HI-SPEED INDUSTRIAL SERVICE

MILLINGTON, TN

April 21, 2020

ARKEMA

Subject: April week 3 vibration service report

Weekly Equipment

C Concentrator Vacuum Pump 2130-1
The pump axial vibration is good; the outboard radial is steady at 0.182"/sec velocity. No action is required.

Agitator, Hydrogenator C 7001-01
Vibrations have dropped considerably since last week. Motor speed was read to be 1332 RPM during data collection this survey. The highest vibrations were in the motor horizontals and gearbox top horizontal and were only just over 0.12 and 0.1"/sec velocity peak respectively. Motor still shows slight fluting in the bearings. **Motor is rated a Class I Defect.**

A/B Concentrator Vacuum Pump 57
Overall vibrations have increased for the outboard pump bearing and is at 0.303"/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 low. 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 have risen to 4.1g's RMS. The trend clearly shows that the vibrations vary considerably over time. We have added 1-20 KHz acceleration overalls to all the compressor measurements and found the outboard male shaft bearing horizontal at 9.7 g's RMS for this unit. This could be a concern. We will watch this unit closely for changes. No immediate actions required at this time; however, we will increase the **Defect Rating to a Class II** for now.

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Air Compressor C-203
Rotor bar vibrations are up a little to 4.4 g's RMS radial. 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
Vibration appeared to be about normal at 0.232"/sec velocity peak for the female shaft. New acceleration overalls show 7 g's RMS for the male shaft this survey. **Rated a Class I Defect.**

Air Compressor NASH A 201-08A
Vibrations are still down in the motor after the foot bolts were tightened. We recommend a complete cleaning and relubrication of all the foot bolts for the motor and vacuum pump. Pump vibrations are mixed. Check the pump bearing large flange bolts also. Check both shafts for excessive clearance with a lift check and finish with a shaft alignment. 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 0.294"/sec velocity peak for the gearbox top E/W measurement. **Still rated a Class I Defect.**

Route Monthly Equipment

Check and inspect the following cooling tower drivetrains.
North cooling tower- South fan
South cooling tower-North fan and South fan

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. 5: ARK WK 3
Report Date: 21-Apr-20 07:12

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD
2130-1old - C Concentrator Vacuum Pump	(20-Apr-20)	
	OVERALL LEVEL	1-20 KHz
11 - Motor OB HOR	.072 In/Sec	.512 G-s
21 - Motor IB HOR	.075 In/Sec	.414 G-s
23 - Motor IB AXIAL	.109 In/Sec	.249 G-s
71 - Compressor IB HOR	.098 In/Sec	1.684 G-s
81 - Compressor OB Horiz	.182 In/Sec	.693 G-s
83 - Compressor OB Axial	.104 In/Sec	1.478 G-s
7000-01 - AGITATOR,HYDROGENATOR C	(20-Apr-20)	
	OVERALL LEVEL	1-20 KHZ
01 - DRIVESHAFT BRG-NORTH-SOUTH	.052 In/Sec	.033 G-s
02 - DRIVESHAFT BRG-EAST-WEST	.040 In/Sec	.044 G-s
03 - DRIVESHAFT BRG-VERTICAL	.053 In/Sec	.026 G-s
11 - C Hydro Agitator MOTOR OB HORIZ	.127 In/Sec	1.069 G-s
12 - C Hydro Agitator MOTOR OB VERT	.069 In/Sec	.583 G-s
13 - C Hydro Agitator Motor OB Axial	.072 In/Sec	.370 G-s
21 - C Hydro Agitator MOTOR IB HORIZ	.106 In/Sec	.913 G-s
22 - C Hydro Agitator MOTOR IB VERT	.083 In/Sec	.565 G-s
23 - C Hydro Agitator Motor IB Axial	.081 In/Sec	.350 G-s
31 - C Hydro Agitator GrBx In Horizon	.097 In/Sec	.665 G-s
32 - C Hydro Agitator GrBx In VERT	.078 In/Sec	.779 G-s
33 - C Hydro Agitator GrBx In Axial	.059 In/Sec	.436 G-s
41 - C Hydro Agitator GrBx Top HZ E-W	.102 In/Sec	.521 G-s
42 - C Hydro Agitator GrBx TOP HZ N-S	.036 In/Sec	.514 G-s
51 - C Hydro Agitator GrBx BOT HZ E-W	.029 In/Sec	.258 G-s
52 - C Hydro Agitator GrBx BOT HZ N-S	.022 In/Sec	.682 G-s
53 - C Hydro Agitator GrBx Top Axial	.055 In/Sec	.532 G-s
53L - C Hydro Agitator GrBx Top Axial	.057 In/Sec	.503 G-s
57 - A/B Concentr Vac Pmp-var RPM	(20-Apr-20)	
	OVERALL LEVEL	1-20 KHz
11 - Motor OB HOR	.052 In/Sec	.264 G-s
12 - Motor OB VERT	.065 In/Sec	.247 G-s
21 - Motor IB HOR	.067 In/Sec	.368 G-s
23 - Motor IB AXIAL	.070 In/Sec	.141 G-s
71 - Compressor IB HOR	.143 In/Sec	.528 G-s
81 - Compressor OB Horiz	.303 In/Sec	.520 G-s
83 - Compressor OB Axial	.053 In/Sec	.791 G-s
2130-1 - FLASH VAP VAC PUMP-var speed	(20-Apr-20)	
	OVERALL LEVEL	1-20 KHz
11 - Motor OB HOR	.038 In/Sec	.339 G-s
12 - Motor OB VERT	.044 In/Sec	.560 G-s
21 - Motor IB HOR	.039 In/Sec	1.596 G-s

