HI-SPEED INDUSTRIAL SERVICE

MILLINGTON, TN

March 30, 2021

Arkema

Subject: March week 4 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
The motor has the highest vibration amplitude of about 0.196”/second velocity peak overall in the axial measurement. No immediate concerns.

Agitator, Hydrogenator C 7001-01
All vibrations are under 0.116”/second velocity peak overall. We will continue to monitor normally. No immediate issue.

A/B Concentrator Vacuum Pump 57
The outboard pump bearing overall is 0.236”/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
All vibrations are below 0.1”/second velocity peak overall. No reportable issues.

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. 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 very 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. 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 high for this motor’s history; 12 g’s at 42 orders (42 Bars most likely). 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 8 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 0.372"/sec velocity peak for the outboard vertical and is the highest amplitude in over 5 years. 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 9002-10 (Unit agitator shaft failed shortly after the survey. Vibration data does not indicate a problem or imminent failure)
Highest overall vibration is at 0.251"/sec velocity peak for the gearbox. Vibrations are mostly sub-synchronous to motor speed. This is lower amplitude for this unit. **Rated a Class I Defect.**

H2O2 Monthly Route Equipment

Cooling tower Fans
South Cooling Tower North Fan
Motor data shows probable fan blade pass vibration in the outboard bearing. Amplitude has not changed much but is still slightly high. Inspect as time allows. **Rated a Class I Defect.**

H2 Monthly Route Equipment

FD Fan C2
The motor shaft speed vibration has increased for several consecutive months. Inspect the motor base and fasteners, the coupling and alignment at the next opportunity. The fan inboard bearing vibration has elevated acceleration at 3 g's RMS. We suspect the bearing is in early stages of failure mode. Have the spare parts sourced and change out the bearings at the next outage or downtime. **Rated a Class II Defect.**

Abbreviated Last Measurement Summary

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Database: Arkema.rbm
Station: PEROXIDE
Route No. 6: ARKEMA WK4
Report Date: 30-Mar-21 09:45

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD	MACHINE SPEED
2130-1old - C Concentrator Vacuum Pump (29-Mar-21)			
	OVERALL LEVEL	1-20 KHz	
11	.079 In/Sec	.332 G-s	1200.0 RPM
21	.069 In/Sec	.373 G-s	
23	.196 In/Sec	.235 G-s	
71	.111 In/Sec	.731 G-s	
81	.165 In/Sec	.830 G-s	
83	.081 In/Sec	1.366 G-s	
7000-01 - AGITATOR,HYDROGENATOR C (29-Mar-21)			
	OVERALL LEVEL	1-20 KHZ	
02	.043 In/Sec	.028 G-s	45.00 RPM
03	.050 In/Sec	.034 G-s	
11	.071 In/Sec	.381 G-s	1400.0 RPM
12	.050 In/Sec	.684 G-s	
13	.078 In/Sec	.206 G-s	
21	.075 In/Sec	.279 G-s	
22	.098 In/Sec	.065 G-s	
23	.058 In/Sec	.262 G-s	
31	.086 In/Sec	.445 G-s	
32	.073 In/Sec	.524 G-s	
33	.061 In/Sec	.373 G-s	
41	.095 In/Sec	1.211 G-s	
42	.073 In/Sec	.816 G-s	
51	.086 In/Sec	.423 G-s	375.0 RPM
53	.112 In/Sec	.370 G-s	
61	.041 In/Sec	.157 G-s	
71	.057 In/Sec	.335 G-s	45.00 RPM
81	.025 In/Sec	.203 G-s	
83	.047 In/Sec	.225 G-s	
57 - A/B Concentr Vac Pmp-var RPM (29-Mar-21)			
	OVERALL LEVEL	1-20 KHz	
11	.046 In/Sec	.278 G-s	900.0 RPM
12	.062 In/Sec	.187 G-s	
21	.077 In/Sec	.183 G-s	
23	.053 In/Sec	.151 G-s	
71	.122 In/Sec	.660 G-s	
81	.236 In/Sec	.719 G-s	
83	.061 In/Sec	1.369 G-s	
2130-1 - FLASH VAP VAC PUMP-var speed (29-Mar-21)			
	OVERALL LEVEL	1-20 KHz	
11	.042 In/Sec	.271 G-s	1200.0 RPM
12	.037 In/Sec	.541 G-s	

21	.040 In/Sec	.744 G-s	
22	.039 In/Sec	.761 G-s	
23	.069 In/Sec	1.361 G-s	
71	.065 In/Sec	.414 G-s	
72	.068 In/Sec	.751 G-s	
81	.074 In/Sec	.309 G-s	
82	.083 In/Sec	.465 G-s	
83	.046 In/Sec	.468 G-s	

