HI-SPEED INDUSTRIAL SERVICE

MILLINGTON, TN

February 5, 2021

Arkema

Subject: February 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,

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
Vibrations appear to be slightly elevated this survey. Motor inboard axial is at 0.190"/sec velocity peak. No actions required just yet.

Agitator, Hydrogenator C 7001-01
The highest motor overall vibration is at 0.120"/sec velocity peak for the inboard vertical. We will continue to monitor normally. Gearbox looks good. No immediate issue.

A/B Concentrator Vacuum Pump 57
The outboard pump bearing overall is 0.227"/sec peak velocity, with a dominant vibration at 16 orders, which is most likely vane pass. We will continue to watch for changes. **Rated a Class I Defect.**

Flash Vacuum Pump 2130-1
Vibrations are all under 0.1"/sec velocity peak overall. 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. 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-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. We will continue to monitor this unit for changes. **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 7 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 0.297"/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 I Defect.**

D Hydrogenator Agitator 9002-10
Highest overall vibration is at 0.249"/sec velocity peak. This is about average for this unit. We will watch carefully during the next few surveys. No immediate concern.

H202 Monthly Equipment Observations

No issues noted.

Abbreviated Last Measurement Summary

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Database: Arkema.rbm
Station: PEROXIDE
Route No. 3: ARK WK 1
Report Date: 05-Feb-21 13:26

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD	MACHINE SPEED
2130-1old - C Concentrator Vacuum Pump (05-Feb-21)			
	OVERALL LEVEL	1-20 KHz	
11	.063 In/Sec	.572 G-s	1200.0 RPM
21	.072 In/Sec	.504 G-s	
23	.190 In/Sec	.161 G-s	
71	.126 In/Sec	1.015 G-s	
81	.157 In/Sec	.801 G-s	
83	.076 In/Sec	1.743 G-s	
7000-01 - AGITATOR,HYDROGENATOR C (05-Feb-21)			
	OVERALL LEVEL	1-20 KHZ	
02	.041 In/Sec	.091 G-s	45.00 RPM
03	.043 In/Sec	.022 G-s	
11	.071 In/Sec	.705 G-s	1400.0 RPM
12	.064 In/Sec	.713 G-s	
13	.100 In/Sec	.273 G-s	
21	.077 In/Sec	.282 G-s	
22	.120 In/Sec	.174 G-s	
23	.104 In/Sec	.637 G-s	
31	.099 In/Sec	.827 G-s	
32	.073 In/Sec	.729 G-s	
33	.051 In/Sec	.441 G-s	
41	.098 In/Sec	1.176 G-s	
42	.084 In/Sec	1.132 G-s	
51	.079 In/Sec	.509 G-s	375.0 RPM
53	.080 In/Sec	.450 G-s	
61	.037 In/Sec	.382 G-s	
71	.055 In/Sec	1.238 G-s	45.00 RPM
81	.020 In/Sec	.373 G-s	
83	.054 In/Sec	.371 G-s	
57 - A/B Concentr Vac Pmp-var RPM (05-Feb-21)			
	OVERALL LEVEL	1-20 KHz	
11	.046 In/Sec	.201 G-s	900.0 RPM
12	.056 In/Sec	.230 G-s	
21	.077 In/Sec	.254 G-s	
23	.052 In/Sec	.229 G-s	
71	.133 In/Sec	.467 G-s	
81	.227 In/Sec	.735 G-s	
83	.040 In/Sec	.704 G-s	
2130-1 - FLASH VAP VAC PUMP-var speed (05-Feb-21)			
	OVERALL LEVEL	1-20 KHz	

	11	.049 In/Sec	.092 G-s	1200.0 RPM
	12	.031 In/Sec	.206 G-s	
	21	.039 In/Sec	.488 G-s	
	22	.043 In/Sec	.359 G-s	
	23	.054 In/Sec	.615 G-s	
	71	.063 In/Sec	.428 G-s	
	72	.078 In/Sec	.352 G-s	
	81	.083 In/Sec	.302 G-s	
	82	.089 In/Sec	.588 G-s	
	83	.045 In/Sec	.559 G-s	

236-06 - HYDRO FD PUMP N 236-06 -2FLR (05-Feb-21)

	OVERALL LEVEL	1-20 KHz	
11	.123 In/Sec	.024 G-s	3600.0 RPM
21	.077 In/Sec	.194 G-s	

