HI-SPEED INDUSTRIAL SERVICE

MILLINGTON, TN

June 22, 2020

ARKEMA

Subject: Week 2 vibration service report

Detailed Weekly Route Equipment

A/B Concentrator Vacuum Pump 57
Water is back on the pump unit this month. The outboard bearing horizontal vibration has jumped back up to 0.350"/sec velocity peak overall. The vibration is dominated by a 16-order peak, which is most likely vane pass. **Rated a Class II Defect**.

Agitator, Hydrogenator C 7001-01
The highest motor overall is 0.259"/sec velocity peak for the outboard axial vibration. The motor speed today was read from the data to be about 1,357 RPM. Data shows multiple harmonics of shaft speed. The bearings and fits in the replacement motor could be in some distress. Other issues could be loose fasteners, cocked bearings, bowed rotor or a coupling and alignment Issue. Inspect the base bolts for proper torque. **Motor is rated a Class II Defect.**

Weekly Route Equipment Observations

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

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

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. 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.

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Air Compressor C-203
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. No actions required.

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 0.255"/sec velocity peak for the outboard vertical. **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 0.299"/sec velocity peak overall for the gearbox measurements. **Still rated a Class I Defect.**

Monthly Route Equipment

Middle Mix Bed Water Pump 191-07
The pump still has a suspected vane pass at an elevated vibration level of 0.372"/sec velocity.
The pump is most likely worn and **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
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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: 22-Jun-20 12:25

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD
2130-1old - C Concentrator Vacuum Pump	(22-Jun-20)	
	OVERALL LEVEL	1-20 KHz
11 - Motor OB HOR	.079 In/Sec	.419 G-s
21 - Motor IB HOR	.082 In/Sec	.387 G-s
23 - Motor IB AXIAL	.125 In/Sec	.199 G-s
71 - Compressor IB HOR	.125 In/Sec	.918 G-s
81 - Compressor OB Horiz	.177 In/Sec	1.224 G-s
83 - Compressor OB Axial	.094 In/Sec	1.910 G-s
7000-01 - AGITATOR,HYDROGENATOR C	(22-Jun-20)	
	OVERALL LEVEL	1-20 KHZ
01 - DRIVESHAFT BRG-NORTH-SOUTH	.048 In/Sec	.028 G-s
02 - DRIVESHAFT BRG-EAST-WEST	.042 In/Sec	.033 G-s
03 - DRIVESHAFT BRG-VERTICAL	.048 In/Sec	.061 G-s
11 - C Hydro Agitator MOTOR OB HORIZ	.233 In/Sec	.798 G-s
12 - C Hydro Agitator MOTOR OB VERT	.128 In/Sec	.778 G-s
13 - C Hydro Agitator Motor OB Axial	.259 In/Sec	.311 G-s
21 - C Hydro Agitator MOTOR IB HORIZ	.178 In/Sec	.664 G-s
22 - C Hydro Agitator MOTOR IB VERT	.216 In/Sec	.811 G-s
23 - C Hydro Agitator Motor IB Axial	.140 In/Sec	.499 G-s
31 - C Hydro Agitator GrBx In Horizon	.167 In/Sec	.453 G-s
32 - C Hydro Agitator GrBx In VERT	.091 In/Sec	.779 G-s
33 - C Hydro Agitator GrBx In Axial	.065 In/Sec	.393 G-s
41 - C Hydro Agitator GrBx Top HZ E-W	.179 In/Sec	.834 G-s
42 - C Hydro Agitator GrBx TOP HZ N-S	.067 In/Sec	.850 G-s
51 - C Hydro Agitator GrBx BOT HZ E-W	.033 In/Sec	.352 G-s
52 - C Hydro Agitator GrBx BOT HZ N-S	.024 In/Sec	.751 G-s
53 - C Hydro Agitator GrBx Top Axial	.054 In/Sec	.562 G-s
57 - A/B Concentr Vac Pmp-var RPM	(22-Jun-20)	
	OVERALL LEVEL	1-20 KHz
11 - Motor OB HOR	.057 In/Sec	.526 G-s
12 - Motor OB VERT	.054 In/Sec	.279 G-s
21 - Motor IB HOR	.064 In/Sec	.317 G-s
23 - Motor IB AXIAL	.086 In/Sec	.131 G-s
71 - Compressor IB HOR	.141 In/Sec	.746 G-s
81 - Compressor OB Horiz	.350 In/Sec	1.300 G-s
83 - Compressor OB Axial	.043 In/Sec	.679 G-s
2130-1 - FLASH VAP VAC PUMP-var speed	(22-Jun-20)	
	OVERALL LEVEL	1-20 KHz
11 - Motor OB HOR	.063 In/Sec	.102 G-s
12 - Motor OB VERT	.065 In/Sec	.437 G-s
21 - Motor IB HOR	.064 In/Sec	.493 G-s
22 - Motor IB VERT	.059 In/Sec	.314 G-s
23 - Motor IB AXIAL	.060 In/Sec	.392 G-s

