HI-SPEED INDUSTRIAL SERVICE

MILLINGTON, TN

May 13, 2021

Arkema

Subject: May week 1 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 Route Critical Equipment Observations

C Concentrator Vacuum Pump 2130-1
The motor has the highest vibration amplitude of about 0.189"/second velocity peak overall in the axial measurement. Vibration consists mostly of a 4x RPM component. We suspect either a 4 finger coupling or process issue associated with impeller pass. **Rated a Class I Defect.**

Agitator, Hydrogenator C 7001-01
All vibrations are under 0.11"/second velocity peak overall. We will continue to monitor normally. No immediate issue.

A/B Concentrator Vacuum Pump 57
The unit vibration overall is 0.1"/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. We will continue to monitor this unit closely for changes. **Rated a Class I Defect**.

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 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 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. **Rated a Class I 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 6 and 9 g's RMS overall in the data. The dominant vibration appears to be the second gear mesh harmonic at near 2500 Hz. We are still watching this unit closely and will be going forward. **Rated a Class I Defect for now.**

Air Compressor NASH A 201-08A
Highest vibration is still in the pump itself at 0.287"/sec velocity peak for the outboard vertical and has dropped slightly. 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 0.26"/sec velocity peak for the gearbox input. Vibrations are mostly sub-synchronous to motor speed. This is still lower amplitude for this unit. **Rated a Class I Defect.**

H2O2 Monthly Route Equipment

ABC Sec Filter Feed Pump North 2130-6
I made a field note in February and this month in the database on this pump. The vibration data does not show much besides a dominant 12x RPM vibration which we believe to be the first harmonic of impeller pass. The data also shows an elevated noise floor up to about 600 Hz. Confirm the pump is operating in the best part of the performance curve, is not cavitating, and is performing as designed. I'm also concerned there could be a bearing issue also, but I don't see any obvious race defect frequencies. The noise floor could be early distress. Ensure the bearings are lubricated if applicable. **Rated a Class II Defect.**

East Oxidizer Feed Pump 9001-1
The data shows an increase in a 6x RPM vibration in the pump, which we assume is impeller pass. Confirm the pump is operating in the best part of the performance curve, is not cavitating, and is performing as designed. **Rated a Class I Defect.**

Abbreviated Last Measurement Summary

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Database: Arkema.rbm
Station: PEROXIDE
Route No. 3: ARK WK 1
Report Date: 13-May-21 13:15

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD	MACHINE SPEED
2130-1old - C Concentrator Vacuum Pump (12-May-21)			
	OVERALL LEVEL	1-20 KHz	
11	.053 In/Sec	.680 G-s	1200.0 RPM
21	.061 In/Sec	.414 G-s	
23	.189 In/Sec	.134 G-s	
71	.120 In/Sec	.886 G-s	
81	.163 In/Sec	.544 G-s	
83	.081 In/Sec	1.137 G-s	
7000-01 - AGITATOR,HYDROGENATOR C (12-May-21)			
	OVERALL LEVEL	1-20 KHZ	
02	.048 In/Sec	.012 G-s	45.00 RPM
03	.050 In/Sec	.061 G-s	
11	.075 In/Sec	.925 G-s	1400.0 RPM
12	.071 In/Sec	.716 G-s	
13	.108 In/Sec	.103 G-s	
21	.077 In/Sec	.388 G-s	
22	.106 In/Sec	.061 G-s	
23	.106 In/Sec	.422 G-s	
31	.079 In/Sec	.411 G-s	
32	.071 In/Sec	.578 G-s	
33	.044 In/Sec	.261 G-s	
41	.070 In/Sec	.578 G-s	
42	.084 In/Sec	.762 G-s	
51	.063 In/Sec	.282 G-s	375.0 RPM
53	.060 In/Sec	.250 G-s	
61	.031 In/Sec	.218 G-s	
71	.054 In/Sec	.221 G-s	45.00 RPM
81	.021 In/Sec	.158 G-s	
83	.050 In/Sec	.205 G-s	
57 - A/B Concentr Vac Pmp-var RPM (12-May-21)			
	OVERALL LEVEL	1-20 KHz	
11	.053 In/Sec	.093 G-s	900.0 RPM
12	.069 In/Sec	.230 G-s	
21	.087 In/Sec	.149 G-s	
23	.059 In/Sec	.272 G-s	
71	.124 In/Sec	.546 G-s	
81	.249 In/Sec	.479 G-s	
83	.062 In/Sec	.803 G-s	
2130-1 - FLASH VAP VAC PUMP-var speed (12-May-21)			
	OVERALL LEVEL	1-20 KHz	
11	.046 In/Sec	.125 G-s	1200.0 RPM
12	.033 In/Sec	.251 G-s	

