HI-SPEED INDUSTRIAL SERVICE

MILLINGTON, TN

August 31, 2020

Arkema

Subject: August week 4 vibration service report

Most of the machines surveyed were found to be in good condition with the exception of 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,

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 actions required.

Agitator, Hydrogenator C 7001-01
The highest motor overall vibrations are 0.182"/sec velocity peak for the inboard 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 has decreased to below 0.10"/sec velocity peak. The outboard pump bearing overall is 0.291"/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. 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 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 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.

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 female shaft outboard axial overall vibration is to 9 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 0.283"/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 0.273"/sec velocity peak for the gearbox top bearing plate in the N/S direction. **Still rated a Class I Defect.**

Abbreviated Last Measurement Summary
****

Database: Arkema.rbm
Station: PEROXIDE
Route No. 6: ARKEMA WK4
Report Date: 31-Aug-20 18:42

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD
2130-1old - C Concentrator Vacuum Pump	(31-Aug-20)	
	OVERALL LEVEL	1-20 KHz
11 - Motor OB HOR	.078 In/Sec	.398 G-s
21 - Motor IB HOR	.075 In/Sec	.379 G-s
23 - Motor IB AXIAL	.114 In/Sec	.224 G-s
71 - Compressor IB HOR	.129 In/Sec	.986 G-s
81 - Compressor OB Horiz	.175 In/Sec	.638 G-s
83 - Compressor OB Axial	.086 In/Sec	1.821 G-s
7000-01 - AGITATOR,HYDROGENATOR C	(31-Aug-20)	
	OVERALL LEVEL	1-20 KHZ
02 - DRIVESHAFT BRG-EAST-WEST	.034 In/Sec	.032 G-s
03 - DRIVESHAFT BRG-VERTICAL	.043 In/Sec	.045 G-s
11 - C Hydro Agitator MOTOR OB HORIZ	.106 In/Sec	1.028 G-s
12 - C Hydro Agitator MOTOR OB VERT	.099 In/Sec	.912 G-s
13 - C Hydro Agitator Motor OB Axial	.165 In/Sec	.430 G-s
21 - C Hydro Agitator MOTOR IB HORIZ	.128 In/Sec	.267 G-s
22 - C Hydro Agitator MOTOR IB VERT	.151 In/Sec	.158 G-s
23 - C Hydro Agitator Motor IB Axial	.182 In/Sec	.454 G-s
31 - C Hydro Agitator GrBx In Horizon	.093 In/Sec	.523 G-s

32	- C Hydro Agitator GrBx In VERT	.098 In/Sec	.976 G-s
33	- C Hydro Agitator GrBx In Axial	.101 In/Sec	.596 G-s
41	- C Hydro Agitator GrBx Top HZ E-W	.047 In/Sec	.468 G-s
42	- C Hydro Agitator GrBx TOP HZ N-S	.022 In/Sec	.406 G-s
51	- C Hydro Agitator GrBx BOT HZ E-W	.031 In/Sec	.698 G-s
52	- C Hydro Agitator GrBx BOT HZ N-S	.024 In/Sec	.727 G-s
53	- C Hydro Agitator GrBx Top Axial	.041 In/Sec	.459 G-s

57	- A/B Concentr Vac Pmp-var RPM	(31-Aug-20)	
		OVERALL LEVEL	1-20 KHz
11	- Motor OB HOR	.059 In/Sec	.271 G-s
12	- Motor OB VERT	.065 In/Sec	.450 G-s
21	- Motor IB HOR	.066 In/Sec	.177 G-s
23	- Motor IB AXIAL	.075 In/Sec	.235 G-s
71	- Compressor IB HOR	.136 In/Sec	.675 G-s
81	- Compressor OB Horiz	.291 In/Sec	.545 G-s
83	- Compressor OB Axial	.077 In/Sec	.732 G-s

2130-1	- FLASH VAP VAC PUMP-var speed	(31-Aug-20)	
		OVERALL LEVEL	1-20 KHz
11	- Motor OB HOR	.048 In/Sec	.466 G-s
12	- Motor OB VERT	.039 In/Sec	.214 G-s
21	- Motor IB HOR	.042 In/Sec	1.104 G-s
22	- Motor IB VERT	.044 In/Sec	.705 G-s
23	- Motor IB AXIAL	.053 In/Sec	.669 G-s
71	- Compressor IB HOR	.059 In/Sec	.386 G-s
72	- Compressor IB VERT	.070 In/Sec	.326 G-s
81	- Compressor OB Horiz	.071 In/Sec	.221 G-s
82	- Compressor OB VERT	.080 In/Sec	.319 G-s
83	- Compressor OB Axial	.038 In/Sec	.378 G-s