22 - Motor IB VERT	.046 In/Sec	.753 G-s
23 - Motor IB AXIAL	.059 In/Sec	.366 G-s
71 - Compressor IB HOR	.070 In/Sec	.313 G-s
72 - Compressor IB VERT	.076 In/Sec	.484 G-s
81 - Compressor OB Horiz	.082 In/Sec	.219 G-s
82 - Compressor OB VERT	.089 In/Sec	.338 G-s
83 - Compressor OB Axial	.043 In/Sec	.425 G-s

C-203 - C-203 Comp	(20-Apr-20)	
	OVERALL LEVEL	1-20 KHz
11 - MOTOR OB HOR	.112 In/Sec	4.481 G-s
12 - MOTOR OB VERT	.063 In/Sec	1.158 G-s
21 - MOTOR IB HOR	.081 In/Sec	3.084 G-s
22 - MOTOR IB VERT	.065 In/Sec	2.054 G-s
23 - MOTOR IB AXIAL	.064 In/Sec	2.559 G-s
	OVERALL LEVEL	1-20 KHZ
71M - COMP MALE SHAFT IB HOR	.036 In/Sec	1.246 G-s
72M - COMP MALE SHAFT IB VERT	.053 In/Sec	2.780 G-s
73M - COMP MALE SHAFT IB AXIAL	.061 In/Sec	1.595 G-s
81M - COMP MALE SHAFT OB HOR	.056 In/Sec	2.589 G-s
82M - COMP MALE SHAFT OB VERT	.057 In/Sec	1.857 G-s
71F - COMP FEMALE SHAFT IB HOR	.042 In/Sec	2.625 G-s
72F - COMP FEMALE SHAFT IB VERT	.072 In/Sec	2.530 G-s
73F - COMP FEMALE SHAFT IB AXIAL	.068 In/Sec	2.604 G-s
81F - COMP FEMALE SHAFT OB HOR	.048 In/Sec	1.781 G-s
82F - COMP FEMALE SHAFT OB VERT	.046 In/Sec	1.387 G-s

C-202 - C-202 Comp	(20-Apr-20)	
	OVERALL LEVEL	1-20 KHz
11 - MOTOR OB HOR	.035 In/Sec	.315 G-s
12 - MOTOR OB VERT	.114 In/Sec	.690 G-s
21 - MOTOR IB HOR	.056 In/Sec	.295 G-s
22 - MOTOR IB VERT	.129 In/Sec	4.179 G-s
23 - MOTOR IB AXIAL	.043 In/Sec	.333 G-s
	OVERALL LEVEL	1-20 KHZ
71M - COMP MALE SHAFT IB HOR	.044 In/Sec	2.381 G-s
72M - COMP MALE SHAFT IB VERT	.045 In/Sec	1.434 G-s
73M - COMP MALE SHAFT IB AXIAL	.085 In/Sec	1.328 G-s
81M - COMP MALE SHAFT OB HOR	.045 In/Sec	2.214 G-s
82M - COMP MALE SHAFT OB VERT	.052 In/Sec	1.836 G-s
71F - COMP FEMALE SHAFT IB HOR	.037 In/Sec	2.004 G-s
72F - COMP FEMALE SHAFT IB VERT	.050 In/Sec	.759 G-s
73F - COMP FEMALE SHAFT IB AXIAL	.060 In/Sec	4.651 G-s
81F - COMP FEMALE SHAFT OB HOR	.043 In/Sec	4.541 G-s
82F - COMP FEMALE SHAFT OB VERT	.055 In/Sec	1.269 G-s

