

April 30, 2021

Arkema

# Subject: April week 4 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 Route Critical Equipment Observations

### C Concentrator Vacuum Pump 2130-1

The motor has the highest vibration amplitude of about 0.177"/second velocity peak overall in the axial measurement. No immediate concerns.

# Agitator, Hydrogenator C 7001-01

All vibrations are under 0.1"/second velocity peak overall. We will continue to monitor normally. No immediate issue.

## A/B Concentrator Vacuum Pump 57

The pump bearings overall are 0.27"/sec peak velocity or less. We will continue to watch for changes. No immediate concerns.

# Flash Vacuum Pump 2130-1

All vibrations are below 0.1"/second velocity peak overall. No reportable issues.

# 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. There are still blower case vibrations around 2.5-3 KHz. With a wide noise floor. The large jump in overall acceleration for the female outboard turbine shaft measurement reported last week has returned to normal. We will continue to monitor this unit closely for changes. **Rated a Class I Defect**.

## Air Compressor C-202

Rotor bar vibrations are low 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. There are still blower case vibrations around 2.5-3 KHz. With a wide noise floor. We will continue to monitor this unit for changes. **Rated a Class I Defect.** 

### Air Compressor C-203

Rotor bar vibrations are slightly above 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. There are still blower case vibrations around 2.5-3 KHz. With a wide noise floor. The turbine male shaft outboard horizontal overall acceleration is near 11 g's RMS. The spectrum shows noise floor and apparent non-synchronous harmonic peaks of about 6.9 orders. We still recommend a once over on the unit and oil analysis also at this time to be prudent. This could just be normal cyclical variations in vibration but rising higher over time as components wear. **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. They continue to vary over time. Both shafts have between 5 and 8 g's RMS overall in the data with the male having the higher reading this survey. The dominant vibration appears to be the second gear mesh harmonic at near 2490 Hz (about 84 orders). We are still watching this unit closely and will be going forward. **Rated a Class II Defect.** 

### Air Compressor NASH A 201-08A

Highest vibration is still in the pump itself at 0.35"/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 II Defect.** 

## D Hydrogenator Agitator 9002

Highest overall vibration is at 0.3"/sec velocity peak for the gearbox. Vibrations are mostly subsynchronous to motor speed. This is still a lower amplitude for this unit. **Rated a Class I Defect.** 

## H2O2 Monthly Route Equipment

## North Cooling Tower, South Fan

#### South Cooling Tower, North Fan and South Fan

These units have overall vibrations at near 0.35"/second velocity peak in the motor measurements. These are typical for cooling towers, but slightly higher than we would like to see. Ensure all fasteners are tight and confirm the shaft alignments are in spec. **Rated a Class I Defect.** 

### H2O2 70% Pumps at Loading Area

#### 27428 C Tank Car Loading Pump

Outboard motor horizontal vibration is at 0.374"/second velocity peak overall and is dominated by a shaft speed vibration. We suspect a coupling or alignment issue. Inspect the unit structure, fasteners and shaft coupling for defects wear or looseness. Check the alignment after any issues are fixed. **Rated a Class I Defect.** 

### H2 Area Equipment

#### C2 FD Blower

The motor outboard overall at shaft speed has been increasing for since last May and is now over 0.35"/second velocity peak. There are also two harmonic peaks in some measurements. Clean and inspect the fan wheel. Check the motor base, fasteners and coupling for defects, wear, and looseness. Check the alignment after any issues are fixed. **Rated a Class I Defect.** 

### **CTPE East Cooling Tower Pump**

Pump unit still has a slightly elevated shaft speed vibration in the pump. Check all fasteners, the coupling and shaft alignment as time allows. **Rated a Class I Defect.** 

	Abbreviated Last **************	Measurement Summar	У *
	Database: Arkema.rbm Station: PEROXIDE Route No. 6: ARKEMA WK Report Date: 04-May-21	54 07:48	
MEASUREMENT P	OINT OVERALL LEVEL	HFD / VHFD	MACHINE SPEED
2130-1old -	C Concentrator Vacuum Pum OVERALL LEVEL	np (30-Apr-21) 1-20 KHz	
11	.073 In/Sec	.363 G-s	1200.0 RPM
21	.064 In/Sec	.400 G-s	
23	.177 In/Sec	.235 G-s	
71	.107 In/Sec	.851 G-s	
81	.175 In/Sec	.593 G-s	
83	.082 In/Sec	1.151 G-s	
7000-01 -	AGITATOR, HYDROGENATOR C	(30-Apr-21)	
02	042 TR/Sec		45 00 BDM
02	.042 IN/Sec		43.00 RPM
11	071 In/Sec	.020 G-S 648 C-S	1400 0 RPM
12	.073 In/Sec	.731 G-s	1100.0 1014

