HI-SPEED INDUSTRIAL SERVICE

MILLINGTON, TN

May 29, 2020

ARKEMA

Subject: week 4 vibration service report

Weekly Route Equipment

C Concentrator Vacuum Pump 2130-1
The pump axial and radial vibrations are acceptable. No action is required.

Agitator, Hydrogenator C 7001-01
The motor overall is 0.244"/sec velocity peak for the inboard axial vibration. The motor speed today was read from the data to be about 1,362 RPM. We still believe the motor bearings in the replacement motor are in some distress. **Motor is rated a Class II Defect.**

A/B Concentrator Vacuum Pump 57
The outboard bearing horizontal vibration has jumped back up to 0.273"/sec velocity peak overall. The vibration is dominated by a 16 order peak; which is most likely vane pass. **Rated a Class I Defect**. No immediate action is required at this time.

Flash Vacuum Pump 2130-1
Vibrations appear to be normal this survey. No actions required.

Air Compressor C-201
Rotor bar vibrations are average 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 will watch this unit closely for changes. No immediate actions required at this time.

Air Compressor C-203
Rotor bar vibrations are average 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.

7030 Ryburn Drive
Millington, TN 38053
P. 901-873-5300
F. 901-873-5301

Instrument Air Compressor new
The male and female shaft vibrations seem to show gear mesh and harmonics as well as a beat vibration occasionally. I added acceleration trending recently to this and many other machine analysis parameter sets and it will help identify when service will be required. We will keep a close eye on this unit going forward. **Rated a Class I Defect for now.**

Air Compressor NASH A 201-08A
Most every vibration measurement on this unit is lower after servicing. Highest is still in the pump itself at just over 0.25"/sec velocity peak. **Rated a Class I Defect.**

D Hydrogenator Agitator 9002-10
Vibration data shows a slight change in vibrations this survey. Highest amplitude is at about 0.25"/sec velocity peak overall for the gearbox measurements. **Still rated a Class I Defect.**

Monthly Route Equipment

Hydrogen ID Fan
We checked this unit again today; it was up slightly.
The fan shaft bearings were replaced, and the unit was aligned during the shutdown. It was suggested that the fan shaft be replaced at the next rebuild. The support base was worn below the bearing spacers. we are still seeing a few harmonics of shaft speed in the fan bearing. The motor is showing possible looseness in its bearings also. Check the fan bearing fasteners for now, both the cap and the feet bolts. Other checks might need to be performed such as checking the fan bearing internal and external clearances, trim balancing the fan, inspecting the unit base for cracks. replacing the motor (due to looseness). **Rated a Class I Defect.**

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 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: 29-May-20 12:10