C-201 - C-201 Comp	(20-Apr-20)	
	OVERALL LEVEL	1-20 KHz
11 - MOTOR OB HOR	.083 In/Sec	.474 G-s
12 - MOTOR OB VERT	.089 In/Sec	.405 G-s
21 - MOTOR IB HOR	.111 In/Sec	.339 G-s
22 - MOTOR IB VERT	.034 In/Sec	.234 G-s
23 - MOTOR IB AXIAL	.078 In/Sec	.565 G-s
	OVERALL LEVEL	1-20 KHZ
71M - COMP MALE SHAFT IB HOR	.044 In/Sec	1.721 G-s
72M - COMP MALE SHAFT IB VERT	.039 In/Sec	1.444 G-s
73M - COMP MALE SHAFT IB AXIAL	.063 In/Sec	1.250 G-s

81M - COMP MALE SHAFT OB HOR	.060 In/Sec	4.113 G-s
82M - COMP MALE SHAFT OB VERT	.057 In/Sec	2.576 G-s
71F - COMP FEMALE SHAFT IB HOR	.049 In/Sec	2.147 G-s
72F - COMP FEMALE SHAFT IB VERT	.049 In/Sec	1.427 G-s
73F - COMP FEMALE SHAFT IB AXIAL	.046 In/Sec	1.662 G-s
81F - COMP FEMALE SHAFT OB HOR	.066 In/Sec	3.440 G-s
82F - COMP FEMALE SHAFT OB VERT	.073 In/Sec	2.754 G-s

new AC - INSTRUMENT AIR COMPRESSOR	(20-Apr-20)	
	OVERALL LEVEL	1-20 KHz
11 - MOTOR OB HOR	.115 In/Sec	.589 G-s
12 - MOTOR OB VERT	.119 In/Sec	.801 G-s
13 - MOTOR OB AXIAL	.067 In/Sec	.102 G-s
21 - MOTOR IB HOR	.211 In/Sec	.620 G-s
22 - MOTOR IB VERT	.082 In/Sec	.412 G-s
23 - MOTOR IB AXIAL	.063 In/Sec	.309 G-s
	OVERALL LEVEL	1-20 KHZ
71F - COMP FEMALE SHAFT IB HOR	.169 In/Sec	5.524 G-s
72F - COMP FEMALE SHAFT IB VERT	.139 In/Sec	3.195 G-s
73F - COMP FEMALE SHAFT IB AXIAL	.157 In/Sec	4.949 G-s
81F - COMP FEMALE SHAFT OB HOR	.138 In/Sec	2.284 G-s
82F - COMP FEMALE SHAFT OB VERT	.235 In/Sec	5.290 G-s
83F - COMP FEMALE SHAFT OB AXIAL	.132 In/Sec	3.030 G-s
71M - COMP MALE SHAFT IB HOR	.102 In/Sec	4.433 G-s
72M - COMP MALE SHAFT IB VERT	.148 In/Sec	3.641 G-s
73M - COMP MALE SHAFT IB AXIAL	.124 In/Sec	3.460 G-s
81M - COMP MALE SHAFT OB HOR	.179 In/Sec	2.563 G-s
82M - COMP MALE SHAFT OB VERT	.209 In/Sec	2.148 G-s
83M - COMP MALE SHAFT OB AXIAL	.232 In/Sec	7.375 G-s

201-08A - COMPRESSOR,NASH A 201-08A	(20-Apr-20)	
	OVERALL LEVEL	1-20 KHz
11 - Nash Compr A Motor OB Horiz	.075 In/Sec	.162 G-s
12 - Nash Compr A Motor OB Vertical	.083 In/Sec	.111 G-s
13 - Nash Compr A Motor OB Axial	.169 In/Sec	.067 G-s
21 - Nash Compr A Motor IB Horiz	.087 In/Sec	.145 G-s
22 - Nash Compr A Motor IB VERT	.118 In/Sec	.175 G-s
23 - Nash Compr A Motor IB AXIAL	.166 In/Sec	.095 G-s
71 - Nash Compr A COMP IB HORIZ	.153 In/Sec	.603 G-s
72 - Nash Compr A Compressor IB Verti	.240 In/Sec	.981 G-s
73 - Nash Compr A COMP IB AXIAL	.165 In/Sec	.281 G-s
81 - Nash Compr A COMP OB HORIZ	.162 In/Sec	.626 G-s
82 - Nash Compr A Compressor OB Verti	.284 In/Sec	.676 G-s
83 - Nash Compr A Compressor OB Axial	.158 In/Sec	.359 G-s