	13	.075 In/Sec	.248 G-s	
	21	.075 In/Sec	.236 G-s	
	22	.098 In/Sec	.062 G-s	
	23	075 Tn/Sec	908 G-s	
	31	082 Tn/Sec	319 G-s	
	32	.002 IN/Sec	.515 G S	
	22	.050 IN/Sec	212 C-2	
	11	.030 III/Sec	.212 G-S	
	41		.450 G-S	
	42	.062 11/560	.324 G-S	275 0 554
	51	.055 In/Sec	.269 G-S	3/5.0 RPM
	53	.082 In/Sec	.221 G-s	
	61	.027 In/Sec	.185 G-s	
	71	.047 In/Sec	.326 G-s	45.00 RPM
	81	.020 In/Sec	.150 G-s	
	83	.051 In/Sec	.246 G-s	
57		- A/B Concentr Vac Pmp-va	ar RPM (30-Apr-21)	
		OVERALL LEVEI	L 1-20 KHz	
	11	.054 In/Sec	.131 G-s	900.0 RPM
	12	.056 In/Sec	.174 G-s	
	21	.075 In/Sec	.157 G-s	
	23	.058 In/Sec	.100 G-s	
	71	.145 In/Sec	.378 G-s	
	81	.271 In/Sec	.451 G-s	
	83	.100 In/Sec	.685 G-s	
2130-1		- FIACH WAD WAC DIMD-WAR	speed $(30-3pr-21)$	
2130 1		OVEDALL IEVEL		
	11			1200 0 DM
	12	.041 11/Sec	.142 G-S	1200.0 RPM
	12	.03/ III/Sec	.409 G-S	
	21	.040 In/Sec	.647 G-S	
	22	.046 In/Sec	.326 G-S	
	23	.054 In/Sec	.896 G-S	
	71	.063 In/Sec	.323 G-s	
	72	.089 In/Sec	.526 G-s	
	81	.074 In/Sec	.265 G-s	
	82	.082 In/Sec	.373 G-s	
	83	.042 In/Sec	.636 G-s	
C-203		- C-203 Comp	(30-Apr-21)	
		OVERALL LEVEI	L 1-20 KHz	
	11	.213 In/Sec	7.909 G-s	3588.0 RPM
	12	.076 In/Sec	3.211 G-s	
	21	.146 In/Sec	5.855 G-s	
	22	.092 In/Sec	3.174 G-s	
	23	.043 In/Sec	1.336 G-s	
		OVERALL LEVEI	. 1-20 кнz	
	71M	.042 In/Sec	1.691 G-s	
	72M	.048 In/Sec	3.023 G-s	
	7 3 M	066 In/Sec	2 819 6-9	
	81M	048 Th/Sec	10 72 G-e	
	82M	056 77/900	5 018 C-5	
	71 F	061 Th/Sec	2 105 G-5	
	725 725		$2.103 G^{-5}$	
	725	.000 IN/SEC	2.100 6-8	
	/ JE 01 m	.U// IN/SEC	4.043 6-5	
	QTF.	.03/ In/Sec	1.307 G-S	
	82F	.056 In/Sec	.800 G-s	