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD
2130-1old - C Concentrator Vacuum Pump	(29-May-20)	
	OVERALL LEVEL	1-20 KHz
11 - Motor OB HOR	.062 In/Sec	.317 G-s
21 - Motor IB HOR	.067 In/Sec	.427 G-s
23 - Motor IB AXIAL	.104 In/Sec	.141 G-s
71 - Compressor IB HOR	.125 In/Sec	.767 G-s
81 - Compressor OB Horiz	.171 In/Sec	.558 G-s
83 - Compressor OB Axial	.085 In/Sec	1.528 G-s
7000-01 - AGITATOR,HYDROGENATOR C	(29-May-20)	
	OVERALL LEVEL	1-20 KHZ
01 - DRIVESHAFT BRG-NORTH-SOUTH	.041 In/Sec	.055 G-s
02 - DRIVESHAFT BRG-EAST-WEST	.044 In/Sec	.063 G-s
03 - DRIVESHAFT BRG-VERTICAL	.045 In/Sec	.044 G-s
11 - C Hydro Agitator MOTOR OB HORIZ	.181 In/Sec	1.084 G-s
12 - C Hydro Agitator MOTOR OB VERT	.134 In/Sec	.836 G-s
13 - C Hydro Agitator Motor OB Axial	.212 In/Sec	.439 G-s
21 - C Hydro Agitator MOTOR IB HORIZ	.157 In/Sec	.247 G-s
22 - C Hydro Agitator MOTOR IB VERT	.215 In/Sec	.633 G-s
23 - C Hydro Agitator Motor IB Axial	.244 In/Sec	.836 G-s
31 - C Hydro Agitator GrBx In Horizon	.130 In/Sec	.523 G-s
32 - C Hydro Agitator GrBx In VERT	.101 In/Sec	1.009 G-s
33 - C Hydro Agitator GrBx In Axial	.091 In/Sec	.502 G-s
41 - C Hydro Agitator GrBx Top HZ E-W	.136 In/Sec	.521 G-s
42 - C Hydro Agitator GrBx TOP HZ N-S	.031 In/Sec	.569 G-s
51 - C Hydro Agitator GrBx BOT HZ E-W	.030 In/Sec	.403 G-s
52 - C Hydro Agitator GrBx BOT HZ N-S	.027 In/Sec	.655 G-s
53 - C Hydro Agitator GrBx Top Axial	.047 In/Sec	.434 G-s
57 - A/B Concentr Vac Pmp-var RPM	(29-May-20)	
	OVERALL LEVEL	1-20 KHz
11 - Motor OB HOR	.044 In/Sec	.268 G-s
12 - Motor OB VERT	.064 In/Sec	.392 G-s
21 - Motor IB HOR	.102 In/Sec	.524 G-s
23 - Motor IB AXIAL	.058 In/Sec	.170 G-s
71 - Compressor IB HOR	.123 In/Sec	.832 G-s
81 - Compressor OB Horiz	.273 In/Sec	.711 G-s
83 - Compressor OB Axial	.049 In/Sec	1.439 G-s
2130-1 - FLASH VAP VAC PUMP-var speed	(29-May-20)	
	OVERALL LEVEL	1-20 KHz
11 - Motor OB HOR	.057 In/Sec	.301 G-s
12 - Motor OB VERT	.025 In/Sec	.423 G-s

21	- Motor IB HOR	.038 In/Sec	.491 G-s
22	- Motor IB VERT	.057 In/Sec	.305 G-s
23	- Motor IB AXIAL	.058 In/Sec	.282 G-s
71	- Compressor IB HOR	.069 In/Sec	.312 G-s
72	- Compressor IB VERT	.061 In/Sec	.354 G-s
81	- Compressor OB Horiz	.063 In/Sec	.180 G-s
82	- Compressor OB VERT	.083 In/Sec	.200 G-s
83	- Compressor OB Axial	.037 In/Sec	.275 G-s

C-203	- C-203 Comp	(29-May-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OB HOR	.051 In/Sec	1.919 G-s
12	- MOTOR OB VERT	.047 In/Sec	1.559 G-s
21	- MOTOR IB HOR	.079 In/Sec	3.053 G-s
22	- MOTOR IB VERT	.059 In/Sec	2.171 G-s
23	- MOTOR IB AXIAL	.020 In/Sec	.497 G-s
		OVERALL LEVEL	1-20 KHZ
71M	- COMP MALE SHAFT IB HOR	.044 In/Sec	2.128 G-s
72M	- COMP MALE SHAFT IB VERT	.062 In/Sec	3.543 G-s
73M	- COMP MALE SHAFT IB AXIAL	.064 In/Sec	1.828 G-s
81M	- COMP MALE SHAFT OB HOR	.063 In/Sec	2.807 G-s
82M	- COMP MALE SHAFT OB VERT	.061 In/Sec	1.913 G-s
71F	- COMP FEMALE SHAFT IB HOR	.046 In/Sec	2.044 G-s
72F	- COMP FEMALE SHAFT IB VERT	.050 In/Sec	1.461 G-s
73F	- COMP FEMALE SHAFT IB AXIAL	.054 In/Sec	1.137 G-s
81F	- COMP FEMALE SHAFT OB HOR	.058 In/Sec	2.796 G-s
82F	- COMP FEMALE SHAFT OB VERT	.064 In/Sec	1.930 G-s

