

Company Name

Street

City

Postcode

Country

Dear [Recipient name]

Re: JPS Reliability: Vibration Analysis Report

I would firstly like to thank you for the courtesy and co-operation shown to JPS Reliability Limited during my recent site visit. Following the survey at your facility I have pleasure in presenting for your attention a comprehensive Vibration Analysis Condition Monitoring report.

Please contact JPS Reliability Limited for any machinery reliability issues or required health verification, we offer full technical/diagnostic back up which includes:

- Conventional vibration analysis
- Phase analysis
- Resonance testing
- Bearing / gear analysis
- Oil analysis
- On Site dynamic fan balancing
- Laser alignment
- Thermal imaging
- Ultrasonic air leak energy saving surveys
- Shaft Voltage Bearing discharge surveys

Date of survey:

- X

Next Survey due:

- X

Instrumentation:

This survey was performed using the CSI 2140 Dual channel Machinery Health Analyser. Data analysis was carried out using the CSI AMS Machinery Health manager software V5.61.

Methodology:

Vibration data including Velocity, Acceleration and bearing condition unit PeakVue was collected from each bearing location as close as possible to the source. Where applicable additional data including high resolution vibration data was collected.



Maintenance Recommendations

SRB Blowers Recommended actions:

1. Check the oil level/condition on Blower 3
2. Check with the OEM for the gear tooth count on the blower 6
3. Motor 1, 4 & 6 drive belts do not have the guarding on. To access you need to open the blower door, but best practice re-instate the guarding at the next opportunity
4. Motor 1 grease the non-drive end bearing
5. Motor 3 in long term plan schedule in bearing change
6. Motor 5 lubricate both motor bearings
7. Motor 6 lubricate drive end bearing

Storm Outfall Pumps:

1. Motor 1 and 4 Inspect the carbon brush condition and lubricate bearings
2. Lubricate the pump bearings

THP Pumps:

1. Motor 2 remove from service for inspection/overhaul

Centrifuges:

1. Motors require greasing at the drive end, an extension for the grease gun will be required
2. Centrifuge 1 maint rotor drive end bearing. First action change the drive belts checking the belt pulley condition. Fully grease purge Centrifuge drive end bearing and then re-gather data to see if this reduced the impacting from the bearing.

Findings

SRB Blower Ends:

All of the blowers have component wear and looseness in various stages. Highest levels from blower 3 and blower 6. Table 1 shows the historical highest Acceleration level trends from the blowers. **(See Table 1)**

Blower 3: levels at the lobe pass frequency have increased slightly, the oil level in the sight glass appears low. First action check the oil level/condition and monitor **(See Image 1 and Figure 1)**

Blower 6: The levels have greatly reduced on the initial unit, however this blower has the highest levels and the blower drive end is hot to the touch. Continue to monitor. Please ask the OEM for the gear tooth count on the blower. **(See Figure 2)**

SRB Blower Motors:

Some motors have bearing defects in various stages of failure. Table 2 is the highest Acceleration level trend from the motors. **(See Table 2 & 3)**

Motor 1: The drive end bearing defect is steady. The non-drive end stress levels have increased, please grease the non-drive end bearing. **(See Figure 3)**

Motor 3: The defect at the drive end remains steady after lubrication, continue to trend and plan in bearing change. **(See Figure 4)**

Motor 4: The bearing defect at the motor drive end remains steady after lubrication. **(See Figure 5)**

Motor 5: Grease both motor bearings. **(See Figure 6)**

Motor 6: Bearing defect is steady. However the drive end grease needs to be replenished. **(See Figure 7)**

Storm Outfall Pumps:

Motors: Motor 1 and 4 show an increase in the periodic impacting at the top (non-drive end). This may be related to the brush condition or looseness in the bearing. **(See Figure 8)**

Pumps: Pump 1 and 4 still have the highest bearing impacting levels. They have remained steady. Lubricate and continue to trend the impacting levels. **(See Figure 9)**

THP Pumps:

THP Pump 2: This is the first set of data and the motor is running in a damaged mode. This is visually and audibly loud and knocking. Site have lubricated the bearings with little affect. Remove the motor for service, check the gearbox oil and drive coupling condition. **(See Figure 10)**

Centrifuges:

Motors: Both the motors require lubrication. **(See Image 2 and Figure 11)**

Main Rotors: There is a concerning increase at the drive end bearing of Centrifuge 1. The impacting is very high. First action change the drive belts checking the belt pulley condition. Fully grease purge Centrifuge drive end bearing and then re-gather data to see if this reduced the impacting from the bearing. **(See Figure 12)**