C-202		-	C-202	Comp				(3)	0-Apr-2	1)		
				ov	ERA	LL LEV	EL	1-20	KHz			
	11			•	056	In/Se	с	1.23	3 G-s		3588.0	RPM
	12				124	In/Se	с	2.79	8 G-s			
	21				059	In/Se	с	. 38'	7 G-s			
	22				086	In/Se	с	.84	6 G-s			
	23				059	In/Se	с	1.52	6 G-s			
				ov	ERA	LL LEV	EL	1-20	KHZ			
	71M				038	In/Se	с	5.634	4 G-s			
	72M				042	In/Se	с	1.394	4 G-s			
	73M				068	In/Se	с	1.16	6 G-s			
	81M				062	In/Se	с	4.08	7 G-s			
	82M				059	In/Se	с	2.51	5 G-s			
	71F				045	In/Se	с	1.21	1 G-s			
	72F				059	In/Se	с	1.16	5 G-s			
	73F				042	In/Se	с	1.41	7 G-s			
	81F				034	In/Se	с	3.22	5 G-s			
	82F				048	In/Se	с	1.64	) G-s			
C-201		-	C-201	Comp				(30	0-Apr-2	1)		
				00	ERA	LL LEV.	ЕГ	1-20	KHZ		2500 0	
	11			•	083	In/Se	C	1.052	2 G-S		3588.0	RPM
	12			•	206	In/Se	C	7.482	2 G-S			
	21			•	095	In/Se	с	. 302	2 G-S			
	22			•	050	In/Se	С	1.22	G-S			
	23				090	In/Se	с 	2.77	6 G-S			
				00	ERA	LL LEV	ЕL	1-20	КНИ			
	71M			•	046	In/Se	С	2.440	JG-S			
	72M			•	046	In/Se	С	2.68	4 G-s			
	73M			•	078	In/Se	С	2.35	b G-s			
	81W			•	062	In/Se	С	3.90.	L G-S			
	82M			•	051	In/Se	С	1.86	/ G-s			
	71F			•	040	In/Se	C	4.94	JG-S			
	72F			•	066	In/Se	с	2.57	/G-S			
	73F			•	037	In/Se	С	.83	b G-s			
	81F.			•	040	In/Se	C	4.56	J G-S			
	82F.			•	066	In/Se	с	2.40.	3 G-s			
new AC		-	INSTRU	JMENT A	IR (	COMPRE	SSOR	(3)	0-Apr-2	1)		
				ov	ERA	LL LEV	EL	1-20	KHz			
	11			•	141	In/Se	с	1.12	7 G-s		1780.0	RPM
	12				104	In/Se	с	. 64	) G-s			
	13				060	In/Se	с	. 334	4 G-s			
	21				156	In/Se	с	1.24	9 G-s			
	22				083	In/Se	с	.50	) G-s			
	23			•	046	In/Se	с	. 65'	7 G-s			
				ov	ERA	LL LEV	EL	1-20	KHZ			
	71M			•	179	In/Se	с	5.09	8 G−s			
	72M			•	161	In/Se	с	3.92	5 G-s			
	73M			•	154	In/Se	с	4.14	6 G-s			
	81M			•	136	In/Se	с	2.87	6 G-s			
	82M			•	250	In/Se	с	6.92	8 G-s			
	83M			•	180	In/Se	с	3.582	2 G-s			
	71F			•	099	In/Se	с	3.86	6 G-s			
	72F			•	134	In/Se	с	8.182	2 G-s			
	73F			•	112	In/Se	с	5.30	8 G-s			

		*****	*****	*****	****	
Vel Summarv	>	In/Sec	PK	7	Abbreviated	Last Measurement
Acc	>	G-s	PK			
Clarifica	ation Of	Vibratio	on Units:			
05		.0.		.137 8 8		
o2 83		.04	33 In/Sec	.020 G-S .137 G-S		
82		.0.	13  Tn/Sec	.030 G-8 026 G-8		
01		. 10	35  In/Sec	.129 G-8 036 C-2		
01 61 T		. 20	B3 Tp/Sec	.143 G-S 120 C-c		
231		.0.	SS IN/Sec	.443 G-S 1/2 C-c		
53		. 1:	33  Tr/Sec	.400 G-S		
521		. 23	53 IN/Sec	.240 G-S 466 G-S		
52		.20	33  III Sec	.24/ G-S 240 C-S		
511		.2:	13 In/Sec	.334 G-S 247 C-e	100.0	/ REM
51		.1:	54  III/Sec	.300 G-S 334 G-S	100 0	
E1		1	ZALL LEVEL	308 C-2		
116		. 24	14 III/SEC	.030 G-S 1_20 VU-		
31 21 T		. 18	DO IN/SEC	.0/U G-S 836 C-C		
31		OVEI	KALL LEVEL	1-20 KHZ		
23		. 05	oi in/Sec	.072 G-s		
21		.00	bi In/Sec	.217 G-s		
11		.0	/8 In/Sec	.119 G-s	1185.0	) KPM
		OVEI	KALL LEVEL	1-20 KHz	1105 /	
9002-10	- D-HYD	ROGENATO	R AGITATOR	(30-Apr-21	L)	
72		. 01	l6 In/Sec	.035 G-s		
71		. 03	34 In/Sec	.050 G-s		
23		. 02	29 In/Sec	.050 G-s		
21		. 01	l6 In/Sec	.180 G-s		
11		. 01	15 In/Sec	.083 G-s	1800.0	) RPM
		OVE	RALL LEVEL	1-20 KHz		
202-05	- NASH	SEAL LIQU	JID PUMP-A	(30-Apr-21	L)	
83		.20	04 In/Sec	.195 G-s		
82		. 3!	52 In/Sec	.394 G-s		
81		.18	33 In/Sec	.306 G-s		
73		.2	ll In/Sec	.155 G-s		
72		.20	65 In/Sec	1.022 G-s		
71		.1	71 In/Sec	1.174 G-s		
23		.1	77 In/Sec	.111 G-s		
22		.0	94 In/Sec	.102 G-s		
21		. 00	95 In/Sec	.088 G-s		
13		.00	51  In/Sec	.134 G-s		
12		. 08	31  Tr/Sec	15/ G-S	500.2	) rem
11		OVEI	ханн нёvён 87 тр/сос	1-20 KHZ	50 <i>6</i> 3	
201-08A	- COMPR	ESSOR, NAS	SH A 201-08A	. (30-Apr-2]	L)	
83F		.23	l6 In/Sec	3.508 G-s		
825		.23	ll In/Sec	7.177 G-s		
81F		.20	06 In/Sec	6.538 G-s		

