HI-SPEED INDUSTRIAL SERVICE

MILLINGTON, TN

May 13, 2020

ARKEMA

Subject: week 2 vibration service report

Weekly Route Equipment

C Concentrator Vacuum Pump 2130-1
The pump axial vibration is good; the outboard radial is relatively steady at 0.168"/sec peak velocity this survey. No action is required.

Agitator, Hydrogenator C 7001-01
Vibrations are similar to last week but up a little. Motor speed was read to be 1333 RPM during data collection this survey. The highest vibrations were in the motor horizontals and were 0.122 and 0.115"/sec velocity peak, respectively. Motor still shows slight looseness and possible fluting in the bearings. All gearbox vibrations were below 0.1"/second velocity peak except the input horizontal which was just over. Due to the recent increase in what appears to be higher order harmonics, we are going to increase the motor defect rating. **Motor is rated a Class II Defect.**

NOTE: There is a small gearbox lubrication pump adjacent to the motor that could be affecting the vibration seen in the motor and gearbox that is not on our vibration route. This unit should be inspected soon.

A/B Concentrator Vacuum Pump 57
Overall vibrations have increased for the outboard pump bearing and is at 0.318"/sec velocity peak, at what looks to be mostly vane pass. We must note; however, that the vibration changes constantly as the vacuum breaks, so the overall reading and the data could change significantly during a short period of time. No immediate action is required at this time. **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 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.

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Air Compressor C-202
Rotor bar vibrations are average 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. **Defect Rating to a Class II**.

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.

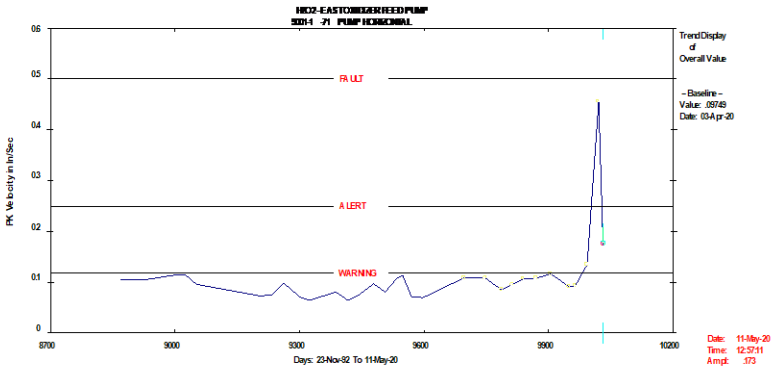
Instrument Air Compressor new
The male and female outboard shaft verticals show higher overall vibrations recently. Inspect the unit fasteners as time allows. We will keep a close eye on this unit going forward. **Rated a Class I Defect for now.**

Air Compressor NASH A 201-08A
We are still recommending a thorough service on this unit. The pump is under 0.3"/sec velocity peak, so the unit is **Rated a Class I Defect this survey.**

D Hydrogenator Agitator 9002-10
Vibration data shows a slight change in vibrations this survey. Highest amplitude is at 0.219"/sec velocity peak for the gearbox horizontal output top E/W measurement. **Still rated a Class I Defect.**

Monthly Route Equipment

East Oxidizer Feed Pump 9001-1
The pump shaft speed vibration has dropped significantly after the coupling service but is slightly higher than normal. The vibration could have knocked out the alignment. Have that checked as time allows.