C-203 - C-203 Comp (29-Mar-21)

	OVERALL LEVEL	1-20 KHz	
11	.133 In/Sec	5.658 G-s	3588.0 RPM
12	.303 In/Sec	13.01 G-s	
21	.188 In/Sec	7.217 G-s	
22	.318 In/Sec	12.43 G-s	
23	.069 In/Sec	2.831 G-s	
	OVERALL LEVEL	1-20 KHZ	
71M	.039 In/Sec	1.544 G-s	
72M	.029 In/Sec	.623 G-s	
73M	.059 In/Sec	1.025 G-s	
81M	.060 In/Sec	2.964 G-s	
82M	.064 In/Sec	5.001 G-s	
71F	.058 In/Sec	1.811 G-s	
72F	.060 In/Sec	3.317 G-s	
73F	.080 In/Sec	4.825 G-s	
81F	.035 In/Sec	1.012 G-s	
82F	.067 In/Sec	2.215 G-s	

C-202 - C-202 Comp (29-Mar-21)

	OVERALL LEVEL	1-20 KHz	
11	.051 In/Sec	1.064 G-s	3588.0 RPM
12	.111 In/Sec	.925 G-s	
21	.066 In/Sec	.339 G-s	
22	.094 In/Sec	.744 G-s	
23	.046 In/Sec	.928 G-s	
	OVERALL LEVEL	1-20 KHZ	
71M	.039 In/Sec	1.138 G-s	
72M	.047 In/Sec	1.914 G-s	
73M	.068 In/Sec	.787 G-s	
81M	.040 In/Sec	1.278 G-s	
82M	.056 In/Sec	3.167 G-s	
71F	.043 In/Sec	1.899 G-s	
72F	.059 In/Sec	1.112 G-s	
73F	.057 In/Sec	1.559 G-s	
81F	.040 In/Sec	1.246 G-s	
82F	.051 In/Sec	.900 G-s	

C-201 - C-201 Comp (29-Mar-21)

	OVERALL LEVEL	1-20 KHz	
11	.093 In/Sec	1.445 G-s	3588.0 RPM
12	.075 In/Sec	1.245 G-s	
21	.098 In/Sec	.892 G-s	
22	.048 In/Sec	.650 G-s	
23	.076 In/Sec	2.455 G-s	
	OVERALL LEVEL	1-20 KHZ	
71M	.054 In/Sec	4.291 G-s	
72M	.032 In/Sec	.962 G-s	

	73M	.068 In/Sec	1.878 G-s	
	81M	.092 In/Sec	4.633 G-s	
	82M	.056 In/Sec	2.557 G-s	
	71F	.045 In/Sec	5.154 G-s	
	72F	.067 In/Sec	2.482 G-s	
	73F	.053 In/Sec	2.095 G-s	
	81F	.074 In/Sec	2.788 G-s	
	82F	.049 In/Sec	1.010 G-s	

new AC - INSTRUMENT AIR COMPRESSOR (29-Mar-21)

	OVERALL LEVEL	1-20 KHz	
11	.149 In/Sec	1.192 G-s	1780.0 RPM
12	.106 In/Sec	.401 G-s	
13	.122 In/Sec	.175 G-s	
21	.144 In/Sec	1.188 G-s	
22	.072 In/Sec	.979 G-s	
23	.048 In/Sec	.693 G-s	
	OVERALL LEVEL	1-20 KHZ	
71M	.207 In/Sec	7.997 G-s	
72M	.149 In/Sec	3.323 G-s	
73M	.171 In/Sec	4.064 G-s	
81M	.134 In/Sec	2.731 G-s	
82M	.232 In/Sec	5.765 G-s	
83M	.195 In/Sec	4.477 G-s	
71F	.118 In/Sec	5.645 G-s	
72F	.148 In/Sec	5.841 G-s	
73F	.108 In/Sec	5.650 G-s	
81F	.180 In/Sec	6.358 G-s	
82F	.235 In/Sec	6.304 G-s	
83F	.190 In/Sec	4.314 G-s	

201-08A - COMPRESSOR,NASH A 201-08A (29-Mar-21)

	OVERALL LEVEL	1-20 KHz	
11	.077 In/Sec	.077 G-s	506.3 RPM
12	.082 In/Sec	.094 G-s	
13	.164 In/Sec	.104 G-s	
21	.070 In/Sec	.146 G-s	
22	.097 In/Sec	.079 G-s	
23	.172 In/Sec	.065 G-s	
71	.166 In/Sec	1.145 G-s	
72	.301 In/Sec	.966 G-s	
73	.148 In/Sec	.518 G-s	
81	.172 In/Sec	.345 G-s	
82	.372 In/Sec	.218 G-s	
83	.173 In/Sec	.256 G-s	