Route No. 5: ARK WK 3 Report Date: 04-May-21 07:48

MEASUREMENT POINT OVERALL LEVEL HFD / VHFD MACHINE SPEED \_\_\_\_\_ ----------\_\_\_\_\_ NTC-SF - N CT-SOUTH FAN, N TWR (30-Apr-21) OVERALL LEVEL 1-20 KHz 1 .370 In/Sec .529 G-s 1780.0 RPM .171 In/Sec .427 G-s 2 3 .204 In/Sec .473 G-s OVERALL LEVEL 1-20 KHZ 4 .263 In/Sec .420 G-s 5 .0036 In/Sec .0012 G-s .376 G-s .280 In/Sec 6 .394 G-s 6г .301 In/Sec NCT - NF - N CT -NORTH FAN, N TWR TH FAN, N TWR (30-Apr OVERALL LEVEL 1-20 KHz (30-Apr-21) .404 G-s .236 In/Sec 7 1780.0 RPM .142 In/Sec .377 G-s 8 .317 G-s .150 In/Sec 9 1-20 KHZ OVERALL LEVEL 10 .124 In/Sec .341 G-s 11 .183 In/Sec .301 G-s 12 .166 In/Sec .372 G-s STC-NF - S CT - NORTH FAN, S TWR (30-Apr-21) OVERALL LEVEL 1-20 KHz .453 G-s .376 In/Sec 1780.0 RPM 1 .325 In/Sec .212 G-s 2 3 .258 In/Sec .112 G-s OVERALL LEVEL 1-20 KHZ .151 In/Sec .362 G-s 4 .129 In/Sec .490 G-s 5 STC-MF - S CT - MID FAN, S TWR (30-Apr-21) OVERALL LEVEL 1-20 KHz .366 G-s 1 .253 In/Sec 1780.0 RPM 2 .203 In/Sec .074 G-s 3 .136 In/Sec .106 G-s OVERALL LEVEL 1-20 KHZ .099 In/Sec .301 G-s 4 .456 G-s .110 In/Sec 5 .104 In/Sec .524 G-s 6 STC-SF (30-Apr 1-20 KHz - S CT - SOUTH FAN, S TWR (30-Apr-21) OVERALL LEVEL .342 G-s .253 In/Sec 1780.0 RPM 1 .287 In/Sec .218 G-s 2 .334 In/Sec .093 G-s 3 OVERALL LEVEL 1-20 KHZ .531 G-s 4 .167 In/Sec 5 .108 In/Sec .559 G-s 6 .213 In/Sec .689 G-s

\_\_\_\_\_ Clarification Of Vibration Units: Acc --> G-s PK Vel --> In/Sec PK Abbreviated Last Measurement Summary \*\*\*\*\*\* Database: Arkema.rbm Station: PEROXIDE 70% H202 PUMPS Route No. 1: 70% PUMPS Report Date: 04-May-21 07:49 OVERALL LEVEL MEASUREMENT POINT HFD / VHFD MACHINE SPEED \_\_\_\_\_ -----\_\_\_\_\_ \_\_\_\_\_ 
 R LOAD PUMP
 (30-Apr-)

 OVERALL LEVEL
 1-20 KHz

 .374 In/Sec
 .048 G-s

 .339 In/Sec
 .122 G-s

 .076 In/Sec
 .108 G-s

 .270 In/Sec
 .388 G-s

 .164 In/Sec
 .305 G-s
 27428 - C TANK CAR LOAD PUMP (30-Apr-21) 11 1750.0 RPM 21 23 71 72 27431 - D TANK CAR LOAD PUMP PERONE (30-Apr-21) OVERALL LEVEL 1-20 KHz 
 .063 In/Sec
 .202 G-s

