HI-SPEED INDUSTRIAL SERVICE

MILLINGTON, TN

September 9, 2020

Arkema

Subject: September week 1 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.

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

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

Class III; 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.

Class IV; 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,

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Weekly Peroxide Route Critical Equipment Observations

C Concentrator Vacuum Pump 2130-1
Vibrations appear to be normal this survey. No vibration is above 0.163"/sec velocity peak. No actions required.

Agitator, Hydrogenator C 7001-01
The highest motor overall vibrations are 0.218"/sec velocity peak for the outboard axial. 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. A vibration at near 3x RPM is dominant and could possibly indicate a coupling or alignment issue.
Motor is rated a Class I Defect.

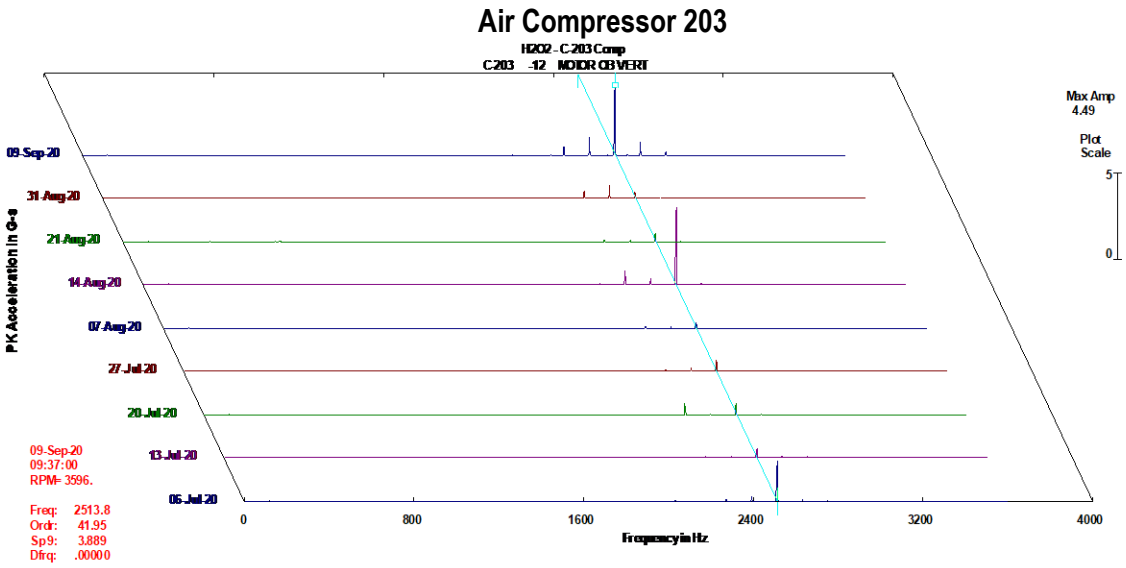
A/B Concentrator Vacuum Pump 57
This unit's motor vibration is still below 0.10"/sec velocity peak. The outboard pump bearing overall is 0.313"/sec peak velocity, with a dominant vibration at 16 orders, which is most likely blade pass. We will continue to watch for changes. **Rated a Class I Defect.**

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 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. We will continue to monitor this unit for changes No actions required.

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 are still watching an increase in acceleration for the compressor section. Rated a Class I Defect this survey. No immediate actions required at this time.

Air Compressor C-203
Rotor bar vibrations are somewhat elevated 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. The largest vibration peak is at about 42 orders of shaft speed, which indicates 42 rotor bars in the motor and also show 120 Hz sidebands. **Rated a Class I Defect this survey**. No actions required.



Plot shows dominant vibration at about 42 orders of shaft speed with 120 Hz sidebamds.

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 shaft outboard axial overall vibration is at to 7 g's RMS. 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 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 0.275"/sec velocity peak for the outboard vertical. The vibration spectrum is 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 an increase in vibrations this survey. Highest overall vibration is 0.265"/sec velocity peak for the gearbox top bearing plate in the N/S direction. **Still rated a Class I Defect.**

NOTE: No monthly equipment on this route was reportable.

