HI-SPEED INDUSTRIAL SERVICE

MILLINGTON, TN

April 16, 2021

IFF

Subject: April16 MSP/MS2P vibration report

Most of the machines surveyed were found to be in good condition with the exception of 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,

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MS2P WET

2P 3256 C-30 #2
Motor shows an increase at 52 Hz (centrifuge speed). Inspect the unit. Check for drive train issues as well as structures and fasteners. **Rated a Class I Defect.**

2P 3266 C-30 #3
Motor has shaft speed vibration Inspect the unit. Check for drive train issues as well as structures and fasteners. **Rated a Class I Defect.**

2P 3276 C-30 #4
Bad data.

2P 4085 SHARPLES #1
Bad data

2P 3304 SHARPLES #2
The highest good quality vibration in the unit is at or near 1.2"/sec velocity peak at 2x shaft speed of the centrifuge inboard bearing axial. We suspect an alignment issue. The bearing is also showing almost 4 g's of acceleration which is the result of a raised noise floor and could indicate a lubrication issue or early bearing wear. Check the drive train components and alignment. Ensure the bearings are receiving adequate lubrication. **Rated a Class III Defect. Some points had bad data.**

2P 3320 SHARPLES #3
The Centrifuge bearing measurements show multiple low amplitude harmonics of shaft speed. There is possibly slight imbalance and looseness. Flush and clean the centrifuge as time allows. **Rated a Class II Defect.**

2P 3296 SHARPLES #4
We still see high acceleration in the motor bearings at what appears to be harmonics of possible bearing defect frequencies or possibly just high amplitude rotor bar peaks due to loading and porous end connection castings with overalls above 4 g's RMS. The inboard centrifuge bearing axial has a vibration at near 1.2"/sec velocity peak overall and is dominated by a 1x RPM peak. Inspect, flush, and clean the centrifuge. Check all couplings and confirm the shafts are aligned. **Rated a Class III Defect. Some points had bad data.**

2P 3171 SHARPLES #5
Mostly low amplitude vibrations in unit. No immediate issues.
Bad data at point M4A

2P 3149 SHARPLES #6
Vibration data shows a strong 1x shaft speed vibration for the C1H bearing measurement this survey with the overall above 1.0"/second velocity peak. Flush or clean the centrifuge. **Rated a Class III Defect.**

2P 3161 SHARPLES #7
Motor and centrifuge have an elevated 1x RPM vibration at near 0.5"/second velocity peak overall. Inspect for drive train component wear, eccentricity, and alignment as well as imbalance. Motor has HF rotor bar vibrations, but of no consequence at this time. **Rated a Class I Defect.**

2P 3151 SHARPLES #8
Motor has rotor bar passing frequency peaks as well as non-synchronous peaks in the spectrum. We suspect some distress in the motor inboard bearing. Centrifuge vibrations are mostly 1x RPM. Flush the unit. Inspect the unit for coupling, alignment, or looseness issues. Ensure the motor bearings are receiving lubrication if greaseable. **Rated a Class II Defect.**

2P 3141 SHARPLES #9
Overall data shows high acceleration in the centrifuge input bearing. The current 19 g's overall is still considered extremely high by us. The acceleration and velocity data below 4KHz still shows harmonics and near harmonics of a strong 1xRPM peak at neat 0.7"/sec velocity peak. The data looks like bearing fluting, which is generally seen in DC motors and AC motors on VFD's. There is an issue in the drive end of the centrifuge that will require investigation soon. We would recommend inspecting the bearing installation and bearing replacement. **Rated a Class IV Defect.**

2P 4085-08 OIL PUMP MOTOR #1
Bad data

2P 3171-08 OIL PUMP MOTOR #5
Bad data

2P 3141-08 OIL PUMP MOTOR #9
Bad data

2P 3137 WESTFALIA PUMP #8
The motor inboard bearing data indicates race defects. The outboard bearing data is bad. Overall acceleration has increased to over 4 g's RMS. The motor bearings are still in distress though. **Rated a Class II Defect.**

2P 3133 WESTFALIA PUMP #9
Bad data

2P 4453 HEAT RECOVERY PUMP
Pump vibration is still dominated by a 3x RPM vibration which we assume is vane pass. Check process parameters. **Rated a Class II Defect.**

2P 3156 BOOSTER PUMP
The motor bearings are still in some distress and have been for a while. The overall acceleration is just below 2 g's again this survey. We will watch this unit for changes. Expect to change the motor sometime in the future. **Rated a Class II Defect.**