21	.040 In/Sec	.344 G-s		
22	.040 In/Sec	.288 G-s		
23	.055 In/Sec	.369 G-s		
71	.069 In/Sec	.335 G-s		
72	.074 In/Sec	.455 G-s		
81	.079 In/Sec	.533 G-s		
82	.070 In/Sec	.567 G-s		
83	.041 In/Sec	.605 G-s		

236-06 - HYDRO FD PUMP N 236-06 -2FLR (12-May-21)

	OVERALL LEVEL	1-20 KHz	
11	.139 In/Sec	.050 G-s	3600.0 RPM
21	.071 In/Sec	.143 G-s	

2130-6 - ABC SEC FILT FEED PUMP-NORTH (12-May-21)

	OVERALL LEVEL	1-20 KHz	
11	.067 In/Sec	.065 G-s	1800.0 RPM
21	.058 In/Sec	.281 G-s	
23	.039 In/Sec	.261 G-s	
71	.172 In/Sec	.646 G-s	
72	.103 In/Sec	1.125 G-s	

9001-1 - EAST OXIDIZER FEED PUMP (12-May-21)

	OVERALL LEVEL	1-20 KHz	
11	.039 In/Sec	.256 G-s	1800.0 RPM
21	.065 In/Sec	.319 G-s	
23	.046 In/Sec	.134 G-s	
71	.079 In/Sec	.663 G-s	
72	.173 In/Sec	.524 G-s	

9001-2 - MIDDLE OXIDIZER FEED PUMP (12-May-21)

	OVERALL LEVEL	1-20 KHz	
11	.022 In/Sec	.713 G-s	1800.0 RPM
21	.039 In/Sec	.459 G-s	
23	.058 In/Sec	.428 G-s	
71	.093 In/Sec	.235 G-s	
72	.062 In/Sec	.381 G-s	

7016-11 - WEST OXIDIZER FEED PUMP (12-May-21)

	OVERALL LEVEL	1-20 KHz	
11	.021 In/Sec	.337 G-s	1800.0 RPM
21	.018 In/Sec	.622 G-s	
23	.015 In/Sec	.293 G-s	
71	.084 In/Sec	.480 G-s	
72	.077 In/Sec	.523 G-s	

234-01 - CHILL WATER PUMP 234-01 (12-May-21)

	OVERALL LEVEL	1-20 KHz	
11	.046 In/Sec	.786 G-s	1790.0 RPM
21	.041 In/Sec	1.057 G-s	
23	.138 In/Sec		
71	.069 In/Sec	.334 G-s	
72	.064 In/Sec	.247 G-s	

C-203 - C-203 Comp (12-May-21)

	OVERALL LEVEL	1-20 KHz	
11	.096 In/Sec	4.004 G-s	3588.0 RPM

	12	.034 In/Sec	.632 G-s	
	21	.023 In/Sec	.427 G-s	
	22	.131 In/Sec	4.118 G-s	
	23	.039 In/Sec	1.446 G-s	
		OVERALL LEVEL	1-20 KHZ	
	71M	.031 In/Sec	.786 G-s	
	72M	.045 In/Sec	2.734 G-s	
	73M	.059 In/Sec	3.117 G-s	
	81M	.058 In/Sec	4.265 G-s	
	82M	.061 In/Sec	4.498 G-s	
	71F	.046 In/Sec	9.886 G-s	
	72F	.067 In/Sec	1.721 G-s	
	73F	.074 In/Sec	7.732 G-s	
	81F	.062 In/Sec	2.967 G-s	
	82F	.063 In/Sec	1.470 G-s	

9000-02 - D HYDROGENATOR FD PUMP- EAST (12-May-21)

		OVERALL LEVEL	1-20 KHz	
	11	.055 In/Sec	.104 G-s	1800.0 RPM
	21	.064 In/Sec	.521 G-s	
	23	.043 In/Sec	.306 G-s	
	71	.100 In/Sec	.573 G-s	
	72	.065 In/Sec	.716 G-s	

236-04A - HYDROGNTOR PRECOOLER FD PUMP (12-May-21)

		OVERALL LEVEL	1-20 KHz	
	11	.038 In/Sec	.484 G-s	1800.0 RPM
	21	.068 In/Sec	.662 G-s	
	23	.058 In/Sec	.247 G-s	
	71	.129 In/Sec	.238 G-s	
	72	.065 In/Sec	.232 G-s	

C-202 - C-202 Comp (12-May-21)