Abbreviated Last Measurement Summary

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Database: Arkema.rbm
Station: PEROXIDE
Route No. 3: ARK WK 1
Report Date: 09-Sep-20 12:27

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD
2130-1old - C Concentrator Vacuum Pump	(09-Sep-20)	
	OVERALL LEVEL	1-20 KHz
11 - Motor OB HOR	.068 In/Sec	.380 G-s
21 - Motor IB HOR	.066 In/Sec	.399 G-s
23 - Motor IB AXIAL	.150 In/Sec	.194 G-s
71 - Compressor IB HOR	.116 In/Sec	.970 G-s
81 - Compressor OB Horiz	.163 In/Sec	.683 G-s
83 - Compressor OB Axial	.090 In/Sec	1.297 G-s
7000-01 - AGITATOR,HYDROGENATOR C	(09-Sep-20)	
	OVERALL LEVEL	1-20 KHZ
02 - DRIVESHAFT BRG-EAST-WEST	.044 In/Sec	.022 G-s
03 - DRIVESHAFT BRG-VERTICAL	.054 In/Sec	.049 G-s
11 - C Hydro Agitator MOTOR OB HORIZ	.087 In/Sec	.463 G-s
12 - C Hydro Agitator MOTOR OB VERT	.120 In/Sec	.826 G-s
13 - C Hydro Agitator Motor OB Axial	.218 In/Sec	.419 G-s
21 - C Hydro Agitator MOTOR IB HORIZ	.127 In/Sec	.302 G-s
22 - C Hydro Agitator MOTOR IB VERT	.177 In/Sec	.525 G-s
23 - C Hydro Agitator Motor IB Axial	.194 In/Sec	.485 G-s
31 - C Hydro Agitator GrBx In Horizon	.096 In/Sec	.632 G-s
32 - C Hydro Agitator GrBx In VERT	.087 In/Sec	.852 G-s
33 - C Hydro Agitator GrBx In Axial	.054 In/Sec	.414 G-s
41 - C Hydro Agitator GrBx Top HZ E-W	.046 In/Sec	.407 G-s
42 - C Hydro Agitator GrBx TOP HZ N-S	.022 In/Sec	.367 G-s
51 - C Hydro Agitator GrBx BOT HZ E-W	.030 In/Sec	.614 G-s
52 - C Hydro Agitator GrBx BOT HZ N-S	.023 In/Sec	.771 G-s
53 - C Hydro Agitator GrBx Top Axial	.048 In/Sec	.473 G-s
57 - A/B Concentr Vac Pmp-var RPM	(09-Sep-20)	
	OVERALL LEVEL	1-20 KHz
11 - Motor OB HOR	.061 In/Sec	.281 G-s
12 - Motor OB VERT	.051 In/Sec	.303 G-s
21 - Motor IB HOR	.061 In/Sec	.336 G-s
23 - Motor IB AXIAL	.070 In/Sec	.190 G-s
71 - Compressor IB HOR	.113 In/Sec	.050 G-s
81 - Compressor OB Horiz	.313 In/Sec	.768 G-s
83 - Compressor OB Axial	.087 In/Sec	.928 G-s
2130-1 - FLASH VAP VAC PUMP-var speed	(09-Sep-20)	
	OVERALL LEVEL	1-20 KHz
11 - Motor OB HOR	.057 In/Sec	.222 G-s
12 - Motor OB VERT	.045 In/Sec	.320 G-s
21 - Motor IB HOR	.041 In/Sec	1.164 G-s

22	- Motor IB VERT	.060 In/Sec	.801 G-s
23	- Motor IB AXIAL	.041 In/Sec	.456 G-s
71	- Compressor IB HOR	.061 In/Sec	.324 G-s
72	- Compressor IB VERT	.069 In/Sec	.421 G-s
81	- Compressor OB Horiz	.077 In/Sec	.236 G-s
82	- Compressor OB VERT	.081 In/Sec	.333 G-s
83	- Compressor OB Axial	.039 In/Sec	.356 G-s

236-06	- HYDRO FD PUMP N 236-06 -2FLR	(09-Sep-20)	
		OVERALL LEVEL	1-20 KHz
11	- Hydro Fd Pmp B No. Motor Top	.087 In/Sec	.137 G-s
21	- Hydro Fd Pmp B No. Motor Bottom	.079 In/Sec	.357 G-s

7007-24	- ABC SEC. FILT FEED PMP-SOUTH	(09-Sep-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OUTBOARD HORIZONTAL	.039 In/Sec	.476 G-s
21	- MOTOR INBOARD HORIZONTAL	.059 In/Sec	1.218 G-s
23	- MOTOR INBOARD AXIAL	.043 In/Sec	.464 G-s
71	- PUMP HORIZONTAL	.161 In/Sec	1.727 G-s
72	- PUMP VERTICAL	.157 In/Sec	1.385 G-s