71	- Compressor IB HOR	.075 In/Sec	.297 G-s
72	- Compressor IB VERT	.066 In/Sec	.256 G-s
81	- Compressor OB Horiz	.066 In/Sec	.160 G-s
82	- Compressor OB VERT	.076 In/Sec	.259 G-s
83	- Compressor OB Axial	.044 In/Sec	.289 G-s

C-203	- C-203 Comp	(22-Jun-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OB HOR	.034 In/Sec	.963 G-s
12	- MOTOR OB VERT	.029 In/Sec	.358 G-s
21	- MOTOR IB HOR	.034 In/Sec	1.102 G-s
22	- MOTOR IB VERT	.028 In/Sec	.484 G-s
23	- MOTOR IB AXIAL	.050 In/Sec	1.877 G-s
		OVERALL LEVEL	1-20 KHZ
71M	- COMP MALE SHAFT IB HOR	.036 In/Sec	1.530 G-s
72M	- COMP MALE SHAFT IB VERT	.051 In/Sec	4.059 G-s
73M	- COMP MALE SHAFT IB AXIAL	.063 In/Sec	1.382 G-s
81M	- COMP MALE SHAFT OB HOR	.070 In/Sec	5.624 G-s
82M	- COMP MALE SHAFT OB VERT	.061 In/Sec	3.678 G-s
71F	- COMP FEMALE SHAFT IB HOR	.045 In/Sec	2.204 G-s
72F	- COMP FEMALE SHAFT IB VERT	.058 In/Sec	2.044 G-s
73F	- COMP FEMALE SHAFT IB AXIAL	.091 In/Sec	7.238 G-s
81F	- COMP FEMALE SHAFT OB HOR	.045 In/Sec	3.611 G-s
82F	- COMP FEMALE SHAFT OB VERT	.043 In/Sec	1.208 G-s

C-202	- C-202 Comp	(22-Jun-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OB HOR	.045 In/Sec	.465 G-s
12	- MOTOR OB VERT	.104 In/Sec	.869 G-s
21	- MOTOR IB HOR	.054 In/Sec	.319 G-s
22	- MOTOR IB VERT	.098 In/Sec	1.684 G-s
23	- MOTOR IB AXIAL	.064 In/Sec	.365 G-s
		OVERALL LEVEL	1-20 KHZ
71M	- COMP MALE SHAFT IB HOR	.040 In/Sec	2.538 G-s
72M	- COMP MALE SHAFT IB VERT	.046 In/Sec	2.063 G-s
73M	- COMP MALE SHAFT IB AXIAL	.078 In/Sec	2.401 G-s
81M	- COMP MALE SHAFT OB HOR	.033 In/Sec	2.832 G-s
82M	- COMP MALE SHAFT OB VERT	.055 In/Sec	1.532 G-s
71F	- COMP FEMALE SHAFT IB HOR	.045 In/Sec	2.220 G-s
72F	- COMP FEMALE SHAFT IB VERT	.058 In/Sec	1.283 G-s
73F	- COMP FEMALE SHAFT IB AXIAL	.085 In/Sec	11.66 G-s
81F	- COMP FEMALE SHAFT OB HOR	.056 In/Sec	3.118 G-s
82F	- COMP FEMALE SHAFT OB VERT	.053 In/Sec	.590 G-s