		OVERALL LEVEL	1-20 KHz	
	11	.059 In/Sec	1.703 G-s	3588.0 RPM
	12	.123 In/Sec	.794 G-s	
	21	.060 In/Sec	.532 G-s	
	22	.163 In/Sec	4.330 G-s	
	23	.091 In/Sec	3.155 G-s	
		OVERALL LEVEL	1-20 KHZ	
	71M	.041 In/Sec	1.939 G-s	
	72M	.046 In/Sec	.812 G-s	
	73M	.074 In/Sec	1.999 G-s	
	81M	.079 In/Sec	9.596 G-s	
	82M	.068 In/Sec	5.294 G-s	
	71F	.040 In/Sec	2.039 G-s	
	72F	.066 In/Sec	2.649 G-s	
	73F	.093 In/Sec	4.812 G-s	
	81F	.045 In/Sec	3.642 G-s	
	82F	.051 In/Sec	1.398 G-s	

C-201 - C-201 Comp (12-May-21)

		OVERALL LEVEL	1-20 KHz	
	11	.193 In/Sec	6.742 G-s	3588.0 RPM
	12	.088 In/Sec	2.322 G-s	
	21	.098 In/Sec	1.132 G-s	
	22	.105 In/Sec	3.815 G-s	

23	.075 In/Sec	2.063 G-s	
	OVERALL LEVEL	1-20 KHZ	
71M	.050 In/Sec	2.756 G-s	
72M	.054 In/Sec	3.701 G-s	
73M	.069 In/Sec	.601 G-s	
81M	.098 In/Sec	7.169 G-s	
82M	.061 In/Sec	4.143 G-s	
71F	.059 In/Sec	2.165 G-s	
72F	.060 In/Sec	2.295 G-s	
73F	.055 In/Sec	2.794 G-s	
81F	.038 In/Sec	1.019 G-s	
82F	.063 In/Sec	2.906 G-s	

new AC - INSTRUMENT AIR COMPRESSOR (12-May-21)

	OVERALL LEVEL	1-20 KHz	
11	.156 In/Sec	.662 G-s	1780.0 RPM
12	.106 In/Sec	.670 G-s	
13	.051 In/Sec	.382 G-s	
21	.146 In/Sec	1.411 G-s	
22	.073 In/Sec	.900 G-s	
23	.052 In/Sec	.541 G-s	
	OVERALL LEVEL	1-20 KHZ	
71F	.196 In/Sec	7.025 G-s	
72F	.131 In/Sec	2.808 G-s	
73F	.147 In/Sec	3.613 G-s	
81F	.141 In/Sec	2.172 G-s	
82F	.204 In/Sec	5.421 G-s	
83F	.195 In/Sec	3.579 G-s	
71M	.123 In/Sec	5.955 G-s	
72M	.129 In/Sec	7.668 G-s	
73M	.111 In/Sec	2.753 G-s	
81M	.194 In/Sec	6.863 G-s	
82M	.295 In/Sec	9.729 G-s	
83M	.206 In/Sec	6.337 G-s	

201-08A - COMPRESSOR,NASH A 201-08A (12-May-21)

	OVERALL LEVEL	1-20 KHz	
11	.072 In/Sec	.070 G-s	506.3 RPM
12	.078 In/Sec	.175 G-s	
13	.155 In/Sec	.150 G-s	
21	.072 In/Sec	.091 G-s	
22	.101 In/Sec	.098 G-s	
23	.160 In/Sec	.137 G-s	
71	.148 In/Sec	1.304 G-s	
72	.245 In/Sec	1.123 G-s	
73	.163 In/Sec	.319 G-s	
81	.178 In/Sec	.246 G-s	
82	.287 In/Sec	.360 G-s	
83	.180 In/Sec	.195 G-s	

9002-10 - D-HYDROGENATOR AGITATOR (12-May-21)

	OVERALL LEVEL	1-20 KHz	
11	.069 In/Sec	.073 G-s	1185.0 RPM
21	.073 In/Sec	.209 G-s	
23	.049 In/Sec	.069 G-s	
	OVERALL LEVEL	1-20 KHZ	
31	.201 In/Sec	.852 G-s	

31L	.260 In/Sec	.752 G-s	
	OVERALL LEVEL	1-20 KHz	
51	.222 In/Sec	.250 G-s	
51L	.198 In/Sec	.250 G-s	100.0 RPM
52	.232 In/Sec	.330 G-s	
52L	.248 In/Sec	.358 G-s	
53	.122 In/Sec	.409 G-s	
53L	.031 In/Sec	.452 G-s	
61	.149 In/Sec	.126 G-s	
61L	.178 In/Sec	.121 G-s	
81	.033 In/Sec	.047 G-s	
82	.032 In/Sec	.024 G-s	
83	.027 In/Sec	.138 G-s	

Clarification Of Vibration Units:

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