)	
900	3-01 - D-HIDRO PRIMARI FILT FD POMP		1 00 1711-
11	MOMOR OUMPOARD HORIZONMAI	OVERALL LEVEL	1-20 KHZ
11 01	- MOTOR OUTBOARD HORIZONTAL	.03/ In/Sec	.185 G-S
22	- MOTOR INBOARD HORIZONIAL	.080 IN/Sec	.312 G-S
23	- MOTOR INBOARD AXIAL	100 Tr/Sec	.208 G-S
71	- POMP HORIZONIAL	.100 IN/Sec	.240 G-S
12	- POMP VERTICAL	.110 In/Sec	.274 G-S
900	1-01 - D-HYDRO SECOND. FILT FD PUMP	(30-Oct-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OUTBOARD HORIZONTAL	.061 In/Sec	.088 G-s
21	- MOTOR INBOARD HORIZONTAL	.055 In/Sec	.142 G-s
23	- MOTOR INBOARD AXIAL	.042 In/Sec	.087 G-s
71	- PUMP HORIZONTAL	.061 In/Sec	.211 G-s
72	- PUMP VERTICAL	.058 In/Sec	.349 G-s
192	-03 - Two Stage Water Pump A-WEST	(30-0ct-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OUTBOARD HORIZONTAL	.059 In/Sec	.186 G-s
21	- MOTOR IB HORIZ	.070 In/Sec	.332 G-s
23	- motor inboard axial	.044 In/Sec	.159 G-s
71	- PUMP HORIZONTAL	.151 In/Sec	.905 G-s
72	- PUMP VERTICAL	.107 In/Sec	.731 G-s
101	_07 _ M MTY איז האיז היא 101_07	(20-04+-20)	
191	-07 - M MIX BED WAIER POMP 191-07		1 20 211-
11	- Chilled #20 Pump Meter OB Merizo	156 Tr/Soc	515 C-2
21	- Chilled H2O Pump Motor IB Horizo	117 Tn/Sec	.515 G-S
23 23	- MOTOR INBOARD	062 Tp/Sec	243 G-5
23 71	- Chilled H20 Pump TB Harizantal	101 Tp/Sec	230 6-5
72	- DIMD VEDTICAL	095 Tp/Sec	303 6-5
12	FORF VERILORE	.035 11/580	.505 6-8

Clarification Of Vibration Units:

rariicacion	UL	VIDIACIO	1 0111
Acc -	->	G-s	PK
Vel -	->	In/Sec	PK