HI-SPEED INDUSTRIAL SERVICE

MILLINGTON, TN

July 27, 2020

Arkema

Subject: July 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**
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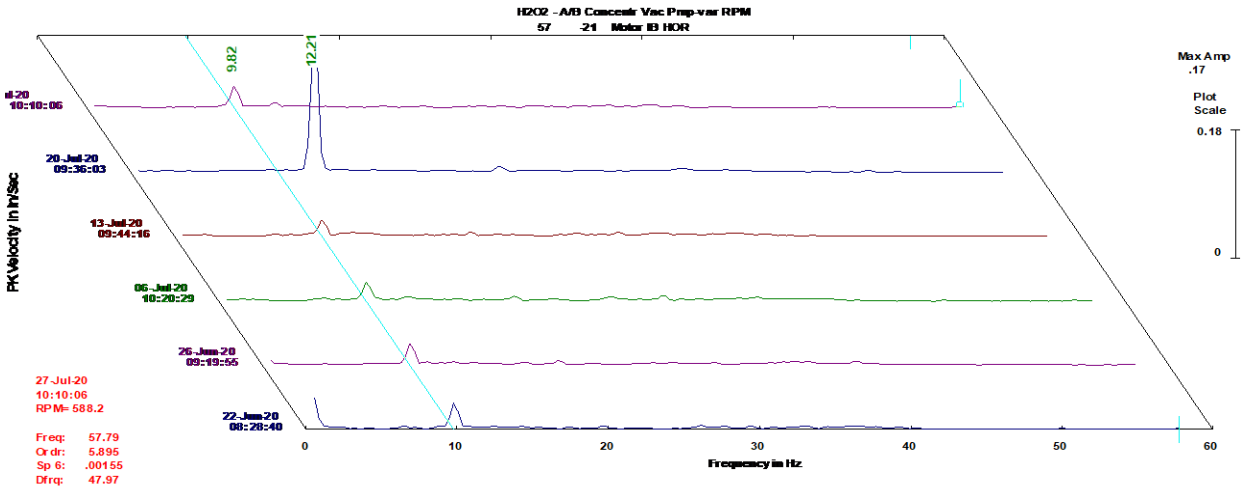
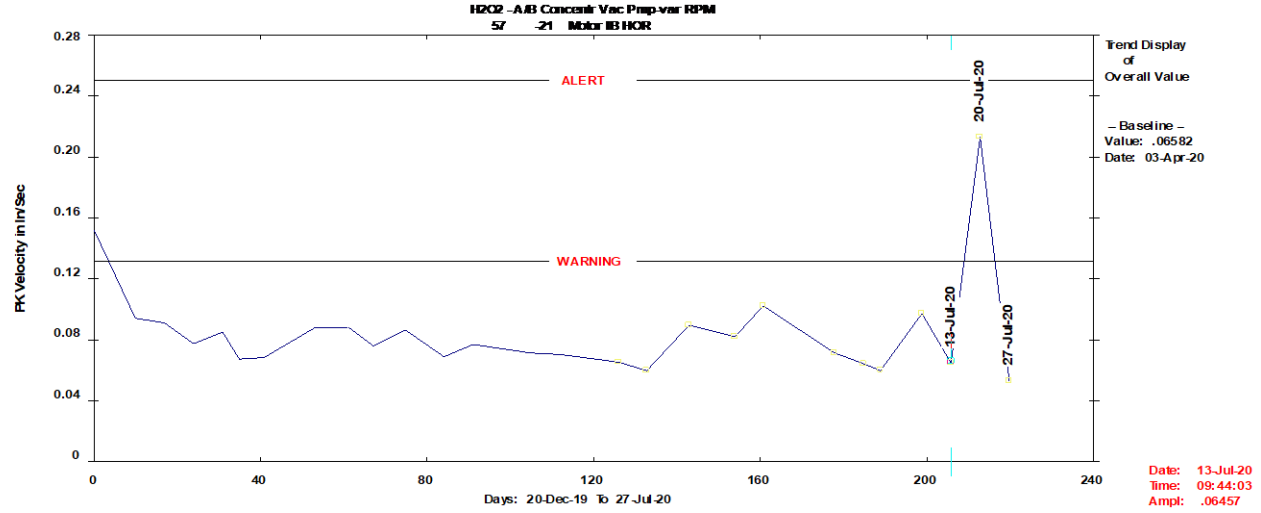
Weekly Peroxide Route Critical Equipment Observations

A/B Concentrator Vacuum Pump 57

This unit was reported as a **class II** last week due to the large jump in motor vibration. We suggested a coupling issue of possibly loose fasteners or structure. Maintenance found the coupling in good condition but the foot bolts loose, which were tightened. Pump output horizontal is still at near 0.33"/sec velocity peak, while motor has dropped to 0.05"/sec. **Unit is now Rated a Class I Defect.**
Also note that the unit was running about 150 RPM faster last week. That could have an impact on the vibration due to resonance or critical speeds.