Asset Assessment Data

SRB Blowers

Overall Data: Overall Impacting for easy reference and is the maximum Acceleration impacting level from

Showing the Peak to Peak g's 10 KHz Acceleration Time Waveform data

Table 1: Blower Air End

Date	18/07/2019	25/10/2019	12/03/2020		Notes
Blower 1	24.23	50.39	21.23		Reduced
Blower 2	79.00	55.53	14.70		Reduced
Blower 3	51.70	26.86	29.14		Check Oil levels
Blower 4	25.52	N/R	17.54		Steady
Blower 5	51.04	33.14	20.50		Reduced
Blower 6	92.91	Spare	52.79		Last Replaced Blower

Table 2: Motor Non-Drive end bearing

Date	18/07/2019	25/10/2019	12/03/2020		Notes
Blower 1	13.21	9.11	11.29		Grease
Blower 2	17.25	9.94	10.69		
Blower 3	11.41	12.03	11.36		
Blower 4	10.59	NR	10.52		
Blower 5	7.17	15.49	21.52		Grease
Blower 6	9.39	16.08	6.27		

Table 3: Motor Drive end bearing

Date	18/07/2019	25/10/2019	12/03/2020		Notes
Blower 1	17.97	19.37	18.19		Defect steady
Blower 2	76.51	7.725	14.63		
Blower 3	21.68	20.78	19.57		Defect steady
Blower 4	22.71	NR	18.62		Defect steady
Blower 5	14.29	11.29	17.46		Grease
Blower 6	23.72	13.09	21.5		Grease