 .036 In/Sec
 .369 G-s

 .040 In/Sec
 .181 G-s

 .038 In/Sec
 .445 G-s

 129 In/Sec
 478 G-s
 11 1750.0 RPM 21 23 71 .478 G-s .129 In/Sec 72 28133 - WEST TANK FARM VACUUM PUMP (30-Apr OVERALL LEVEL 1-20 KHz (30-Apr-21) 

 .034 In/Sec
 .200 G-s

 .062 In/Sec
 .152 G-s

 .085 In/Sec
 .135 G-s

 .060 In/Sec
 .157 G-s

 .113 In/Sec
 .187 G-s

11 1750.0 RPM 21 23 71 72 \_\_\_\_\_ Clarification Of Vibration Units: Acc --> G-s PK Vel --> In/Sec PK Abbreviated Last Measurement Summary \* Database: Arkema.rbm Station: HYDROGEN Route No. 1: H2 MONTHLY Report Date: 04-May-21 07:49 OVERALL LEVEL HFD / VHFD MACHINE SPEED MEASUREMENT POINT -----\_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ P2A - PUMP MEA CIRC WEST P2A (30-Apr-21) OVERALL LEVEL 1-20 KHz .060 In/Sec .323 G-s 3585.0 RPM 11

	21		.04	8 In/Sec	.247 G	-s	
	23		.07	1 In/Sec	.240 G	-s	
	71		.18	9 In/Sec	.511 G	-s	
	72		.15	8 In/Sec	.574 G	-s	
P1A		- PUMP E	FW WEST	P1A	(30-A	pr-21)	
			OVEF	ALL LEVEL	1-20 КН	z	
	11		.08	7 In/Sec	.259 G	-s	3600.0 RPM
	21		.10	5 In/Sec	.959 G	-s	
	23		.18	8 In/Sec	.444 G	-s	
	71		.09	1 In/Sec	.847 G	-s	
	72		.10	7 In/Sec	.314 G	-s	
	81		.13	8 In/Sec	.595 G	-s	
	82		.13	7 In/Sec	.661 G	-s	
	83		.05	4 In/Sec	.838 G	-s	
C2		- FD BLC	WER C	:2	(30-A	pr-21)	
			OVEF	ALL LEVEL	1-20 КН	Z	
	11		. 35	3 In/Sec	.200 G	-s	3600.0 RPM
	21		. 32	9 In/Sec	.294 G	-s	
	23		.19	4 In/Sec	.094 G	-s	
	71		. 22	4 In/Sec	1.854 G	-s	
	81		. 27	3 In/Sec	1.413 G	-s	
21		- ID -BI	OWER	C1	(30-A	pr-21)	
			OVEF	ALL LEVEL	1-20 КН	z	
	11		.12	0 In/Sec	.370 G	-s	1800.0 RPM
	21		.12	2 In/Sec	.540 G	-s	
	23		.15	4 In/Sec	.613 G	-s	
	71		.09	5 In/Sec	.410 G	-s	
	72		.05	5 In/Sec	.462 G	-s	
	81		.18	5 In/Sec	.608 G	-s	
	82		.18	8 In/Sec	.703 G	-s	
CTPE		- EAST C	OOLING 1	OWER PUMP	(30-A	pr-21)	
			OVEF	ALL LEVEL	1-20 КН	z	
	11		.15	2 In/Sec	.446 G	-s	1750.0 RPM
	21		.09	0 In/Sec	.296 G	-s	
	23		.19	2 In/Sec	.987 G	-s	
	71		.16	0 In/Sec	.434 G	-s	
	72		. 32	7 In/Sec	.494 G	-s	
CTPW		- WEST C	OOLING 1	OWER PUMP	(30-A	pr-21)	
			OVEF	ALL LEVEL	1-20 КН	z	
	11		.06	3 In/Sec	.370 G	-s	1750.0 RPM
	21		.06	6 In/Sec	.431 G	-s	
	23		.16	1 In/Sec	.350 G	-s	
	71		.26	6 In/Sec	.747 G	-s	
	72		.12	2 In/Sec	.808 G	-s	
Clar A	ntic Acc	ation Of >	Vibratic G-s	on Units: PK			
τ.	/el	>	In/Sec	PK			
			, 560				