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 is 0.231"/sec velocity peak for the outboard axial vibration. 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 3x RPM vibration is dominant and could indicate a coupling or alignment issue.
Motor is 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 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 normal for this motor's history. The trend clearly shows that the vibrations vary considerably over time. We are 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 new
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 vertical overall vibration has dropped to near 0.25"/sec velocity peak and 6 g's RMS. Two harmonic vibrations at near 1500 and 1600 Hz are beating near 120 Hz. The beat is strong 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 0.264"/sec velocity peak for the outboard vertical.
Rated a Class I Defect.

D Hydrogenator Agitator 9002-10

Vibration data shows a drop in vibrations this survey. Highest amplitude is 0.264”/sec velocity peak for the top bearing plate. **Still rated a Class I Defect.**

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Sincerely,

David W. Shook
Senior Reliability Specialist
dshook@gohispeed.com
Hi-Speed **Industrial Service**

Abbreviated Last Measurement Summary

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Database: Arkema.rbm
Station: PEROXIDE
Route No. 6: ARKEMA WK4
Report Date: 27-Jul-20 15:37

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD
2130-1old - C Concentrator Vacuum Pump	(27-Jul-20)	
	OVERALL LEVEL	1-20 KHz
11 - Motor OB HOR	.079 In/Sec	.409 G-s
21 - Motor IB HOR	.079 In/Sec	.377 G-s
23 - Motor IB AXIAL	.194 In/Sec	.171 G-s
71 - Compressor IB HOR	.113 In/Sec	.860 G-s
81 - Compressor OB Horiz	.175 In/Sec	.758 G-s
83 - Compressor OB Axial	.090 In/Sec	1.960 G-s
7000-01 - AGITATOR,HYDROGENATOR C	(27-Jul-20)	
	OVERALL LEVEL	1-20 KHZ
01 - DRIVESHAFT BRG-NORTH-SOUTH	.039 In/Sec	.020 G-s
02 - DRIVESHAFT BRG-EAST-WEST	.036 In/Sec	.041 G-s
03 - DRIVESHAFT BRG-VERTICAL	.042 In/Sec	.048 G-s
11 - C Hydro Agitator MOTOR OB HORIZ	.108 In/Sec	1.054 G-s
12 - C Hydro Agitator MOTOR OB VERT	.079 In/Sec	.887 G-s
13 - C Hydro Agitator Motor OB Axial	.142 In/Sec	.438 G-s
21 - C Hydro Agitator MOTOR IB HORIZ	.119 In/Sec	.290 G-s
22 - C Hydro Agitator MOTOR IB VERT	.158 In/Sec	.488 G-s
23 - C Hydro Agitator Motor IB Axial	.149 In/Sec	.610 G-s
31 - C Hydro Agitator GrBx In Horizon	.097 In/Sec	.518 G-s
32 - C Hydro Agitator GrBx In VERT	.092 In/Sec	.897 G-s
33 - C Hydro Agitator GrBx In Axial	.052 In/Sec	.257 G-s
41 - C Hydro Agitator GrBx Top HZ E-W	.047 In/Sec	.552 G-s
42 - C Hydro Agitator GrBx TOP HZ N-S	.035 In/Sec	.576 G-s
51 - C Hydro Agitator GrBx BOT HZ E-W	.021 In/Sec	.304 G-s
52 - C Hydro Agitator GrBx BOT HZ N-S	.026 In/Sec	.771 G-s
53 - C Hydro Agitator GrBx Top Axial	.045 In/Sec	.566 G-s
57 - A/B Concentr Vac Pmp-var RPM	(27-Jul-20)	
	OVERALL LEVEL	1-20 KHz
11 - Motor OB HOR	.052 In/Sec	.381 G-s
12 - Motor OB VERT	.050 In/Sec	.487 G-s
21 - Motor IB HOR	.053 In/Sec	.329 G-s
23 - Motor IB AXIAL	.068 In/Sec	.215 G-s
71 - Compressor IB HOR	.148 In/Sec	.546 G-s
81 - Compressor OB Horiz	.324 In/Sec	.664 G-s
83 - Compressor OB Axial	.065 In/Sec	2.040 G-s
2130-1 - FLASH VAP VAC PUMP-var speed	(27-Jul-20)	
	OVERALL LEVEL	1-20 KHz
11 - Motor OB HOR	.075 In/Sec	.500 G-s
12 - Motor OB VERT	.029 In/Sec	.245 G-s
21 - Motor IB HOR	.052 In/Sec	.731 G-s
22 - Motor IB VERT	.042 In/Sec	.441 G-s
23 - Motor IB AXIAL	.044 In/Sec	.564 G-s