2130-6	- ABC SEC FILT FEED PUMP-NORTH	(09-Sep-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OUTBOARD HORIZONTAL	.071 In/Sec	.081 G-s
21	- MOTOR INBOARD HORIZONTAL	.060 In/Sec	.461 G-s
23	- MOTOR INBOARD AXIAL	.035 In/Sec	.017 G-s
71	- PUMP HORIZONTAL	.114 In/Sec	.469 G-s
72	- PUMP VERTICAL	.093 In/Sec	.523 G-s

9001-1	- EAST OXIDIZER FEED PUMP	(09-Sep-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OUTBOARD HORIZONTAL	.037 In/Sec	.227 G-s
21	- MOTOR INBOARD HORIZONTAL	.062 In/Sec	.723 G-s
23	- MOTOR INBOARD AXIAL	.047 In/Sec	.153 G-s
71	- PUMP HORIZONTAL	.132 In/Sec	.547 G-s
72	- PUMP VERTICAL	.156 In/Sec	.332 G-s

9001-2	- MIDDLE OXIDIZER FEED PUMP	(09-Sep-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OUTBOARD HORIZONTAL	.025 In/Sec	.820 G-s
21	- MOTOR INBOARD HORIZONTAL	.046 In/Sec	.472 G-s
23	- MOTOR INBOARD AXIAL	.066 In/Sec	.300 G-s
71	- PUMP HORIZONTAL	.084 In/Sec	.286 G-s
72	- PUMP VERTICAL	.066 In/Sec	.219 G-s

7016-11	- WEST OXIDIZER FEED PUMP	(09-Sep-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OUTBOARD HORIZONTAL	.044 In/Sec	.533 G-s
21	- MOTOR INBOARD HORIZONTAL	.018 In/Sec	.600 G-s
23	- MOTOR INBOARD AXIAL	.022 In/Sec	.276 G-s
71	- PUMP HORIZONTAL	.097 In/Sec	1.512 G-s
72	- PUMP VERTICAL	.077 In/Sec	1.471 G-s

234-01	- CHILL WATER PUMP 234-01	(09-Sep-20)	
		OVERALL LEVEL	1-20 KHz
11	- Chilled H2O Pump Motor OB Horizo	.095 In/Sec	.719 G-s
		OVERALL LEVEL	1-20 KHZ