C-203	- C-203 Comp	(31-Aug-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OB HOR	.034 In/Sec	.559 G-s
12	- MOTOR OB VERT	.040 In/Sec	1.048 G-s
21	- MOTOR IB HOR	.029 In/Sec	.728 G-s
22	- MOTOR IB VERT	.040 In/Sec	1.036 G-s
23	- MOTOR IB AXIAL	.030 In/Sec	.259 G-s
		OVERALL LEVEL	1-20 KHZ
71M	- COMP MALE SHAFT IB HOR	.035 In/Sec	1.158 G-s
72M	- COMP MALE SHAFT IB VERT	.044 In/Sec	3.733 G-s
73M	- COMP MALE SHAFT IB AXIAL	.054 In/Sec	2.237 G-s
81M	- COMP MALE SHAFT OB HOR	.050 In/Sec	2.243 G-s
82M	- COMP MALE SHAFT OB VERT	.046 In/Sec	2.107 G-s
71F	- COMP FEMALE SHAFT IB HOR	.042 In/Sec	2.984 G-s
72F	- COMP FEMALE SHAFT IB VERT	.050 In/Sec	1.166 G-s
73F	- COMP FEMALE SHAFT IB AXIAL	.054 In/Sec	2.210 G-s
81F	- COMP FEMALE SHAFT OB HOR	.039 In/Sec	1.569 G-s
82F	- COMP FEMALE SHAFT OB VERT	.040 In/Sec	.777 G-s

C-202	- C-202 Comp	(31-Aug-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OB HOR	.035 In/Sec	.847 G-s
12	- MOTOR OB VERT	.106 In/Sec	.480 G-s
21	- MOTOR IB HOR	.066 In/Sec	.707 G-s
22	- MOTOR IB VERT	.087 In/Sec	.442 G-s
23	- MOTOR IB AXIAL	.039 In/Sec	.199 G-s

		OVERALL LEVEL	1-20 KHZ
71M - COMP MALE SHAFT IB HOR		.044 In/Sec	1.739 G-s
72M - COMP MALE SHAFT IB VERT		.050 In/Sec	3.563 G-s
73M - COMP MALE SHAFT IB AXIAL		.092 In/Sec	1.479 G-s
81M - COMP MALE SHAFT OB HOR		.040 In/Sec	2.809 G-s
82M - COMP MALE SHAFT OB VERT		.050 In/Sec	2.361 G-s
71F - COMP FEMALE SHAFT IB HOR		.036 In/Sec	1.875 G-s
72F - COMP FEMALE SHAFT IB VERT		.059 In/Sec	1.318 G-s
73F - COMP FEMALE SHAFT IB AXIAL		.059 In/Sec	7.366 G-s
81F - COMP FEMALE SHAFT OB HOR		.043 In/Sec	1.900 G-s
82F - COMP FEMALE SHAFT OB VERT		.048 In/Sec	.765 G-s

C-201	- C-201 Comp	(31-Aug-20)	
		OVERALL LEVEL	1-20 KHz
11 - MOTOR OB HOR		.092 In/Sec	.650 G-s
12 - MOTOR OB VERT		.077 In/Sec	1.132 G-s
21 - MOTOR IB HOR		.097 In/Sec	.603 G-s
22 - MOTOR IB VERT		.043 In/Sec	.255 G-s
23 - MOTOR IB AXIAL		.101 In/Sec	1.036 G-s
		OVERALL LEVEL	1-20 KHZ
71M - COMP MALE SHAFT IB HOR		.041 In/Sec	2.167 G-s
72M - COMP MALE SHAFT IB VERT		.046 In/Sec	1.997 G-s
73M - COMP MALE SHAFT IB AXIAL		.078 In/Sec	2.663 G-s
81M - COMP MALE SHAFT OB HOR		.057 In/Sec	3.263 G-s
82M - COMP MALE SHAFT OB VERT		.046 In/Sec	2.261 G-s
71F - COMP FEMALE SHAFT IB HOR		.048 In/Sec	2.388 G-s
72F - COMP FEMALE SHAFT IB VERT		.040 In/Sec	.658 G-s
73F - COMP FEMALE SHAFT IB AXIAL		.058 In/Sec	1.743 G-s
81F - COMP FEMALE SHAFT OB HOR		.049 In/Sec	1.577 G-s
82F - COMP FEMALE SHAFT OB VERT		.051 In/Sec	1.894 G-s