Middle Mixed Bed Water Pump 191-07
This unit still suffers from an elevated pump passing vibration. As before, check for flow issues. Is the pump operating in the best part of the curve? Excessive unit wear could also be responsible. **Rated a Class II 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. 4: ARK WK 2
Report Date: 13-May-20 08:16

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD
2130-1old - C Concentrator Vacuum Pump	(11-May-20)	
	OVERALL LEVEL	1-20 KHz
11 - Motor OB HOR	.061 In/Sec	.374 G-s
21 - Motor IB HOR	.069 In/Sec	.368 G-s
23 - Motor IB AXIAL	.107 In/Sec	.246 G-s
71 - Compressor IB HOR	.137 In/Sec	.892 G-s
81 - Compressor OB Horiz	.168 In/Sec	.759 G-s
83 - Compressor OB Axial	.090 In/Sec	1.362 G-s
7000-01 - AGITATOR,HYDROGENATOR C	(11-May-20)	
	OVERALL LEVEL	1-20 KHZ
01 - DRIVESHAFT BRG-NORTH-SOUTH	.038 In/Sec	.035 G-s
02 - DRIVESHAFT BRG-EAST-WEST	.042 In/Sec	.031 G-s
03 - DRIVESHAFT BRG-VERTICAL	.047 In/Sec	.028 G-s
11 - C Hydro Agitator MOTOR OB HORIZ	.115 In/Sec	1.060 G-s
12 - C Hydro Agitator MOTOR OB VERT	.059 In/Sec	1.076 G-s
13 - C Hydro Agitator Motor OB Axial	.073 In/Sec	.484 G-s
21 - C Hydro Agitator MOTOR IB HORIZ	.122 In/Sec	1.041 G-s
22 - C Hydro Agitator MOTOR IB VERT	.062 In/Sec	1.068 G-s
23 - C Hydro Agitator Motor IB Axial	.117 In/Sec	.251 G-s
31 - C Hydro Agitator GrBx In Horizon	.109 In/Sec	.561 G-s
32 - C Hydro Agitator GrBx In VERT	.083 In/Sec	.742 G-s
33 - C Hydro Agitator GrBx In Axial	.059 In/Sec	.511 G-s
41 - C Hydro Agitator GrBx Top HZ E-W	.091 In/Sec	.417 G-s
42 - C Hydro Agitator GrBx TOP HZ N-S	.027 In/Sec	.674 G-s
51 - C Hydro Agitator GrBx BOT HZ E-W	.029 In/Sec	.374 G-s
52 - C Hydro Agitator GrBx BOT HZ N-S	.019 In/Sec	.449 G-s
53 - C Hydro Agitator GrBx Top Axial	.046 In/Sec	.380 G-s
57 - A/B Concentr Vac Pmp-var RPM	(11-May-20)	
	OVERALL LEVEL	1-20 KHz
11 - Motor OB HOR	.059 In/Sec	.391 G-s
12 - Motor OB VERT	.053 In/Sec	.193 G-s
21 - Motor IB HOR	.090 In/Sec	.258 G-s
23 - Motor IB AXIAL	.070 In/Sec	.147 G-s
71 - Compressor IB HOR	.165 In/Sec	.759 G-s
81 - Compressor OB Horiz	.318 In/Sec	.698 G-s
83 - Compressor OB Axial	.070 In/Sec	1.030 G-s
2130-1 - FLASH VAP VAC PUMP-var speed	(11-May-20)	
	OVERALL LEVEL	1-20 KHz
11 - Motor OB HOR	.051 In/Sec	.286 G-s
12 - Motor OB VERT	.033 In/Sec	.340 G-s

21	- Motor IB HOR	.038 In/Sec	1.333 G-s
22	- Motor IB VERT	.044 In/Sec	.786 G-s
23	- Motor IB AXIAL	.056 In/Sec	.643 G-s
71	- Compressor IB HOR	.063 In/Sec	.400 G-s
72	- Compressor IB VERT	.075 In/Sec	.498 G-s
81	- Compressor OB Horiz	.076 In/Sec	.266 G-s
82	- Compressor OB VERT	.095 In/Sec	.345 G-s
83	- Compressor OB Axial	.043 In/Sec	.481 G-s