2P 3224 CLARIFIED TANK PUMP
Data still shows a 1xRPMvibration in the motor vertical. Inspect the fasteners and structure, as well as the motor fan and the coupling and alignment as time allows. **Rated a Class I Defect.**

2P 3727 EAST RESLURRY PUMP
Data still shows a strong 1xRPM vibration throughout the motor. Amplitudes are still near 0.7"/second velocity peak overall. These vibrations have been high for a long time Inspect the fasteners and structure, as well as the motor fan and the coupling and alignment as time allows. **Rated a Class II Defect.**

2P 3289 WEST RESLURRY PUMP
Both the motor and pump vibrations are up at shaft speed. The pump also has an increase at sub synchronous speeds. Check the unit operating parameters as well as drive train components, fasteners, and alignment. Highest overall vibration is over ½" per second velocity peak. **Rated a Class I Defect.**

2P 3461 E BOGEY CONDENSATE PUMP
Most points look good, but some have bad data

2P 3475 E BOGEY PUMP
Pump outboard vertical vibration is over 0.6"/second velocity peak at 6x RPM (possible vane pass). We believe there is process issue. Check operating parameters as well as unit base fasteners and alignment. **Rated a Class II Defect.**

2P 3471 E BOGEY VACUUMIZER PUMP
Bad data

2P 3352 South Chill Tank Pump
The motor still suffers from bearing defects. The pump seems to show bearing defects also. The data seems to indicate bearing fluting. Change the motor and pump as time allows. **Rated a Class II Defect.**

MS2P-CIP

No current data

MS2P FEED DRYER

2P 3843 Filter Blower
Vibration have gone up for horizontals and down for verticals in the unit which is odd. Motor has highest vibration. Fan speed vibrations still dominate the unit measurements. Ensure measurement are taken consistently. Check for drive train wear and alignment and that the fasteners and structures are tight and in good shape. Have the fan cleaned and inspected. Consider trim balancing. **Rated a Class II Defect.**

2P3828 Recycle Blower
Vibrations have dropped. Lobe blowers tend to generate harmonics. We will watch for changes. Non-rated now.

2P 3844 DRYER EXHAUST FAN
The unit appears to have a belt issue due to a sub synchronous vibration. **Rated a Class I Defect.**

2P 3847 INLET FAN
The motor bearings are still in distress. Overall acceleration 1-20 KHz trend is still over 4 g's. The motor will need replacing as some point in the future. Check the fan sheave for run out, eccentricity, wear and alignment with the motor sheave. **Rated a Class II Defect.**

MS2P FEED DRYER

2P 8054, 8084, 8074 #2, #3, #4 CMC BLOWERS
Blower bearings still show what looks to be a shaft speed vibration with multiple low harmonics, but little changed. Inspect the unit drive train components for wear as time allows. Blowers 2 and 4 have Bad data on some points. **Rated a Class I Defect.**

2P 8001 INLET FAN
Bad data at point M1H.

2P 8006 Cooling Ring Fan
Bad data at point F2V, otherwise, the unit looks good after repairs.

2P 3710 BLENDER
The motor data still shows significant velocity in multiple measurements over time. Many vibration measurements are still near 1"/sec velocity peak at near 20 Hz (1200 RPM) with the axial being the highest. High vibrations like these will shorten the life of the motor. Gearbox has similar vibrations but somewhat lower. Inspect the unit base structure, fasteners coupling and alignment as time allows. The motor still shows strong rotor bar passing vibrations that are indications of porosity in the rotor cast end connections. **Rated a Class III Defect.**

2P 8068 #1 EXHAUST FAN
The fan bearings seem to have an issue in high frequencies. Bad data for the point F2H hampers our analysis. Ensure the bearings are receiving proper lubrication Inspect them if possible. We should increase the FMAX on the data set to see if we can identify the frequencies responsible for the rise. The motor has rotor bar passing frequency vibrations also. **Rated a Class II Defect.**

2P 8088 #2 EXHAUST FAN
Bad data throughout the measurements.

2P 8069 and 8089 HEAT FANS
Both motors still have a vibration at about 42.5 Hz at or near 0.7"/sec velocity peak overall. Inspect the drive system and all fasteners and structures. Clean and inspect the fan also. Bad data on fan axials on 8089. **Rated a Class II Defect.**

2P 8008 STATIC INLET FAN
Vibration data still shows what appears to be non-synchronous vibration peaks in the bearings. We suspect early distress in the bearings. **Rated a Class I Defect for now.**

2P 8100 VF EXHAUST FAN
Bad data in fan axial measurements.

2P 8014 EXPORT BLOWER
Bad data in blower axial measurement.