new AC	- INSTRUMENT AIR COMPRESSOR	(31-Aug-20)	
		OVERALL LEVEL	1-20 KHz
11 - MOTOR OB HOR		.125 In/Sec	.764 G-s
12 - MOTOR OB VERT		.100 In/Sec	.724 G-s
13 - MOTOR OB AXIAL		.068 In/Sec	.610 G-s
21 - MOTOR IB HOR		.135 In/Sec	1.471 G-s
22 - MOTOR IB VERT		.083 In/Sec	.990 G-s
23 - MOTOR IB AXIAL		.048 In/Sec	.752 G-s
		OVERALL LEVEL	1-20 KHZ
71M - COMP MALE SHAFT IB HOR		.158 In/Sec	6.066 G-s
72M - COMP MALE SHAFT IB VERT		.175 In/Sec	4.441 G-s
73M - COMP MALE SHAFT IB AXIAL		.220 In/Sec	3.988 G-s
81M - COMP MALE SHAFT OB HOR		.136 In/Sec	3.026 G-s
82M - COMP MALE SHAFT OB VERT		.268 In/Sec	6.455 G-s
83M - COMP MALE SHAFT OB AXIAL		.164 In/Sec	4.020 G-s
71F - COMP FEMALE SHAFT IB HOR		.113 In/Sec	3.768 G-s
72F - COMP FEMALE SHAFT IB VERT		.173 In/Sec	6.009 G-s
73F - COMP FEMALE SHAFT IB AXIAL		.237 In/Sec	5.866 G-s
81F - COMP FEMALE SHAFT OB HOR		.177 In/Sec	4.020 G-s
82F - COMP FEMALE SHAFT OB VERT		.287 In/Sec	9.087 G-s
83F - COMP FEMALE SHAFT OB AXIAL		.287 In/Sec	9.474 G-s

201-08A	- COMPRESSOR,NASH A 201-08A	(31-Aug-20)	
		OVERALL LEVEL	1-20 KHz
11 - Nash Compr A Motor OB Horiz		.071 In/Sec	.082 G-s
12 - Nash Compr A Motor OB Vertical		.070 In/Sec	.102 G-s

13	- Nash Compr A Motor OB Axial	.135 In/Sec	.082 G-s
21	- Nash Compr A Motor IB Horiz	.073 In/Sec	.100 G-s
22	- Nash Compr A Motor IB VERT	.082 In/Sec	.083 G-s
23	- Nash Compr A Motor IB AXIAL	.134 In/Sec	.098 G-s
71	- Nash Compr A COMP IB HORIZ	.128 In/Sec	.267 G-s
72	- Nash Compr A Compressor IB Verti	.211 In/Sec	1.106 G-s
73	- Nash Compr A COMP IB AXIAL	.122 In/Sec	.261 G-s
81	- Nash Compr A COMP OB HORIZ	.150 In/Sec	.290 G-s
82	- Nash Compr A Compressor OB Verti	.283 In/Sec	.285 G-s
83	- Nash Compr A Compressor OB Axial	.142 In/Sec	.270 G-s

202-05	- NASH SEAL LIQUID PUMP-A	(31-Aug-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OUTBOARD HORIZ	.056 In/Sec	.043 G-s
21	- MOTOR INBOARD HORIZ	.018 In/Sec	.073 G-s
23	- MOTOR INBOARD AXIAL	.013 In/Sec	.080 G-s
71	- PUMP HORIZ	.037 In/Sec	.067 G-s
72	- PUMP VERT	.020 In/Sec	.076 G-s

9002-10	- D-HYDROGENATOR AGITATOR	(31-Aug-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OUTBOARD HORIZONTAL	.086 In/Sec	.036 G-s
21	- MOTOR INBOARD HORIZONTAL	.072 In/Sec	.143 G-s
23	- MOTOR INBOARD AXIAL	.046 In/Sec	.066 G-s
31	- GEARBOX INPUT SHAFT -HORIZONTAL	.167 In/Sec	.589 G-s
51	- GEARBOX TOP PLATE- E-W	.199 In/Sec	.184 G-s
52	- GEARBOX TOP PLATE- N-S	.273 In/Sec	.301 G-s
53	- GEARBOX OUTPUT TOP -VERTICAL	.146 In/Sec	.708 G-s
61	- GEARBOX BOTTOM E-W-HORIZONTAL	.249 In/Sec	.132 G-s
81	- AGIT INTERMED BRG @ SEAL- N-S	.041 In/Sec	.029 G-s
82	- AGIT INTERMED BRG @ SEAL- E-W	.039 In/Sec	.023 G-s
83	- AGIT INTERMED BRG @ SEAL- VERT	.033 In/Sec	.149 G-s

Clarification Of Vibration Units:

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