9002-10 - D-HYDROGENATOR AGITATOR	(20-Apr-20)	
	OVERALL LEVEL	1-20 KHz
11 - MOTOR OUTBOARD HORIZONTAL	.087 In/Sec	.089 G-s
21 - MOTOR INBOARD HORIZONTAL	.071 In/Sec	.102 G-s
23 - motor inboard axial	.050 In/Sec	.081 G-s
31 - GEARBOX INPUT SHAFT -HORIZONTAL	.220 In/Sec	.710 G-s
	OVERALL LEVEL	1-20 KHZ
31L - GEARBOX INPUT SHAFT-N-S-LOW FRQ	.194 In/Sec	.665 G-s
	OVERALL LEVEL	1-20 KHz
51 - GEARBOX TOP PLATE- E-W	.271 In/Sec	.221 G-s
	OVERALL LEVEL	1-20 KHZ
51L - GEARBOX OUTPUT SHAFT-E-W-LOW FRQ	.294 In/Sec	.218 G-s

		OVERALL LEVEL	1-20 KHz
52	- GEARBOX TOP PLATE- N-S	.218 In/Sec	.254 G-s
		OVERALL LEVEL	1-20 KHZ
52L	- GEARBOX OUTPUT SHAFT-E-W-LOW FRQ	.243 In/Sec	.258 G-s
		OVERALL LEVEL	1-20 KHz
53	- GEARBOX OUTPUT SHAFT -VERTICAL	.184 In/Sec	.707 G-s
61	- GEARBOX OUTPUT SHAFT-HORIZONTAL	.225 In/Sec	.109 G-s
		OVERALL LEVEL	1-20 KHZ
61L	- GEARBOX OUTPUT SHAFT-E-W-LOW FRQ	.192 In/Sec	.111 G-s
		OVERALL LEVEL	1-20 KHz
81	- AGIT INTERMED BRG @ SEAL- N-S	.040 In/Sec	.023 G-s
82	- AGIT INTERMED BRG @ SEAL- E-W	.044 In/Sec	.047 G-s
83	- AGIT INTERMED BRG @ SEAL- VERT	.041 In/Sec	.218 G-s
NTC-SF	- N CT-SOUTH FAN, N TWR	(20-Apr-20)	
		OVERALL LEVEL	1-20 KHz
1	- MOTOR OB HORIZ	.284 In/Sec	.636 G-s
2	- MOTOR IB HORIZ	.227 In/Sec	.716 G-s
3	- MOTOR IB AXIAL	.134 In/Sec	.669 G-s
		OVERALL LEVEL	1-20 KHZ
4	- GEARBOX INPUT HORIZONTAL	.124 In/Sec	.316 G-s
5	- GEARBOX VERTICAL	.0034 In/Sec	.0010 G-s
6	- GEARBOX AXIAL	.119 In/Sec	.304 G-s
6L	- GEARBOX AXIAL LOW FREQ	.127 In/Sec	.316 G-s
NCT - NF	- N CT -NORTH FAN, N TWR	(20-Apr-20)	
		OVERALL LEVEL	1-20 KHz
7	- MOTOR OB HORIZ	.093 In/Sec	.316 G-s
8	- MOTOR IB HORIZ	.091 In/Sec	.260 G-s
9	- MOTOR IB AXIAL	.094 In/Sec	.243 G-s
		OVERALL LEVEL	1-20 KHZ
10	- GEARBOX INPUT HORIZONTAL	.144 In/Sec	.156 G-s
11	- GEARBOX VERTICAL	.097 In/Sec	.161 G-s
12	- GEARBOX AXIAL	.094 In/Sec	.182 G-s
530-02	- PUMP,N.COOLING TWR,MIDDLE	(20-Apr-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOT TOP N-S	.107 In/Sec	.391 G-s
12	- MOTOR TOP E-W	.135 In/Sec	.329 G-s
530-03	- PUMP,N.COOLING TWR,SOUTH	(20-Apr-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOT TOP N-S	.099 In/Sec	.511 G-s
12	- MOTOR TOP E-W	.157 In/Sec	.393 G-s
548-7	- IRON-FREE H2O BOOSTER PUMP	(20-Apr-20)	
		OVERALL LEVEL	1-20 KHz
11	- MOTOR OUTBOARD HORIZONTAL	.030 In/Sec	.285 G-s
21	- MOTOR INBOARD HORIZONTAL	.032 In/Sec	.423 G-s
23	- MOTOR INBOARD AXIAL	.041 In/Sec	.309 G-s
71	- PUMP HORIZONTAL	.077 In/Sec	.050 G-s
72	- PUMP VERTICAL	.035 In/Sec	.078 G-s
STC-NF	- S CT - NORTH FAN, S TWR	(20-Apr-20)	
		OVERALL LEVEL	1-20 KHz
1	- MOTOR OB HORIZ	.319 In/Sec	.274 G-s
2	- MOTOR IB HORIZ	.259 In/Sec	.173 G-s