202-05 - NASH SEAL LIQUID PUMP-A (29-Mar-21)

	OVERALL LEVEL	1-20 KHz	
11	.037 In/Sec	.087 G-s	1800.0 RPM
21	.016 In/Sec	.117 G-s	
23	.028 In/Sec	.088 G-s	
71	.039 In/Sec	.054 G-s	
72	.022 In/Sec	.039 G-s	

9002-10 - D-HYDROGENATOR AGITATOR (29-Mar-21)

	OVERALL LEVEL	1-20 KHz	
11	.084 In/Sec	.113 G-s	1185.0 RPM

21	.082 In/Sec	.127 G-s	
23	.053 In/Sec	.060 G-s	
	OVERALL LEVEL	1-20 KHZ	
31	.228 In/Sec	.574 G-s	
31L	.119 In/Sec	.586 G-s	
	OVERALL LEVEL	1-20 KHz	
51	.316 In/Sec	.180 G-s	
51L	.254 In/Sec	.183 G-s	100.0 RPM
52	.152 In/Sec	.191 G-s	
52L	.236 In/Sec	.163 G-s	
53	.100 In/Sec	.556 G-s	
53L	.046 In/Sec	.626 G-s	
61	.264 In/Sec	.118 G-s	
61L	.166 In/Sec	.115 G-s	
81	.034 In/Sec	.022 G-s	
82	.035 In/Sec	.016 G-s	
83	.033 In/Sec	.190 G-s	

Clarification Of Vibration Units:
Acc --> G-s PK
Vel --> In/Sec PK

Abbreviated Last Measurement Summary

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Database: Arkema.rbm
Station: HYDROGEN
Route No. 1: H2 MONTHLY
Report Date: 30-Mar-21 09:45

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD	MACHINE SPEED
P2A - PUMP MEA CIRC WEST P2A	(29-Mar-21)		
	OVERALL LEVEL	1-20 KHz	
11	.070 In/Sec	.162 G-s	3585.0 RPM
21	.049 In/Sec	.772 G-s	
23	.062 In/Sec	.436 G-s	
71	.198 In/Sec	1.030 G-s	
72	.154 In/Sec	.297 G-s	
P1A - PUMP BFW WEST P1A	(29-Mar-21)		
	OVERALL LEVEL	1-20 KHz	
11	.107 In/Sec	.223 G-s	3600.0 RPM
21	.119 In/Sec	.868 G-s	
23	.128 In/Sec	.384 G-s	
71	.113 In/Sec	.841 G-s	
72	.100 In/Sec	.805 G-s	
81	.133 In/Sec	.606 G-s	
82	.134 In/Sec	.982 G-s	
83	.049 In/Sec	1.090 G-s	
C2 - FD BLOWER C2	(29-Mar-21)		
	OVERALL LEVEL	1-20 KHz	
11	.346 In/Sec	.200 G-s	3600.0 RPM
21	.346 In/Sec	.253 G-s	
23	.217 In/Sec	.114 G-s	

	71	.247 In/Sec	3.097 G-s	
	81	.271 In/Sec	1.298 G-s	

C1 - ID -BLOWER C1 (29-Mar-21)

	OVERALL LEVEL	1-20 KHz	
11	.067 In/Sec	.070 G-s	1800.0 RPM
21	.083 In/Sec	.455 G-s	
23	.136 In/Sec	.481 G-s	
71	.077 In/Sec	.972 G-s	
72	.056 In/Sec	.909 G-s	
81	.179 In/Sec	1.156 G-s	
82	.164 In/Sec	.871 G-s	

CTPE - EAST COOLING TOWER PUMP (29-Mar-21)

	OVERALL LEVEL	1-20 KHz	
11	.282 In/Sec	.478 G-s	1750.0 RPM
21	.111 In/Sec	.436 G-s	
23	.198 In/Sec	.670 G-s	
71	.236 In/Sec	.329 G-s	
72	.297 In/Sec	.354 G-s	

CTPW - WEST COOLING TOWER PUMP (29-Mar-21)

	OVERALL LEVEL	1-20 KHz	
11	.046 In/Sec	.438 G-s	1750.0 RPM
21	.070 In/Sec	.419 G-s	
23	.147 In/Sec	.561 G-s	
71	.251 In/Sec	.715 G-s	
72	.122 In/Sec	.884 G-s	

Clarification Of Vibration Units:

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