11L - MOTOR HORZ OUTBOARD - L-FREQ	.049 In/Sec	.671 G-s
	OVERALL LEVEL	1-20 KHz
21 - Chilled H2O Pump Motor IB Horizo	.040 In/Sec	1.247 G-s
23 - MOTOR INBOARD	.028 In/Sec	
	OVERALL LEVEL	1-20 KHZ
23L - MOTOR AXIAL INBOARD - L-FREQ	.029 In/Sec	1.182 G-s
	OVERALL LEVEL	1-20 KHz
71 - Chilled H2O Pump IB Horizontal	.057 In/Sec	.297 G-s
72 - PUMP VERTICAL	.058 In/Sec	.200 G-s
C-203 - C-203 Comp	(09-Sep-20)	
	OVERALL LEVEL	1-20 KHz
11 - MOTOR OB HOR	.046 In/Sec	1.487 G-s
12 - MOTOR OB VERT	.140 In/Sec	5.512 G-s
21 - MOTOR IB HOR	.064 In/Sec	2.623 G-s
22 - MOTOR IB VERT	.043 In/Sec	1.303 G-s
23 - MOTOR IB AXIAL	.037 In/Sec	1.329 G-s
	OVERALL LEVEL	1-20 KHZ
71M - COMP MALE SHAFT IB HOR	.038 In/Sec	2.075 G-s
72M - COMP MALE SHAFT IB VERT	.046 In/Sec	5.773 G-s
73M - COMP MALE SHAFT IB AXIAL	.057 In/Sec	1.894 G-s
81M - COMP MALE SHAFT OB HOR	.046 In/Sec	2.531 G-s
82M - COMP MALE SHAFT OB VERT	.063 In/Sec	2.934 G-s
71F - COMP FEMALE SHAFT IB HOR	.048 In/Sec	2.836 G-s
72F - COMP FEMALE SHAFT IB VERT	.042 In/Sec	.895 G-s
73F - COMP FEMALE SHAFT IB AXIAL	.047 In/Sec	1.817 G-s
81F - COMP FEMALE SHAFT OB HOR	.050 In/Sec	1.816 G-s
82F - COMP FEMALE SHAFT OB VERT	.056 In/Sec	2.007 G-s
9000-01 - D HYDROGENATOR FD PUMP- WEST	(09-Sep-20)	
	OVERALL LEVEL	1-20 KHz
11 - MOTOR OUTBOARD HORIZONTAL	.056 In/Sec	.450 G-s
21 - MOTOR INBOARD HORIZONTAL	.033 In/Sec	.398 G-s
23 - MOTOR INBOARD AXIAL	.022 In/Sec	.218 G-s
71 - PUMP HORIZONTAL	.089 In/Sec	.680 G-s
72 - PUMP VERTICAL	.053 In/Sec	.465 G-s
236-04A - HYDROGNTOR PRECOOLER FD PUMP	(09-Sep-20)	
	OVERALL LEVEL	1-20 KHz
11 - MOTOR OUTBOARD HORIZ	.034 In/Sec	.378 G-s
21 - MOTOR INBOARD HORIZ	.082 In/Sec	.673 G-s
23 - MOTOR INBOARD AXIAL	.031 In/Sec	.305 G-s
71 - PUMP HORIXONTAL	.127 In/Sec	.210 G-s
72 - PUMP VERTICAL	.047 In/Sec	.374 G-s
C-202 - C-202 Comp	(09-Sep-20)	
	OVERALL LEVEL	1-20 KHz
11 - MOTOR OB HOR	.041 In/Sec	.945 G-s
12 - MOTOR OB VERT	.105 In/Sec	.414 G-s
21 - MOTOR IB HOR	.054 In/Sec	.845 G-s
22 - MOTOR IB VERT	.097 In/Sec	1.028 G-s
23 - MOTOR IB AXIAL	.062 In/Sec	.310 G-s
	OVERALL LEVEL	1-20 KHZ
71M - COMP MALE SHAFT IB HOR	.043 In/Sec	2.755 G-s
72M - COMP MALE SHAFT IB VERT	.045 In/Sec	1.759 G-s
73M - COMP MALE SHAFT IB AXIAL	.081 In/Sec	2.152 G-s
81M - COMP MALE SHAFT OB HOR	.043 In/Sec	2.719 G-s