C-201	- C-201 Comp	(22-Jun-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OB HOR	.091 In/Sec	1.399 G-s
12	- MOTOR OB VERT	.082 In/Sec	.547 G-s
21	- MOTOR IB HOR	.100 In/Sec	.748 G-s
22	- MOTOR IB VERT	.046 In/Sec	.305 G-s
23	- MOTOR IB AXIAL	.044 In/Sec	.239 G-s
		OVERALL LEVEL	1-20 KHZ
71M	- COMP MALE SHAFT IB HOR	.043 In/Sec	2.340 G-s
72M	- COMP MALE SHAFT IB VERT	.046 In/Sec	4.096 G-s
73M	- COMP MALE SHAFT IB AXIAL	.074 In/Sec	1.958 G-s
81M	- COMP MALE SHAFT OB HOR	.049 In/Sec	4.068 G-s
82M	- COMP MALE SHAFT OB VERT	.062 In/Sec	3.489 G-s

71F - COMP FEMALE SHAFT IB HOR		.052 In/Sec	4.743 G-s
72F - COMP FEMALE SHAFT IB VERT		.044 In/Sec	1.089 G-s
73F - COMP FEMALE SHAFT IB AXIAL		.080 In/Sec	5.184 G-s
81F - COMP FEMALE SHAFT OB HOR		.063 In/Sec	2.701 G-s
82F - COMP FEMALE SHAFT OB VERT		.053 In/Sec	1.163 G-s

new AC	- INSTRUMENT AIR COMPRESSOR	(22-Jun-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OB HOR	.120 In/Sec	.993 G-s
12	- MOTOR OB VERT	.101 In/Sec	.769 G-s
13	- MOTOR OB AXIAL	.075 In/Sec	.757 G-s
21	- MOTOR IB HOR	.138 In/Sec	.831 G-s
22	- MOTOR IB VERT	.079 In/Sec	.961 G-s
23	- MOTOR IB AXIAL	.053 In/Sec	.773 G-s
		OVERALL LEVEL	1-20 KHZ
71F	- COMP FEMALE SHAFT IB HOR	.254 In/Sec	8.891 G-s
72F	- COMP FEMALE SHAFT IB VERT	.161 In/Sec	2.813 G-s
73F	- COMP FEMALE SHAFT IB AXIAL	.158 In/Sec	3.213 G-s
81F	- COMP FEMALE SHAFT OB HOR	.176 In/Sec	4.367 G-s
82F	- COMP FEMALE SHAFT OB VERT	.309 In/Sec	8.300 G-s
83F	- COMP FEMALE SHAFT OB AXIAL	.145 In/Sec	2.872 G-s
71M	- COMP MALE SHAFT IB HOR	.130 In/Sec	4.603 G-s
72M	- COMP MALE SHAFT IB VERT	.183 In/Sec	6.255 G-s
73M	- COMP MALE SHAFT IB AXIAL	.133 In/Sec	3.189 G-s
81M	- COMP MALE SHAFT OB HOR	.169 In/Sec	3.372 G-s
82M	- COMP MALE SHAFT OB VERT	.275 In/Sec	3.312 G-s
83M	- COMP MALE SHAFT OB AXIAL	.225 In/Sec	3.978 G-s

201-08A	- COMPRESSOR,NASH A 201-08A	(22-Jun-20)	
		OVERALL LEVEL	1-20 KHz
11	- Nash Compr A Motor OB Horiz	.073 In/Sec	.088 G-s
12	- Nash Compr A Motor OB Vertical	.070 In/Sec	.103 G-s
13	- Nash Compr A Motor OB Axial	.133 In/Sec	.096 G-s
21	- Nash Compr A Motor IB Horiz	.072 In/Sec	.092 G-s
22	- Nash Compr A Motor IB VERT	.097 In/Sec	.122 G-s
23	- Nash Compr A Motor IB AXIAL	.144 In/Sec	.103 G-s
71	- Nash Compr A COMP IB HORIZ	.144 In/Sec	.877 G-s
72	- Nash Compr A Compressor IB Verti	.202 In/Sec	.619 G-s
73	- Nash Compr A COMP IB AXIAL	.141 In/Sec	.229 G-s
81	- Nash Compr A COMP OB HORIZ	.156 In/Sec	.419 G-s
82	- Nash Compr A Compressor OB Verti	.255 In/Sec	.435 G-s
83	- Nash Compr A Compressor OB Axial	.150 In/Sec	.297 G-s