2130-6 - ABC SEC FILT FEED PUMP-NORTH (05-Feb-21)

	OVERALL LEVEL	1-20 KHz	
11	.069 In/Sec	.102 G-s	1800.0 RPM
21	.057 In/Sec	.451 G-s	
23	.046 In/Sec	.299 G-s	
71	.205 In/Sec	.817 G-s	
72	.105 In/Sec	1.277 G-s	

9001-1 - EAST OXIDIZER FEED PUMP (05-Feb-21)

	OVERALL LEVEL	1-20 KHz	
11	.030 In/Sec	.170 G-s	1800.0 RPM
21	.069 In/Sec	.592 G-s	
23	.048 In/Sec	.194 G-s	
71	.106 In/Sec	.652 G-s	
72	.130 In/Sec	.250 G-s	

9001-2 - MIDDLE OXIDIZER FEED PUMP (05-Feb-21)

	OVERALL LEVEL	1-20 KHz	
11	.020 In/Sec	.897 G-s	1800.0 RPM
21	.041 In/Sec	.409 G-s	
23	.044 In/Sec	.221 G-s	
71	.087 In/Sec	.233 G-s	
72	.068 In/Sec	.277 G-s	

7016-11 - WEST OXIDIZER FEED PUMP (05-Feb-21)

	OVERALL LEVEL	1-20 KHz	
11	.024 In/Sec	.178 G-s	1800.0 RPM
21	.019 In/Sec	.447 G-s	
23	.017 In/Sec	.328 G-s	
71	.085 In/Sec	.582 G-s	
72	.086 In/Sec	.508 G-s	

234-01 - CHILL WATER PUMP 234-01 (05-Feb-21)

	OVERALL LEVEL	1-20 KHz	
11	.043 In/Sec	.652 G-s	1790.0 RPM
21	.043 In/Sec	1.001 G-s	
23	.076 In/Sec		
71	.075 In/Sec	.284 G-s	
72	.071 In/Sec	.246 G-s	

C-203 - C-203 Comp (05-Feb-21)

	OVERALL LEVEL	1-20 KHz	
11	.093 In/Sec	3.397 G-s	3588.0 RPM
12	.034 In/Sec	.414 G-s	
21	.085 In/Sec	2.965 G-s	
22	.048 In/Sec	1.674 G-s	
23	.078 In/Sec	2.856 G-s	
	OVERALL LEVEL	1-20 KHZ	
71M	.042 In/Sec	1.379 G-s	
72M	.048 In/Sec	2.141 G-s	
73M	.063 In/Sec	2.886 G-s	
81M	.063 In/Sec	3.633 G-s	
82M	.073 In/Sec	2.969 G-s	
71F	.062 In/Sec	2.865 G-s	
72F	.076 In/Sec	2.215 G-s	
73F	.094 In/Sec	4.799 G-s	
81F	.070 In/Sec	2.836 G-s	
82F	.056 In/Sec	1.400 G-s	

9000-01 - D HYDROGENATOR FD PUMP- WEST (05-Feb-21)

	OVERALL LEVEL	1-20 KHz	
11	.057 In/Sec	.144 G-s	1800.0 RPM
21	.029 In/Sec	.287 G-s	
23	.027 In/Sec	.300 G-s	
71	.104 In/Sec	.754 G-s	
72	.051 In/Sec	.651 G-s	

236-04A - HYDROGNTOR PRECOOLER FD PUMP (05-Feb-21)

	OVERALL LEVEL	1-20 KHz	
11	.059 In/Sec	.387 G-s	1800.0 RPM
21	.077 In/Sec	.493 G-s	
23	.038 In/Sec	.308 G-s	
71	.135 In/Sec	.327 G-s	
72	.069 In/Sec	.275 G-s	

C-202 - C-202 Comp (05-Feb-21)

	OVERALL LEVEL	1-20 KHz	
11	.073 In/Sec	.945 G-s	3588.0 RPM
12	.123 In/Sec	1.592 G-s	
21	.102 In/Sec	2.650 G-s	
22	.164 In/Sec	5.998 G-s	
23	.067 In/Sec	.611 G-s	
	OVERALL LEVEL	1-20 KHZ	
71M	.045 In/Sec	1.676 G-s	
72M	.052 In/Sec	.869 G-s	
73M	.073 In/Sec	1.972 G-s	
81M	.070 In/Sec	3.494 G-s	
82M	.076 In/Sec	3.167 G-s	
71F	.045 In/Sec	2.162 G-s	
72F	.058 In/Sec	1.347 G-s	
73F	.084 In/Sec	3.442 G-s	
81F	.059 In/Sec	2.637 G-s	
82F	.087 In/Sec	2.102 G-s	