2P 3727 #1 AZO
No issues now.

2P 8064 #1 CMC BLOWER
Bad data in blower measurements.

MSP WET

3246 C-30 #1
There has been a jump in the centrifuge inboard axial at shaft speed. Check for drive train issues like alignment, components defects or wear. **Rated a Class II Defect.**

3256 C-30 #2
Data shows another increase in the motor vibration at centrifuge speed. There has also been a large jump in the centrifuge inboard axial at shaft speed. Check for drive train issues like alignment, components defects or wear. Inspect, clean and/or flush the centrifuge. **Rated a Class III Defect.**

3266-C30 #3
There has also been a large jump in the centrifuge inboard horizontal at shaft speed. Inspect, clean and/or flush the centrifuge. **Rated a Class III Defect.**

3276 C-30 #4
Data still shows of what looks to be high frequency rotor bar defect signatures. Generally, we do not report these unless they are high or increasing for several consecutive surveys. We also see other multiple vibration peaks mixed in with these vibrations. These peaks could be early bearing defect frequencies. Ensure the motor is operating no higher than rated amps and that the voltage and current are balanced. Slight increase in the centrifuge shaft speed vibration. Inspect, clean and/or flush the centrifuge. **Rated a Class I Defect.**

3141 SHARPLE #1
The motor appears to have substantial harmonic vibration peaks of a near 3.5 order fundamental peak. Overall a1-20 KHz acceleration is 11.5 g's. There could be a severe bearing defect in the motor drive end bearing. The B2V measurement is lower near 0.7"/second velocity peak overall and dominated by a 2x RPM vibration of shaft speed. The centrifuge inboard axial is dominated by what looks to be a 3x RPM vibration. We suspect a drive train issue such as misalignment, coupling defects or eccentricity. Inspect the drivetrain and be prepared to replace the motor. **Rated a Class IV Defect.**

3151 SHARPLE #2
Both the centrifuge and the Bearing (BVI, BV2) measurements are at 0.7 to 1"/second velocity peak overall now and consist of multiple harmonics of shaft speeds. Inspect for loose fasteners, looseness in the bearings, and coupling and alignment issues. **Rated a Class II Defect.**

3161 **SHARPLE #3**
The motor still has non-synchronous harmonic vibrations at over 6 g's RMS overall that usually indicate defects in the bearings. The Centrifuge inboard axial has a dominant half harmonic vibration of the fundamental at over 1.3"/second velocity peak. This could be a rub, and/or looseness. The radial measurement shows multiple half order harmonics. Check for a mechanical rub as well as looseness in the main centrifuge bearings. **Rated a Class III Defect.**

3149 **SHARPLE #4**
The centrifuge inboard bearing shows a strong 1xRPM vibration as well as multiple harmonics. Clean and flush the centrifuge and inspect the bearings for mechanical looseness. **Rated a Class III Defect.**

3171 **SHARPLE #5**
Centrifuge C1H measurement is at 2.2 g's RMS. Check lubrication. Clean and flush also. **Rated a Class II Defect.**

3304 **SHARPLE #6**
The centrifuge inboard bearing shows a strong 1xRPM vibration as well as multiple harmonics and a slight raised noise floor. Clean and flush the centrifuge and inspect the bearings for mechanical looseness. Ensure bearings are lubricated. **Rated a Class III Defect.**

3320 SHARPLE #7
The centrifuge inboard bearing shows a strong 1xRPM vibration as well as multiple harmonics and a slight raised noise floor. Clean and flush the centrifuge and inspect the bearings for mechanical looseness. Ensure bearings are lubricated. **Rated a Class II Defect.**

3296 SHARPLE 8
The centrifuge inboard bearing shows a 1xRPM vibration as well as multiple small. Clean and flush the centrifuge. **Rated a Class II Defect.**

4085 SHARPLE #9
The centrifuge bearings appear to be in very bad shape with 20 g's RMS overall acceleration in the C2H measurement and C1V at over 1.5"/second velocity peak. Replace the bearings, inspect all drive train components repair/replace worn or defective components, and clean and flush. **Rated a Class IV Defect.**

3151-08 OIL PUMP MOTOR #2
Motor vertical vibration at shaft speed is back up this month. Inspect for defects, check fasteners and alignment. **Rated a Class II Defect.**

4085-08 OIL PUMP MOTOR #9
Motor data still shows several non-synchronous harmonic vibration peaks. This is most likely early bearing defect frequencies. **Rated a Class I Defect.**