C-202	- C-202 Comp	(29-May-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OB HOR	.052 In/Sec	1.366 G-s
12	- MOTOR OB VERT	.110 In/Sec	.696 G-s
21	- MOTOR IB HOR	.056 In/Sec	.531 G-s
22	- MOTOR IB VERT	.093 In/Sec	.312 G-s
23	- MOTOR IB AXIAL	.057 In/Sec	1.364 G-s
		OVERALL LEVEL	1-20 KHZ
71M	- COMP MALE SHAFT IB HOR	.036 In/Sec	1.076 G-s
72M	- COMP MALE SHAFT IB VERT	.054 In/Sec	2.458 G-s
73M	- COMP MALE SHAFT IB AXIAL	.075 In/Sec	1.575 G-s
81M	- COMP MALE SHAFT OB HOR	.043 In/Sec	1.853 G-s
82M	- COMP MALE SHAFT OB VERT	.056 In/Sec	2.398 G-s
71F	- COMP FEMALE SHAFT IB HOR	.043 In/Sec	1.750 G-s
72F	- COMP FEMALE SHAFT IB VERT	.069 In/Sec	1.676 G-s
73F	- COMP FEMALE SHAFT IB AXIAL	.060 In/Sec	3.425 G-s
81F	- COMP FEMALE SHAFT OB HOR	.048 In/Sec	3.282 G-s
82F	- COMP FEMALE SHAFT OB VERT	.054 In/Sec	1.388 G-s

C-201	- C-201 Comp	(29-May-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OB HOR	.083 In/Sec	.285 G-s
12	- MOTOR OB VERT	.126 In/Sec	3.256 G-s
21	- MOTOR IB HOR	.093 In/Sec	.906 G-s
22	- MOTOR IB VERT	.084 In/Sec	3.255 G-s
23	- MOTOR IB AXIAL	.077 In/Sec	1.020 G-s
		OVERALL LEVEL	1-20 KHZ
71M	- COMP MALE SHAFT IB HOR	.054 In/Sec	2.564 G-s
72M	- COMP MALE SHAFT IB VERT	.049 In/Sec	1.883 G-s

73M - COMP MALE SHAFT IB AXIAL	.080 In/Sec	3.896 G-s
81M - COMP MALE SHAFT OB HOR	.036 In/Sec	7.006 G-s
82M - COMP MALE SHAFT OB VERT	.064 In/Sec	2.446 G-s
71F - COMP FEMALE SHAFT IB HOR	.054 In/Sec	2.706 G-s
72F - COMP FEMALE SHAFT IB VERT	.047 In/Sec	1.392 G-s
73F - COMP FEMALE SHAFT IB AXIAL	.082 In/Sec	4.458 G-s
81F - COMP FEMALE SHAFT OB HOR	.060 In/Sec	3.271 G-s
82F - COMP FEMALE SHAFT OB VERT	.062 In/Sec	2.276 G-s

new AC - INSTRUMENT AIR COMPRESSOR	(29-May-20)	
	OVERALL LEVEL	1-20 KHz
11 - MOTOR OB HOR	.121 In/Sec	1.173 G-s
12 - MOTOR OB VERT	.100 In/Sec	.847 G-s
13 - MOTOR OB AXIAL	.063 In/Sec	.464 G-s
21 - MOTOR IB HOR	.112 In/Sec	1.184 G-s
22 - MOTOR IB VERT	.100 In/Sec	1.712 G-s
23 - MOTOR IB AXIAL	.062 In/Sec	.398 G-s
	OVERALL LEVEL	1-20 KHZ
71M - COMP MALE SHAFT IB HOR	.223 In/Sec	8.017 G-s
72M - COMP MALE SHAFT IB VERT	.155 In/Sec	3.828 G-s
73M - COMP MALE SHAFT IB AXIAL	.203 In/Sec	5.057 G-s
81M - COMP MALE SHAFT OB HOR	.156 In/Sec	3.901 G-s
82M - COMP MALE SHAFT OB VERT	.415 In/Sec	9.717 G-s
83M - COMP MALE SHAFT OB AXIAL	.174 In/Sec	3.381 G-s
71F - COMP FEMALE SHAFT IB HOR	.100 In/Sec	3.942 G-s
72F - COMP FEMALE SHAFT IB VERT	.155 In/Sec	5.591 G-s
73F - COMP FEMALE SHAFT IB AXIAL	.144 In/Sec	4.806 G-s
81F - COMP FEMALE SHAFT OB HOR	.136 In/Sec	1.960 G-s
82F - COMP FEMALE SHAFT OB VERT	.301 In/Sec	9.618 G-s
83F - COMP FEMALE SHAFT OB AXIAL	.204 In/Sec	6.438 G-s