71	- Compressor IB HOR	.063 In/Sec	.473 G-s
72	- Compressor IB VERT	.076 In/Sec	.513 G-s
81	- Compressor OB Horiz	.096 In/Sec	.269 G-s
82	- Compressor OB VERT	.087 In/Sec	.385 G-s
83	- Compressor OB Axial	.072 In/Sec	.737 G-s

C-203	- C-203 Comp	(27-Jul-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OB HOR	.034 In/Sec	1.152 G-s
12	- MOTOR OB VERT	.032 In/Sec	.308 G-s
21	- MOTOR IB HOR	.060 In/Sec	1.245 G-s
22	- MOTOR IB VERT	.030 In/Sec	.549 G-s
23	- MOTOR IB AXIAL	.055 In/Sec	1.993 G-s
		OVERALL LEVEL	1-20 KHZ
71M	- COMP MALE SHAFT IB HOR	.030 In/Sec	.984 G-s
72M	- COMP MALE SHAFT IB VERT	.050 In/Sec	2.708 G-s
73M	- COMP MALE SHAFT IB AXIAL	.065 In/Sec	1.675 G-s
81M	- COMP MALE SHAFT OB HOR	.065 In/Sec	3.985 G-s
82M	- COMP MALE SHAFT OB VERT	.049 In/Sec	1.367 G-s
71F	- COMP FEMALE SHAFT IB HOR	.045 In/Sec	1.890 G-s
72F	- COMP FEMALE SHAFT IB VERT	.059 In/Sec	1.743 G-s
73F	- COMP FEMALE SHAFT IB AXIAL	.064 In/Sec	3.759 G-s
81F	- COMP FEMALE SHAFT OB HOR	.049 In/Sec	2.943 G-s
82F	- COMP FEMALE SHAFT OB VERT	.076 In/Sec	2.416 G-s

C-202	- C-202 Comp	(27-Jul-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OB HOR	.082 In/Sec	1.516 G-s
12	- MOTOR OB VERT	.113 In/Sec	.251 G-s
21	- MOTOR IB HOR	.059 In/Sec	.456 G-s
22	- MOTOR IB VERT	.096 In/Sec	.705 G-s
23	- MOTOR IB AXIAL	.054 In/Sec	1.379 G-s
		OVERALL LEVEL	1-20 KHZ
71M	- COMP MALE SHAFT IB HOR	.038 In/Sec	1.935 G-s
72M	- COMP MALE SHAFT IB VERT	.045 In/Sec	1.246 G-s
73M	- COMP MALE SHAFT IB AXIAL	.098 In/Sec	1.307 G-s
81M	- COMP MALE SHAFT OB HOR	.031 In/Sec	5.714 G-s
82M	- COMP MALE SHAFT OB VERT	.049 In/Sec	1.702 G-s
71F	- COMP FEMALE SHAFT IB HOR	.041 In/Sec	1.935 G-s
72F	- COMP FEMALE SHAFT IB VERT	.069 In/Sec	1.015 G-s
73F	- COMP FEMALE SHAFT IB AXIAL	.065 In/Sec	8.232 G-s
81F	- COMP FEMALE SHAFT OB HOR	.051 In/Sec	2.845 G-s
82F	- COMP FEMALE SHAFT OB VERT	.054 In/Sec	.976 G-s

C-201	- C-201 Comp	(27-Jul-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OB HOR	.087 In/Sec	.572 G-s
12	- MOTOR OB VERT	.100 In/Sec	.349 G-s
21	- MOTOR IB HOR	.088 In/Sec	.403 G-s
22	- MOTOR IB VERT	.064 In/Sec	.422 G-s
23	- MOTOR IB AXIAL	.071 In/Sec	.447 G-s
		OVERALL LEVEL	1-20 KHZ
71M	- COMP MALE SHAFT IB HOR	.045 In/Sec	1.801 G-s
72M	- COMP MALE SHAFT IB VERT	.046 In/Sec	2.125 G-s
73M	- COMP MALE SHAFT IB AXIAL	.086 In/Sec	2.072 G-s
81M	- COMP MALE SHAFT OB HOR	.034 In/Sec	6.987 G-s
82M	- COMP MALE SHAFT OB VERT	.052 In/Sec	2.203 G-s