C-203	- C-203 Comp	(11-May-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OB HOR	.041 In/Sec	1.153 G-s
12	- MOTOR OB VERT	.054 In/Sec	1.449 G-s
21	- MOTOR IB HOR	.070 In/Sec	1.682 G-s
22	- MOTOR IB VERT	.121 In/Sec	4.530 G-s
23	- MOTOR IB AXIAL	.050 In/Sec	.904 G-s
		OVERALL LEVEL	1-20 KHZ
71M	- COMP MALE SHAFT IB HOR	.052 In/Sec	2.514 G-s
72M	- COMP MALE SHAFT IB VERT	.037 In/Sec	1.031 G-s
73M	- COMP MALE SHAFT IB AXIAL	.065 In/Sec	2.451 G-s
81M	- COMP MALE SHAFT OB HOR	.057 In/Sec	1.846 G-s
82M	- COMP MALE SHAFT OB VERT	.063 In/Sec	2.204 G-s
71F	- COMP FEMALE SHAFT IB HOR	.048 In/Sec	2.339 G-s
72F	- COMP FEMALE SHAFT IB VERT	.060 In/Sec	2.176 G-s
73F	- COMP FEMALE SHAFT IB AXIAL	.086 In/Sec	5.497 G-s
81F	- COMP FEMALE SHAFT OB HOR	.055 In/Sec	1.882 G-s
82F	- COMP FEMALE SHAFT OB VERT	.058 In/Sec	1.926 G-s

C-202	- C-202 Comp	(11-May-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OB HOR	.040 In/Sec	.715 G-s
12	- MOTOR OB VERT	.108 In/Sec	.355 G-s
21	- MOTOR IB HOR	.052 In/Sec	.464 G-s
22	- MOTOR IB VERT	.104 In/Sec	2.509 G-s
23	- MOTOR IB AXIAL	.063 In/Sec	1.693 G-s
		OVERALL LEVEL	1-20 KHZ
71M	- COMP MALE SHAFT IB HOR	.043 In/Sec	2.322 G-s
72M	- COMP MALE SHAFT IB VERT	.049 In/Sec	1.416 G-s
73M	- COMP MALE SHAFT IB AXIAL	.081 In/Sec	2.042 G-s
81M	- COMP MALE SHAFT OB HOR	.047 In/Sec	2.919 G-s
82M	- COMP MALE SHAFT OB VERT	.073 In/Sec	5.030 G-s
71F	- COMP FEMALE SHAFT IB HOR	.036 In/Sec	1.913 G-s
72F	- COMP FEMALE SHAFT IB VERT	.060 In/Sec	1.033 G-s
73F	- COMP FEMALE SHAFT IB AXIAL	.096 In/Sec	4.445 G-s
81F	- COMP FEMALE SHAFT OB HOR	.050 In/Sec	2.166 G-s
82F	- COMP FEMALE SHAFT OB VERT	.050 In/Sec	1.362 G-s

C-201	- C-201 Comp	(11-May-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OB HOR	.092 In/Sec	.581 G-s
12	- MOTOR OB VERT	.053 In/Sec	.513 G-s
21	- MOTOR IB HOR	.102 In/Sec	.849 G-s
22	- MOTOR IB VERT	.036 In/Sec	.682 G-s
23	- MOTOR IB AXIAL	.073 In/Sec	.977 G-s
		OVERALL LEVEL	1-20 KHZ
71M	- COMP MALE SHAFT IB HOR	.044 In/Sec	1.629 G-s
72M	- COMP MALE SHAFT IB VERT	.055 In/Sec	2.329 G-s

73M - COMP MALE SHAFT IB AXIAL	.076 In/Sec	2.555 G-s
81M - COMP MALE SHAFT OB HOR	.057 In/Sec	3.471 G-s
82M - COMP MALE SHAFT OB VERT	.064 In/Sec	2.565 G-s
71F - COMP FEMALE SHAFT IB HOR	.056 In/Sec	1.948 G-s
72F - COMP FEMALE SHAFT IB VERT	.040 In/Sec	1.026 G-s
73F - COMP FEMALE SHAFT IB AXIAL	.050 In/Sec	1.544 G-s
81F - COMP FEMALE SHAFT OB HOR	.075 In/Sec	2.912 G-s
82F - COMP FEMALE SHAFT OB VERT	.049 In/Sec	.957 G-s