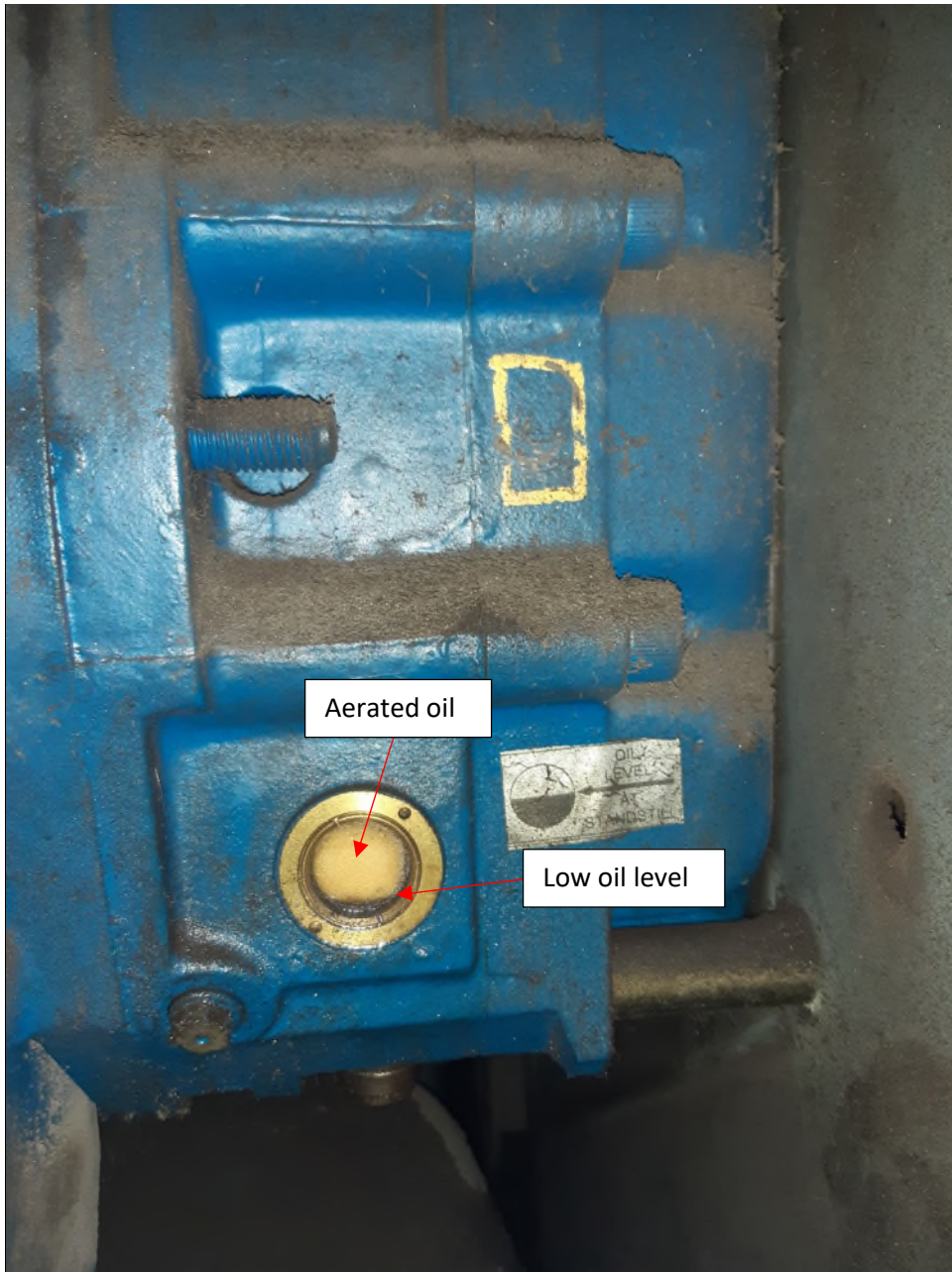
SRB Blower 3

Visual Data: Oil Level

Image 1 is of the drive end oil level

Check the oil level and condition

Image 1:



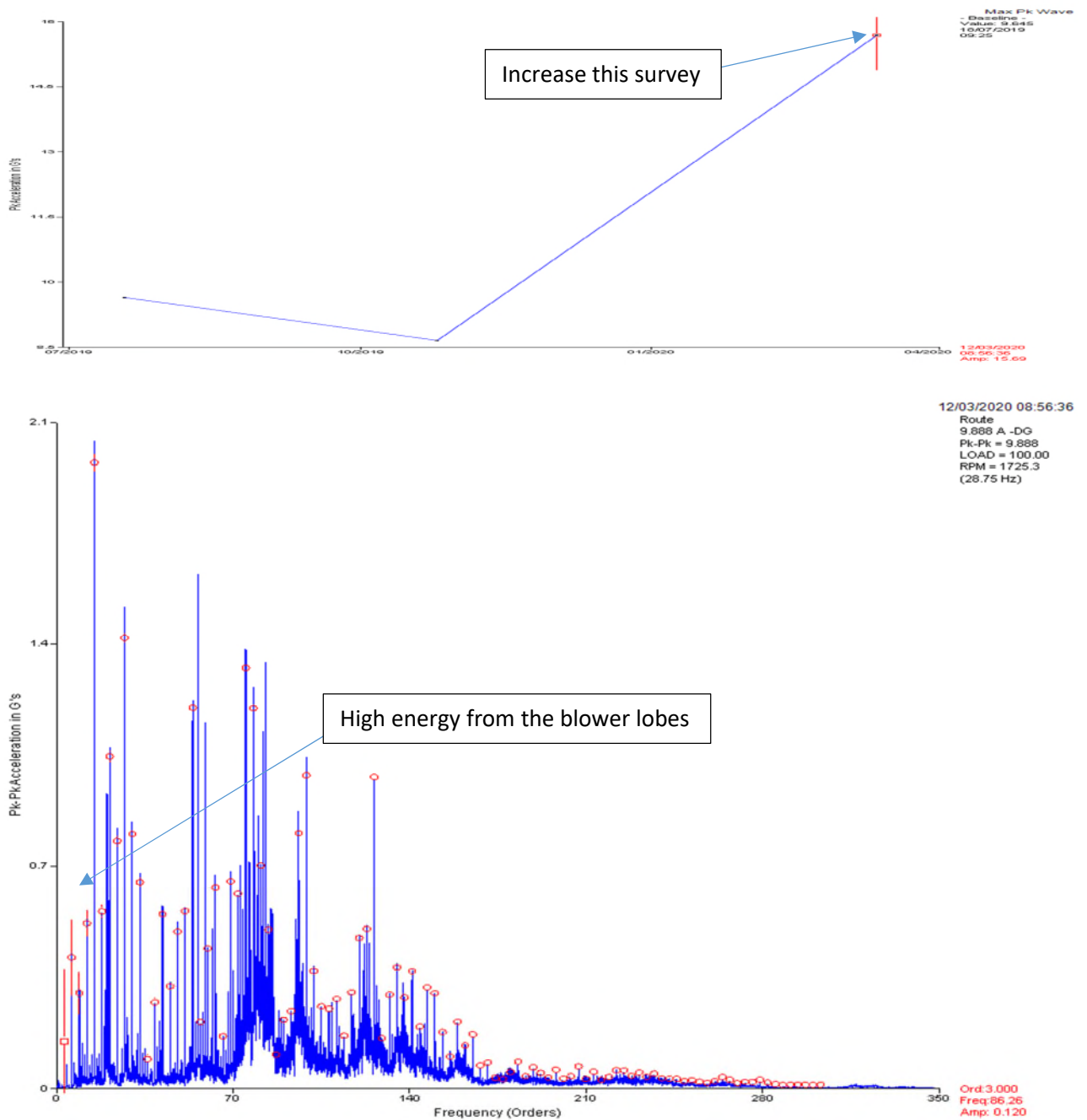
SRB Blower 3

Vibration Data: Blower

Figure 1 top trend shows the Acceleration Peak trend and the increase this survey. The bottom plot is the Acceleration spectrum and shows that the highest energy is occurring at 3 Orders, the pulse frequency of the blower.