202-05	- NASH SEAL LIQUID PUMP-A	(22-Jun-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OUTBOARD HORIZ	.064 In/Sec	.045 G-s
21	- MOTOR INBOARD HORIZ	.017 In/Sec	.098 G-s
23	- MOTOR INBOARD AXIAL	.024 In/Sec	.140 G-s
71	- PUMP HORIZ	.032 In/Sec	.092 G-s
72	- PUMP VERT	.023 In/Sec	.038 G-s

9002-10	- D-HYDROGENATOR AGITATOR	(22-Jun-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OUTBOARD HORIZONTAL	.080 In/Sec	.092 G-s
21	- MOTOR INBOARD HORIZONTAL	.070 In/Sec	.209 G-s
23	- MOTOR INBOARD AXIAL	.040 In/Sec	.041 G-s
31	- GEARBOX INPUT SHAFT -HORIZONTAL	.203 In/Sec	.638 G-s

51	- GEARBOX TOP PLATE- E-W	.238 In/Sec	.265 G-s
52	- GEARBOX TOP PLATE- N-S	.299 In/Sec	.619 G-s
53	- GEARBOX OUTPUT TOP -VERTICAL	.133 In/Sec	.605 G-s
61	- GEARBOX BOTTOM E-W-HORIZONTAL	.201 In/Sec	.161 G-s
81	- AGIT INTERMED BRG @ SEAL- N-S	.047 In/Sec	.026 G-s
82	- AGIT INTERMED BRG @ SEAL- E-W	.038 In/Sec	.026 G-s
83	- AGIT INTERMED BRG @ SEAL- VERT	.044 In/Sec	.121 G-s

9003-01 - D-HYDRO PRIMARY FILT FD PUMP (22-Jun-20)

		OVERALL LEVEL	1-20 KHz
11	- MOTOR OUTBOARD HORIZONTAL	.069 In/Sec	.312 G-s
21	- MOTOR INBOARD HORIZONTAL	.046 In/Sec	.310 G-s
23	- MOTOR INBOARD AXIAL	.028 In/Sec	.197 G-s
71	- PUMP HORIZONTAL	.111 In/Sec	.223 G-s
72	- PUMP VERTICAL	.110 In/Sec	.212 G-s

9001-01 - D-HYDRO SECOND. FILT FD PUMP (22-Jun-20)

		OVERALL LEVEL	1-20 KHz
11	- MOTOR OUTBOARD HORIZONTAL	.056 In/Sec	.312 G-s
21	- MOTOR INBOARD HORIZONTAL	.053 In/Sec	.325 G-s
23	- MOTOR INBOARD AXIAL	.036 In/Sec	.184 G-s
71	- PUMP HORIZONTAL	.064 In/Sec	.449 G-s
72	- PUMP VERTICAL	.067 In/Sec	.410 G-s

192-03 - Two Stage Water Pump A-WEST (22-Jun-20)

		OVERALL LEVEL	1-20 KHz
11	- MOTOR OUTBOARD HORIZONTAL	.066 In/Sec	.122 G-s
21	- MOTOR IB HORIZ	.067 In/Sec	.376 G-s
23	- motor inboard axial	.051 In/Sec	.189 G-s
71	- PUMP HORIZONTAL	.146 In/Sec	.659 G-s
72	- PUMP VERTICAL	.074 In/Sec	.513 G-s

191-07 - M MIX BED WATER PUMP 191-07 (22-Jun-20)

		OVERALL LEVEL	1-20 KHz
11	- Chilled H2O Pump Motor OB Horizo	.155 In/Sec	.619 G-s
21	- Chilled H2O Pump Motor IB Horizo	.128 In/Sec	.854 G-s
23	- MOTOR INBOARD	.065 In/Sec	.470 G-s
71	- Chilled H2O Pump IB Horizontal	.372 In/Sec	.245 G-s
72	- PUMP VERTICAL	.164 In/Sec	.289 G-s

Clarification Of Vibration Units:

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