3137 SHARPLES DEFOAMER PUMP #2
Motor data still indicates some misalignment due to a possible dominant 2x motor RPM vibration at near 0.9"/sec velocity peak if the motor speed (1780 RPM) is correct in the database. Vibration continues to rise. Check unit for alignment issues. Pump bearings look better. **Rated a Class III Defect.**

3207 SHARPLES DEFOAMER PUMP #3
Increase in shaft speed pump vibration. Visual inspection as time allows for now. **Rated a Class I Defect.**

4095 CURD GRINDER #4
32.5 Hz vibration increase. Inspect the unit fasteners, drive train components and alignment as time allows. **Rated a Class II Defect.**

3425 East IND Pump
Motor has an increase in overall acceleration in the bearings. We will keep an eye on it. Is it on a drive? **Rated a Class I Defect.**

3550 NORTH BOGEY PUMP
Motor bearings are now a concern due to non-synchronous harmonic peaks. Possible cavitation in the pump. **Rated a Class I Defect.**

3534 NORTH CONDENSATE PUMP
The motor outboard vibration data shows a dominant vibration at just over 10 Hz. We are not sure what this is, but it has been in past data spectrums. We assume it is sub synchronous, so it could be a resonance, which is sometimes seen in vertical pumps. The overall peak velocity is almost 0.5"/second. Inspect fasteners and structure. **Rated a Class I Defect.**

3475 SOUTH BOGEY PUMP
Pump vibration has increased and still shows high 1x and 2x RPM vibration at near 0.9"/sec velocity peak overall. Have the alignment checked as well as the coupling, hubs, and shafts for run out. Pump impeller could be worn too. **Rated a Class II Defect.**

3289 WEST RESLURRY PUMP
Pump has a strong 3x RPM vibration and first harmonic. Could be vane pass or a bad 3 ear Lovejoy coupling. **Rated a Class II Defect.**

3237 EAST RESLURRY PUMP
Pump shows an increase at 6x RPM. Possible vane pass process flow issue. **Rated a Class I Defect.**

3562 NORTH HYDRO TANK PUMP
Motor axial vibration is just under 0.5"/second velocity peak at near 51 Hz. Inspect the coupling and alignment as time allows. **Rated a Class I Defect.**

5681 SLAM TANK PUMP
Non-synchronous pump vibrations. Early bearing defects. **Rated a Class I Defect.**

MSP CIP ROOM

No current data

MSP FEED DRYER/ MSP FEED DRYER

3828 RECYCLE BLOWER
Increase in blower output vibration at just over 86 Hz. Inspect unit. Please confirm blower shaft speed. **Rated a Class II Defect.**

3836 MAC FILTER ASP FAN
Bad data

3800 MIXING CONVEYOR
Motor outboard has strong overall consisting of a sub-synchronous and shaft speed vibration of the same amplitude. Inspect the unit structure, fasteners, and drive train. **Rated a Class II Defect.** **Multiple points have bad data also.**

3847 NORTH INLET FAN
Check the unit and belts. **Rated a Class I Defect.**

3832 RECYCLE CONVEYOR
Inspect the unit fasteners, structure, and drivetrain. **Rated a Class I Defect.**

3843 SOUTH INLET FAN
Increase in motor vibration. Inspect for defects. **Rated a Class I Defect.**

MSP DRYER/ MSP DRYER

3608 Cooling Fan
Poor quality data is affecting analysis. Looks like belt and sheave issues. Inspect the belts and sheaves for wear and alignment. Clean and inspect the fan wheel. Trim balance might be needed. **Rated a Class II Defect.**

3618 EAST EXHAUST FAN
Bad data again this month.

3761 INLET FAN
A sub synchronous vibration dominates the data. We suspect a belt, structural or fastener issue. Inspect as time allows. Possible early bearing issue in fan also. Ensure the fan bearings are lubricated. **Rated a Class II Defect.**

3627-1 NE CS FILTER BLOWER
The blower shaft speed vibrations dominate the unit data. Check the drive train components and alignment. Clean the unit if possible and or trim balance. **Rated a Class II Defect.**

3642-1 NW CS Blower
Blower bearing data shows a dominant shaft speed vibration and an elevated noise floor. Inspect for drive train defects and ensure blower bearings are lubricated. Unit could have imbalance so clean and trim balance if possible. **Rated a Class II Defect.**

3649 PRODUCT COLLECTOR FAN
Large vibration in still in motor at what looks to be fan speed. Motor vibration overall is at 1.2”/second velocity peak. Inspect the unit and drive train as soon as possible. Clean and inspect the fan wheel too. **Rated a Class III Defect.**

3617-1 SE CS FILTER FAN
Bad data.