201-08A - COMPRESSOR,NASH A 201-08A	(29-May-20)	
	OVERALL LEVEL	1-20 KHz
11 - Nash Compr A Motor OB Horiz	.067 In/Sec	.108 G-s
12 - Nash Compr A Motor OB Vertical	.065 In/Sec	.126 G-s
13 - Nash Compr A Motor OB Axial	.136 In/Sec	.069 G-s
21 - Nash Compr A Motor IB Horiz	.069 In/Sec	.086 G-s
22 - Nash Compr A Motor IB VERT	.084 In/Sec	.109 G-s
23 - Nash Compr A Motor IB AXIAL	.142 In/Sec	.131 G-s
71 - Nash Compr A COMP IB HORIZ	.155 In/Sec	.747 G-s
72 - Nash Compr A Compressor IB Verti	.228 In/Sec	1.251 G-s
73 - Nash Compr A COMP IB AXIAL	.147 In/Sec	.151 G-s
81 - Nash Compr A COMP OB HORIZ	.173 In/Sec	.545 G-s
82 - Nash Compr A Compressor OB Verti	.256 In/Sec	.446 G-s
83 - Nash Compr A Compressor OB Axial	.140 In/Sec	.479 G-s

202-05 - NASH SEAL LIQUID PUMP-A	(29-May-20)	
	OVERALL LEVEL	1-20 KHz
11 - MOTOR OUTBOARD HORIZ	.068 In/Sec	.059 G-s
21 - MOTOR INBOARD HORIZ	.038 In/Sec	.097 G-s
23 - MOTOR INBOARD AXIAL	.024 In/Sec	.052 G-s
71 - PUMP HORIZ	.036 In/Sec	.060 G-s
72 - PUMP VERT	.018 In/Sec	.040 G-s

9002-10 - D-HYDROGENATOR AGITATOR	(29-May-20)	
	OVERALL LEVEL	1-20 KHz
11 - MOTOR OUTBOARD HORIZONTAL	.099 In/Sec	.056 G-s

21	- MOTOR INBOARD HORIZONTAL	.083 In/Sec	.061 G-s
23	- MOTOR INBOARD AXIAL	.056 In/Sec	.063 G-s
31	- GEARBOX INPUT SHAFT -HORIZONTAL	.207 In/Sec	.738 G-s
51	- GEARBOX TOP PLATE- E-W	.243 In/Sec	.260 G-s
52	- GEARBOX TOP PLATE- N-S	.141 In/Sec	.339 G-s
53	- GEARBOX OUTPUT TOP -VERTICAL	.157 In/Sec	.528 G-s
61	- GEARBOX BOTTOM E-W-HORIZONTAL	.166 In/Sec	.171 G-s
81	- AGIT INTERMED BRG @ SEAL- N-S	.051 In/Sec	.025 G-s
82	- AGIT INTERMED BRG @ SEAL- E-W	.040 In/Sec	.035 G-s
83	- AGIT INTERMED BRG @ SEAL- VERT	.046 In/Sec	.191 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: 29-May-20 12:11

MEASUREMENT POINT		OVERALL LEVEL	HFD / VHFD
C1	- ID -BLOWER C1	(29-May-20)	
		OVERALL LEVEL	1-20 KHz
11	- I.D.Fan Motor OB Horizontal	.130 In/Sec	.270 G-s
21	- I.D.Fan Motor IB Horizontal	.143 In/Sec	.295 G-s
23	- motor inboard axial	.175 In/Sec	.205 G-s
71	- I.D.Fan Coupling End Horizontal	.136 In/Sec	.827 G-s
72	- I.D.Fan Coupling End VERTICAL	.096 In/Sec	1.491 G-s
81	- I.D.Fan Fan End Horizontal	.309 In/Sec	1.330 G-s
82	- I.D.Fan Fan End VERTICAL	.235 In/Sec	1.270 G-s

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