82M - COMP MALE SHAFT OB VERT		.055 In/Sec	1.771 G-s
71F - COMP FEMALE SHAFT IB HOR		.035 In/Sec	1.759 G-s
72F - COMP FEMALE SHAFT IB VERT		.067 In/Sec	1.164 G-s
73F - COMP FEMALE SHAFT IB AXIAL		.071 In/Sec	5.667 G-s
81F - COMP FEMALE SHAFT OB HOR		.048 In/Sec	2.881 G-s
82F - COMP FEMALE SHAFT OB VERT		.053 In/Sec	.955 G-s
C-201	- C-201 Comp	(09-Sep-20)	
		OVERALL LEVEL	1-20 KHz
11 - MOTOR OB HOR		.088 In/Sec	.936 G-s
12 - MOTOR OB VERT		.102 In/Sec	1.307 G-s
21 - MOTOR IB HOR		.097 In/Sec	1.151 G-s
22 - MOTOR IB VERT		.041 In/Sec	.461 G-s
23 - MOTOR IB AXIAL		.068 In/Sec	.179 G-s
		OVERALL LEVEL	1-20 KHZ
71M - COMP MALE SHAFT IB HOR		.041 In/Sec	1.851 G-s
72M - COMP MALE SHAFT IB VERT		.044 In/Sec	2.259 G-s
73M - COMP MALE SHAFT IB AXIAL		.077 In/Sec	1.845 G-s
81M - COMP MALE SHAFT OB HOR		.042 In/Sec	2.882 G-s
82M - COMP MALE SHAFT OB VERT		.056 In/Sec	1.998 G-s
71F - COMP FEMALE SHAFT IB HOR		.069 In/Sec	2.841 G-s
72F - COMP FEMALE SHAFT IB VERT		.041 In/Sec	.737 G-s
73F - COMP FEMALE SHAFT IB AXIAL		.051 In/Sec	2.923 G-s
81F - COMP FEMALE SHAFT OB HOR		.071 In/Sec	2.810 G-s
82F - COMP FEMALE SHAFT OB VERT		.053 In/Sec	1.603 G-s
new AC	- INSTRUMENT AIR COMPRESSOR	(09-Sep-20)	
		OVERALL LEVEL	1-20 KHz
11 - MOTOR OB HOR		.166 In/Sec	1.193 G-s
12 - MOTOR OB VERT		.103 In/Sec	.644 G-s
13 - MOTOR OB AXIAL		.062 In/Sec	.571 G-s
21 - MOTOR IB HOR		.201 In/Sec	1.158 G-s
22 - MOTOR IB VERT		.077 In/Sec	.689 G-s
23 - MOTOR IB AXIAL		.052 In/Sec	.829 G-s
		OVERALL LEVEL	1-20 KHZ
71F - COMP FEMALE SHAFT IB HOR		.176 In/Sec	5.951 G-s
72F - COMP FEMALE SHAFT IB VERT		.168 In/Sec	4.070 G-s
73F - COMP FEMALE SHAFT IB AXIAL		.166 In/Sec	3.731 G-s
81F - COMP FEMALE SHAFT OB HOR		.142 In/Sec	3.284 G-s
82F - COMP FEMALE SHAFT OB VERT		.250 In/Sec	6.910 G-s
83F - COMP FEMALE SHAFT OB AXIAL		.161 In/Sec	3.597 G-s
71M - COMP MALE SHAFT IB HOR		.119 In/Sec	4.834 G-s
72M - COMP MALE SHAFT IB VERT		.175 In/Sec	6.704 G-s
73M - COMP MALE SHAFT IB AXIAL		.166 In/Sec	4.148 G-s
81M - COMP MALE SHAFT OB HOR		.199 In/Sec	5.865 G-s
82M - COMP MALE SHAFT OB VERT		.236 In/Sec	7.126 G-s
83M - COMP MALE SHAFT OB AXIAL		.254 In/Sec	4.622 G-s
201-08A	- COMPRESSOR,NASH A 201-08A	(09-Sep-20)	
		OVERALL LEVEL	1-20 KHz
11 - Nash Compr A Motor OB Horiz		.063 In/Sec	.194 G-s
12 - Nash Compr A Motor OB Vertical		.060 In/Sec	.116 G-s
13 - Nash Compr A Motor OB Axial		.148 In/Sec	.076 G-s
21 - Nash Compr A Motor IB Horiz		.072 In/Sec	.104 G-s
22 - Nash Compr A Motor IB VERT		.094 In/Sec	.111 G-s
23 - Nash Compr A Motor IB AXIAL		.127 In/Sec	.121 G-s
71 - Nash Compr A COMP IB HORIZ		.137 In/Sec	.394 G-s

72	- Nash Compr A Compressor IB Verti	.213 In/Sec	1.533 G-s
73	- Nash Compr A COMP IB AXIAL	.143 In/Sec	.432 G-s
81	- Nash Compr A COMP OB HORIZ	.148 In/Sec	.743 G-s
82	- Nash Compr A Compressor OB Verti	.275 In/Sec	.595 G-s
83	- Nash Compr A Compressor OB Axial	.139 In/Sec	.333 G-s

9002-10 - D-HYDROGENATOR AGITATOR (09-Sep-20)

		OVERALL LEVEL	1-20 KHz
11	- MOTOR OUTBOARD HORIZONTAL	.083 In/Sec	.085 G-s
21	- MOTOR INBOARD HORIZONTAL	.068 In/Sec	.226 G-s
23	- MOTOR INBOARD AXIAL	.046 In/Sec	.079 G-s
31	- GEARBOX INPUT SHAFT -HORIZONTAL	.182 In/Sec	.553 G-s
51	- GEARBOX TOP PLATE- E-W	.189 In/Sec	.139 G-s
52	- GEARBOX TOP PLATE- N-S	.265 In/Sec	.327 G-s
53	- GEARBOX OUTPUT TOP -VERTICAL	.124 In/Sec	.604 G-s
61	- GEARBOX BOTTOM E-W-HORIZONTAL	.122 In/Sec	.096 G-s
81	- AGIT INTERMED BRG @ SEAL- N-S	.045 In/Sec	.024 G-s
82	- AGIT INTERMED BRG @ SEAL- E-W	.046 In/Sec	.024 G-s
83	- AGIT INTERMED BRG @ SEAL- VERT	.038 In/Sec	.169 G-s

Clarification Of Vibration Units:

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