71F - COMP FEMALE SHAFT IB HOR		.051 In/Sec	1.982 G-s
72F - COMP FEMALE SHAFT IB VERT		.040 In/Sec	1.234 G-s
73F - COMP FEMALE SHAFT IB AXIAL		.049 In/Sec	2.109 G-s
81F - COMP FEMALE SHAFT OB HOR		.062 In/Sec	2.491 G-s
82F - COMP FEMALE SHAFT OB VERT		.053 In/Sec	1.596 G-s

new AC	- INSTRUMENT AIR COMPRESSOR	(27-Jul-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OB HOR	.132 In/Sec	1.141 G-s
12	- MOTOR OB VERT	.099 In/Sec	.719 G-s
13	- MOTOR OB AXIAL	.052 In/Sec	.526 G-s
21	- MOTOR IB HOR	.197 In/Sec	1.443 G-s
22	- MOTOR IB VERT	.107 In/Sec	1.897 G-s
23	- MOTOR IB AXIAL	.057 In/Sec	.792 G-s
		OVERALL LEVEL	1-20 KHZ
71M - COMP MALE SHAFT IB HOR		.131 In/Sec	4.665 G-s
72M - COMP MALE SHAFT IB VERT		.179 In/Sec	6.554 G-s
73M - COMP MALE SHAFT IB AXIAL		.140 In/Sec	5.309 G-s
81M - COMP MALE SHAFT OB HOR		.155 In/Sec	3.102 G-s
82M - COMP MALE SHAFT OB VERT		.214 In/Sec	6.348 G-s
83M - COMP MALE SHAFT OB AXIAL		.286 In/Sec	10.08 G-s
71F - COMP FEMALE SHAFT IB HOR		.236 In/Sec	8.362 G-s
72F - COMP FEMALE SHAFT IB VERT		.162 In/Sec	4.426 G-s
73F - COMP FEMALE SHAFT IB AXIAL		.174 In/Sec	3.884 G-s
81F - COMP FEMALE SHAFT OB HOR		.138 In/Sec	2.830 G-s
82F - COMP FEMALE SHAFT OB VERT		.247 In/Sec	6.405 G-s
83F - COMP FEMALE SHAFT OB AXIAL		.170 In/Sec	3.954 G-s

201-08A	- COMPRESSOR,NASH A 201-08A	(27-Jul-20)	
		OVERALL LEVEL	1-20 KHz
11	- Nash Compr A Motor OB Horiz	.063 In/Sec	.141 G-s
12	- Nash Compr A Motor OB Vertical	.069 In/Sec	.105 G-s
13	- Nash Compr A Motor OB Axial	.130 In/Sec	.072 G-s
21	- Nash Compr A Motor IB Horiz	.083 In/Sec	.123 G-s
22	- Nash Compr A Motor IB VERT	.076 In/Sec	.100 G-s
23	- Nash Compr A Motor IB AXIAL	.124 In/Sec	.124 G-s
71	- Nash Compr A COMP IB HORIZ	.135 In/Sec	1.082 G-s
72	- Nash Compr A Compressor IB Verti	.206 In/Sec	1.332 G-s
73	- Nash Compr A COMP IB AXIAL	.139 In/Sec	.438 G-s
81	- Nash Compr A COMP OB HORIZ	.150 In/Sec	.661 G-s
82	- Nash Compr A Compressor OB Verti	.264 In/Sec	.756 G-s
83	- Nash Compr A Compressor OB Axial	.153 In/Sec	.369 G-s

202-05	- NASH SEAL LIQUID PUMP-A	(27-Jul-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OUTBOARD HORIZ	.039 In/Sec	.079 G-s
21	- MOTOR INBOARD HORIZ	.015 In/Sec	.116 G-s
23	- MOTOR INBOARD AXIAL	.016 In/Sec	.088 G-s
71	- PUMP HORIZ	.037 In/Sec	.061 G-s
72	- PUMP VERT	.019 In/Sec	.068 G-s

9002-10	- D-HYDROGENATOR AGITATOR	(27-Jul-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OUTBOARD HORIZONTAL	.088 In/Sec	.169 G-s
21	- MOTOR INBOARD HORIZONTAL	.061 In/Sec	.169 G-s
23	- MOTOR INBOARD AXIAL	.044 In/Sec	.097 G-s
31	- GEARBOX INPUT SHAFT -HORIZONTAL	.180 In/Sec	.585 G-s

51 - GEARBOX TOP PLATE- E-W	.194 In/Sec	.313 G-s
52 - GEARBOX TOP PLATE- N-S	.264 In/Sec	.337 G-s
53 - GEARBOX OUTPUT TOP -VERTICAL	.168 In/Sec	.529 G-s
61 - GEARBOX BOTTOM E-W-HORIZONTAL	.152 In/Sec	.107 G-s
81 - AGIT INTERMED BRG @ SEAL- N-S	.046 In/Sec	.021 G-s
82 - AGIT INTERMED BRG @ SEAL- E-W	.037 In/Sec	.020 G-s
83 - AGIT INTERMED BRG @ SEAL- VERT	.041 In/Sec	.163 G-s

Clarification Of Vibration Units:

Acc --> G-s PK

Vel --> In/Sec PK

Abbreviated Last Measurement Summary