Check the oil condition and level as it appears low.

Fig 1:



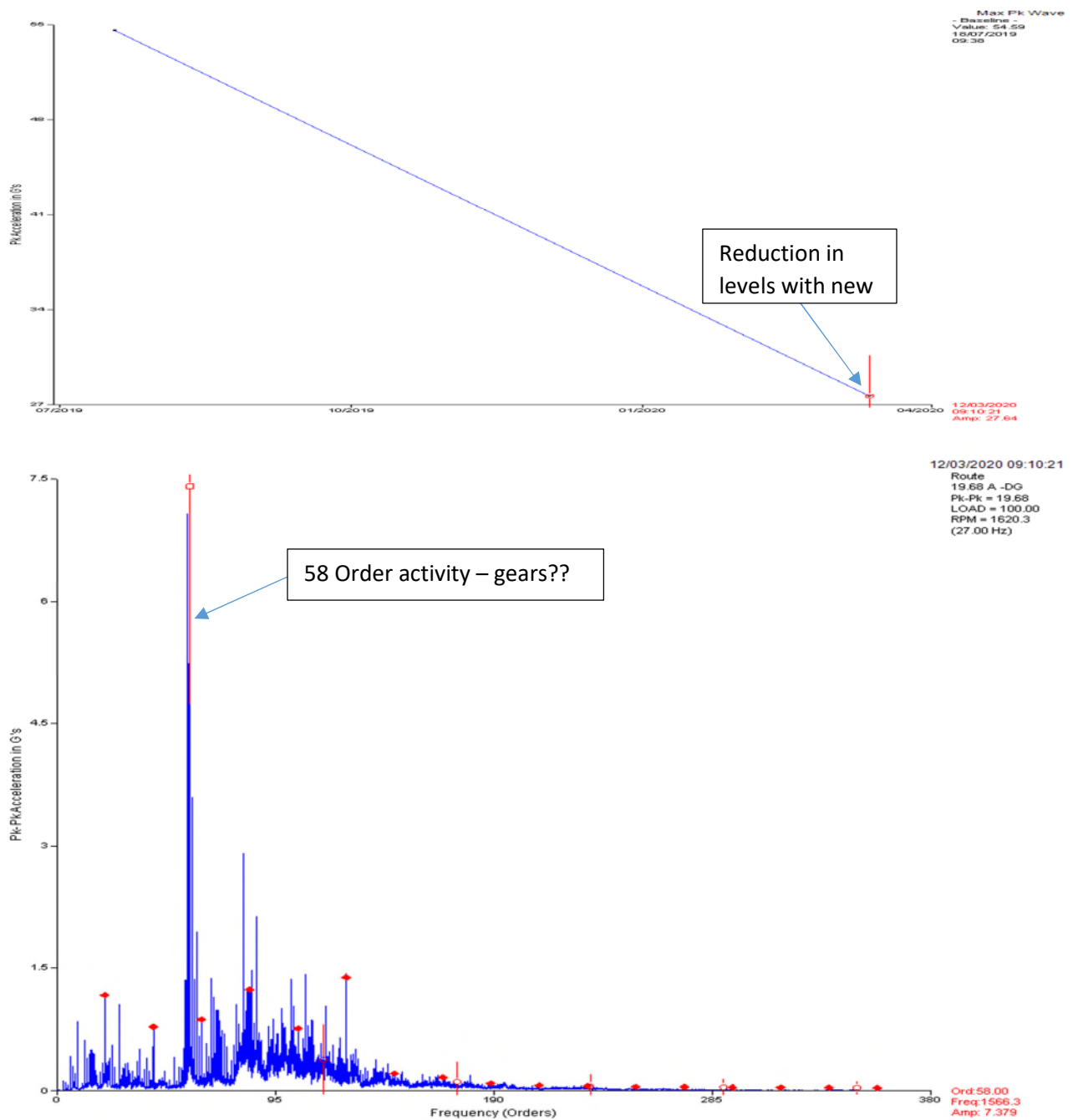
SRB Blower 6

Vibration Data: Blower

Figure 2 top trend shows the Acceleration Peak trend and the reduction with the new blower end, it is still elevated compared to the other units. The bottom Acceleration spectrum shows a peak at around 58 Orders sidebanded by running speed.