3 - MOTOR IB AXIAL	.158 In/Sec	.090 G-s
	OVERALL LEVEL	1-20 KHZ
4 - GEARBOX INPUT HORIZONTAL	.155 In/Sec	.499 G-s
6 - GEARBOX AXIAL	.185 In/Sec	.370 G-s

STC-MF - S CT - MID FAN, S TWR	(20-Apr-20)	
	OVERALL LEVEL	1-20 KHz
1 - MOTOR OB HORIZ	.252 In/Sec	.496 G-s
2 - MOTOR IB HORIZ	.238 In/Sec	.127 G-s
3 - MOTOR IB AXIAL	.161 In/Sec	.225 G-s
	OVERALL LEVEL	1-20 KHZ
4 - GEARBOX INPUT HORIZONTAL	.118 In/Sec	.426 G-s
5 - GEARBOX VERTICAL	.106 In/Sec	.549 G-s
6 - GEARBOX AXIAL	.106 In/Sec	.311 G-s

STC-SF - S CT - SOUTH FAN, S TWR	(20-Apr-20)	
	OVERALL LEVEL	1-20 KHz
1 - MOTOR OB HORIZ	.296 In/Sec	.358 G-s
2 - MOTOR IB HORIZ	.307 In/Sec	.212 G-s
3 - MOTOR IB AXIAL	.286 In/Sec	.090 G-s
	OVERALL LEVEL	1-20 KHZ
4 - GEARBOX INPUT HORIZONTAL	.180 In/Sec	.533 G-s
5 - GEARBOX VERTICAL	.209 In/Sec	.679 G-s
6 - GEARBOX AXIAL	.285 In/Sec	.510 G-s

SCT-1 - SOUTH CT PUMP - EAST	(20-Apr-20)	
	OVERALL LEVEL	1-20 KHz
11 - MOTOR OUTBOARD HORIZONTAL	.048 In/Sec	.450 G-s
21 - MOTOR INBOARD HORIZONTAL	.053 In/Sec	.763 G-s
23 - MOTOR INBOARD AXIAL	.054 In/Sec	.153 G-s
71 - PUMP HORIZONTAL	.177 In/Sec	.378 G-s
72 - PUMP VERTICAL	.086 In/Sec	.838 G-s

SCT-2 - SOUTH CT PUMP - MID	(20-Apr-20)	
	OVERALL LEVEL	1-20 KHz
11 - MOTOR OUTBOARD HORIZONTAL	.028 In/Sec	.842 G-s
21 - MOTOR INBOARD HORIZONTAL	.110 In/Sec	.378 G-s
23 - MOTOR INBOARD AXIAL	.059 In/Sec	.330 G-s
71 - PUMP HORIZONTAL	.102 In/Sec	.492 G-s
72 - PUMP VERTICAL	.106 In/Sec	.689 G-s

SCT-3 - SOUTH CT PUMP - WEST	(20-Apr-20)	
	OVERALL LEVEL	1-20 KHz
11 - MOTOR OUTBOARD HORIZONTAL	.037 In/Sec	1.840 G-s
21 - MOTOR INBOARD HORIZONTAL	.057 In/Sec	.972 G-s
23 - MOTOR INBOARD AXIAL	.083 In/Sec	.692 G-s
71 - PUMP HORIZONTAL	.176 In/Sec	.845 G-s
72 - PUMP VERTICAL	.205 In/Sec	.771 G-s

Clarification Of Vibration Units:

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