3634-1 SW CS FILTER BLOWER
Blower shaft speed vibration has jumped up considerably in the vertical measurements. Inspect the unit structure, fasteners and drive train components for defects wear, eccentricity, and alignment. Balance could also be an issue and need a cleaning or trim. **Rated a Class III Defect.**

3655 TURBO FAN
Bad data on fan.

3636 WEST EXHAUST FAN
Fan shows decrease in axial vibration. Motor has rotor bar vibrations still, noteworthy only. Inspect the motor to fan drive train for wear and alignment. Check fan for process variables. Motor data is poor quality. **Rated a Class I Defect.**

5310 AUTOPACK AZO
Increase in motor vibration at 37 Hz. Inspect for drive train issues. **Rated a Class I Defect.**

5304 PH1 PACKER SURGE BIN ASP FAN
A few harmonic peaks and fan shaft speed vibration are up in amplitude in the fan bearings. Inspect the drive train components and alignment. Motor vibration data is poor quality. **Rated a Class II Defect.**

3712 BLENDER EXHAUST FAN
Check the drive train for wear, run out, eccentricity, and alignment, and especially looseness in the fan bearings. All bearings show multiple harmonics of around 45 Hz. **Rated a Class I Defect now.**

3710 BLENDER
Multiple vibrations dominate the data near shaft speed. Inspect the base, fasteners and drive train for defects, wear and alignment as time allows. **Rated a Class I Defect.**

800 T GRINDING

2P100AC ATLAS COPCO COMPRESSOR
Vibration data for the motor still shows non-synchronous harmonics. We suspect bearing defects are present. **Rated a Class II Defect.**

2P 3029 2P SOUTH GRINDER
Data shows an increase in the motor vibration at what looks to be shaft speed. Inspect the unit for abnormalities, wear, loose fasteners, structural issues, and alignment if applicable. **Rated a Class I Defect.**

2P 3043 NORTH MILL RECEIVING FAN
The outboard fan bearing vibration is still at ½"/second velocity peak at shaft speed. Consider trim balancing the fan. **Rated a Class II Defect.**
NOTE: Consider changing the type of bearings. The shaft still needs to be replaced and the bearing moved back to original spot.

2P 3048 SOUTH MILL RECEIVING FAN
Harmonics are up in the fan bearings which usually indicate looseness in the bearing housing fits or fasteners. Check the fasteners and perform a lift check at the next opportunity. **Rated a Class II Defect.**

3043 North Collector Fan
Sub synchronous vibration data for the motor could indicate a belt or sheave issue, or possibly a structural or fastener problem. Inspect the unit for worn drive train components, ensure the belts are tensioned and aligned properly, and that the structure is sound and that all fasteners are torqued to specification. **Rated a Class I Defect.**

3016 NORTH GRINDER
Motor has increase in axial shaft speed vibration and grinder has some non-synchronous harmonic vibration peaks. Inspect the unit drive train components, structure and fasteners for defects and alignment. We will watch the grinder bearings for changes. **Rated a Class II Defect.**

3029 SOUTH GRINDER
Vibration 1-20 KHz acceleration trend in the grinder inboard bearing is up. Some of the defects are possibly above the spectrum FMAX in our analysis set. For now, make sure they are properly lubricated. Consider increasing the Spectrum FMAX. **Rated a Class II Defect.**

2P 3008 FLAKE RECEIVER FAN
1x and 2x RPM fan speed vibrations still in the motor. Inspect the drive train components for wear, eccentricity, runout, and alignment. **Rated a Class I Defect.**

MS2P GROUND FLAKE

No noted issues on collected units.

SOUTH PLANT UTILITIES

2P 4112 #2 COOLING TOWER WATER PUMP
Increase again in motor and pump vibrations. There is still a considerable vibration at shaft speed. Inspect the unit including the coupling, alignment, and all fasteners and structures as soon as possible. **Rated a Class III Defect. Motor has some poor quality data.**

29 4162 EAST CHILL WATER PUMP
Poor quality data.

2P 4160 WEST CHILL WATER PUMP
Poor quality data.

2P 4127 WEST COMPRESSOR
Possible early bearing defects in the motor. We will watch for changes. **Rated a Class I Defect.**

4161 #2 SUPPLY PUMP
Motor vibrations are still near 0.5"/second velocity peak at shaft speed. Inspect the unit including the coupling and all fasteners and structures at the next opportunity. **Rated a Class II Defect.**

4114 WEST CIRCULATION PUMP
Motor has strong rotor bar passing frequency vibrations. No immediate concern. **Rated a Class I Defect.**

MSP GROUND FLAKE

No data collected