C-201 - C-201 Comp (05-Feb-21)

	OVERALL LEVEL	1-20 KHz	
11	.102 In/Sec	1.876 G-s	3588.0 RPM
12	.056 In/Sec	.936 G-s	

21	.102 In/Sec	1.727 G-s	
22	.055 In/Sec	1.257 G-s	
23	.146 In/Sec	5.555 G-s	
	OVERALL LEVEL	1-20 KHZ	
71M	.067 In/Sec	4.361 G-s	
72M	.059 In/Sec	3.000 G-s	
73M	.089 In/Sec	2.729 G-s	
81M	.052 In/Sec	6.681 G-s	
82M	.070 In/Sec	2.653 G-s	
71F	.068 In/Sec	3.321 G-s	
72F	.076 In/Sec	2.605 G-s	
73F	.104 In/Sec	5.718 G-s	
81F	.071 In/Sec	3.203 G-s	
82F	.072 In/Sec	2.162 G-s	

new AC - INSTRUMENT AIR COMPRESSOR (05-Feb-21)

	OVERALL LEVEL	1-20 KHz	
11	.140 In/Sec	1.084 G-s	1780.0 RPM
12	.109 In/Sec	.694 G-s	
13	.065 In/Sec	.585 G-s	
21	.189 In/Sec	1.098 G-s	
22	.075 In/Sec	.653 G-s	
23	.045 In/Sec	.920 G-s	
	OVERALL LEVEL	1-20 KHZ	
71F	.238 In/Sec	7.211 G-s	
72F	.185 In/Sec	5.801 G-s	
73F	.269 In/Sec	9.777 G-s	
81F	.156 In/Sec	2.745 G-s	
82F	.300 In/Sec	9.404 G-s	
83F	.256 In/Sec	8.384 G-s	
71M	.130 In/Sec	5.090 G-s	
72M	.206 In/Sec	6.440 G-s	
73M	.132 In/Sec	5.553 G-s	
81M	.160 In/Sec	3.959 G-s	
82M	.240 In/Sec	4.666 G-s	
83M	.240 In/Sec	7.103 G-s	

201-08A - COMPRESSOR,NASH A 201-08A (05-Feb-21)

	OVERALL LEVEL	1-20 KHz	
11	.071 In/Sec	.106 G-s	506.3 RPM
12	.076 In/Sec	.127 G-s	
13	.139 In/Sec	.077 G-s	
21	.066 In/Sec	.086 G-s	
22	.090 In/Sec	.133 G-s	
23	.150 In/Sec	.106 G-s	
71	.162 In/Sec	1.275 G-s	
72	.260 In/Sec	.629 G-s	
73	.155 In/Sec	.167 G-s	
81	.173 In/Sec	.413 G-s	
82	.297 In/Sec	.354 G-s	
83	.147 In/Sec	.211 G-s	

9002-10 - D-HYDROGENATOR AGITATOR (05-Feb-21)

	OVERALL LEVEL	1-20 KHz	
11	.083 In/Sec	.073 G-s	1185.0 RPM
21	.071 In/Sec	.164 G-s	
23	.056 In/Sec	.072 G-s	

	OVERALL LEVEL	1-20 KHZ	
31	.167 In/Sec	.622 G-s	
31L	.279 In/Sec	.618 G-s	
	OVERALL LEVEL	1-20 KHz	
51	.240 In/Sec	.160 G-s	
51L	.215 In/Sec	.191 G-s	100.0 RPM
52	.249 In/Sec	.312 G-s	
52L	.247 In/Sec	.302 G-s	
53	.146 In/Sec	.600 G-s	
53L	.034 In/Sec	.597 G-s	
61	.136 In/Sec	.109 G-s	
61L	.137 In/Sec	.104 G-s	
81	.032 In/Sec	.023 G-s	
82	.031 In/Sec	.026 G-s	
83	.028 In/Sec	.159 G-s	

Clarification Of Vibration Units:

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