new AC - INSTRUMENT AIR COMPRESSOR	(11-May-20)	
	OVERALL LEVEL	1-20 KHz
11 - MOTOR OB HOR	.151 In/Sec	1.499 G-s
12 - MOTOR OB VERT	.102 In/Sec	.930 G-s
13 - MOTOR OB AXIAL	.060 In/Sec	.314 G-s
21 - MOTOR IB HOR	.137 In/Sec	1.008 G-s
22 - MOTOR IB VERT	.088 In/Sec	.620 G-s
23 - MOTOR IB AXIAL	.051 In/Sec	.840 G-s
	OVERALL LEVEL	1-20 KHZ
71F - COMP FEMALE SHAFT IB HOR	.215 In/Sec	7.988 G-s
72F - COMP FEMALE SHAFT IB VERT	.189 In/Sec	3.375 G-s
73F - COMP FEMALE SHAFT IB AXIAL	.198 In/Sec	6.435 G-s
81F - COMP FEMALE SHAFT OB HOR	.134 In/Sec	2.642 G-s
82F - COMP FEMALE SHAFT OB VERT	.363 In/Sec	9.795 G-s
83F - COMP FEMALE SHAFT OB AXIAL	.218 In/Sec	5.506 G-s
71M - COMP MALE SHAFT IB HOR	.107 In/Sec	4.325 G-s
72M - COMP MALE SHAFT IB VERT	.207 In/Sec	5.237 G-s
73M - COMP MALE SHAFT IB AXIAL	.171 In/Sec	5.421 G-s
81M - COMP MALE SHAFT OB HOR	.144 In/Sec	2.919 G-s
82M - COMP MALE SHAFT OB VERT	.291 In/Sec	8.851 G-s
83M - COMP MALE SHAFT OB AXIAL	.271 In/Sec	4.262 G-s

201-08A - COMPRESSOR,NASH A 201-08A	(11-May-20)	
	OVERALL LEVEL	1-20 KHz
11 - Nash Compr A Motor OB Horiz	.073 In/Sec	.175 G-s
12 - Nash Compr A Motor OB Vertical	.084 In/Sec	.151 G-s
13 - Nash Compr A Motor OB Axial	.175 In/Sec	.089 G-s
21 - Nash Compr A Motor IB Horiz	.078 In/Sec	.113 G-s
22 - Nash Compr A Motor IB VERT	.095 In/Sec	.205 G-s
23 - Nash Compr A Motor IB AXIAL	.159 In/Sec	.094 G-s
71 - Nash Compr A COMP IB HORIZ	.147 In/Sec	.455 G-s
72 - Nash Compr A Compressor IB Verti	.258 In/Sec	.806 G-s
73 - Nash Compr A COMP IB AXIAL	.159 In/Sec	.136 G-s
81 - Nash Compr A COMP OB HORIZ	.168 In/Sec	.556 G-s
82 - Nash Compr A Compressor OB Verti	.278 In/Sec	.438 G-s
83 - Nash Compr A Compressor OB Axial	.159 In/Sec	.412 G-s

202-05 - NASH SEAL LIQUID PUMP-A	(11-May-20)	
	OVERALL LEVEL	1-20 KHz
11 - MOTOR OUTBOARD HORIZ	.018 In/Sec	.069 G-s
21 - MOTOR INBOARD HORIZ	.015 In/Sec	.124 G-s
23 - MOTOR INBOARD AXIAL	.017 In/Sec	.092 G-s
71 - PUMP HORIZ	.060 In/Sec	.045 G-s
72 - PUMP VERT	.017 In/Sec	.044 G-s

9002-10 - D-HYDROGENATOR AGITATOR	(11-May-20)	
	OVERALL LEVEL	1-20 KHz
11 - MOTOR OUTBOARD HORIZONTAL	.084 In/Sec	.184 G-s

21 - MOTOR INBOARD HORIZONTAL	.074 In/Sec	.085 G-s
23 - MOTOR INBOARD AXIAL	.046 In/Sec	.115 G-s
31 - GEARBOX INPUT SHAFT -HORIZONTAL	.203 In/Sec	.606 G-s
51 - GEARBOX TOP PLATE- E-W	.219 In/Sec	.247 G-s
52 - GEARBOX TOP PLATE- N-S	.185 In/Sec	.303 G-s
53 - GEARBOX OUTPUT TOP -VERTICAL	.145 In/Sec	.674 G-s
61 - GEARBOX BOTTOM E-W-HORIZONTAL	.190 In/Sec	.153 G-s
81 - AGIT INTERMED BRG @ SEAL- N-S	.045 In/Sec	.030 G-s
82 - AGIT INTERMED BRG @ SEAL- E-W	.043 In/Sec	.029 G-s
83 - AGIT INTERMED BRG @ SEAL- VERT	.054 In/Sec	.235 G-s

9003-01 - D-HYDRO PRIMARY FILT FD PUMP (11-May-20)

	OVERALL LEVEL	1-20 KHz
11 - MOTOR OUTBOARD HORIZONTAL	.045 In/Sec	.310 G-s
21 - MOTOR INBOARD HORIZONTAL	.034 In/Sec	.216 G-s
23 - MOTOR INBOARD AXIAL	.030 In/Sec	.286 G-s
71 - PUMP HORIZONTAL	.115 In/Sec	.186 G-s
72 - PUMP VERTICAL	.120 In/Sec	.238 G-s

9001-01 - D-HYDRO SECOND. FILT FD PUMP (11-May-20)

	OVERALL LEVEL	1-20 KHz
11 - MOTOR OUTBOARD HORIZONTAL	.051 In/Sec	.171 G-s
21 - MOTOR INBOARD HORIZONTAL	.044 In/Sec	.227 G-s
23 - MOTOR INBOARD AXIAL	.030 In/Sec	.268 G-s
71 - PUMP HORIZONTAL	.074 In/Sec	.325 G-s
72 - PUMP VERTICAL	.090 In/Sec	.205 G-s

192-03 - Two Stage Water Pump A-WEST (11-May-20)

	OVERALL LEVEL	1-20 KHz
11 - MOTOR OUTBOARD HORIZONTAL	.065 In/Sec	.145 G-s
21 - MOTOR IB HORIZ	.075 In/Sec	.279 G-s
23 - motor inboard axial	.056 In/Sec	.135 G-s
71 - PUMP HORIZONTAL	.145 In/Sec	.667 G-s
72 - PUMP VERTICAL	.084 In/Sec	.708 G-s

191-07 - M MIX BED WATER PUMP 191-07 (11-May-20)

	OVERALL LEVEL	1-20 KHz
11 - Chilled H2O Pump Motor OB Horizo	.157 In/Sec	.522 G-s
21 - Chilled H2O Pump Motor IB Horizo	.125 In/Sec	.722 G-s
23 - MOTOR INBOARD	.064 In/Sec	.199 G-s
71 - Chilled H2O Pump IB Horizontal	.337 In/Sec	.207 G-s
72 - PUMP VERTICAL	.314 In/Sec	.209 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: PEROXIDE
Report Date: 13-May-20 08:17

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD

9001-1 - EAST OXIDIZER FEED PUMP	(11-May-20)	
	OVERALL LEVEL	1-20 KHz
11 - MOTOR OUTBOARD HORIZONTAL	.034 In/Sec	.107 G-s
21 - MOTOR INBOARD HORIZONTAL	.061 In/Sec	.494 G-s
23 - MOTOR INBOARD AXIAL	.052 In/Sec	.138 G-s
71 - PUMP HORIZONTAL	.173 In/Sec	.639 G-s
72 - PUMP VERTICAL	.176 In/Sec	.208 G-s

Clarification Of Vibration Units:

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