Please ask the OEM for the gear tooth count in the blower.

Fig 2:



SRB Blower 1

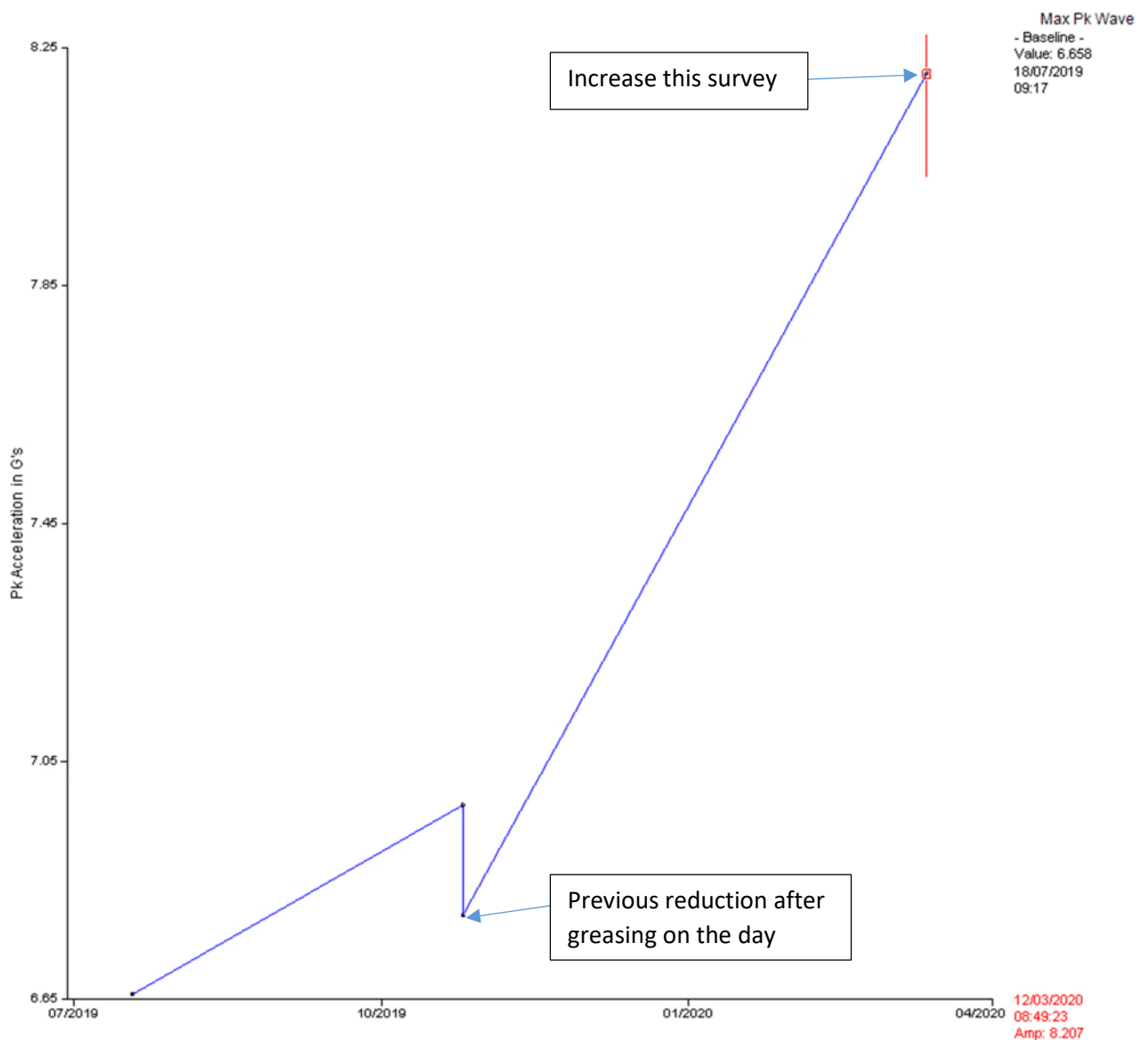
Vibration Data: Motor

Figure 3 is the PeakVue Acceleration trend from the motor non-drive end bearing.

This shows the reduction last survey after lubrication and the subsequent increase this survey.

Ensure that the motor non-drive end is lubricated.

Fig 3:



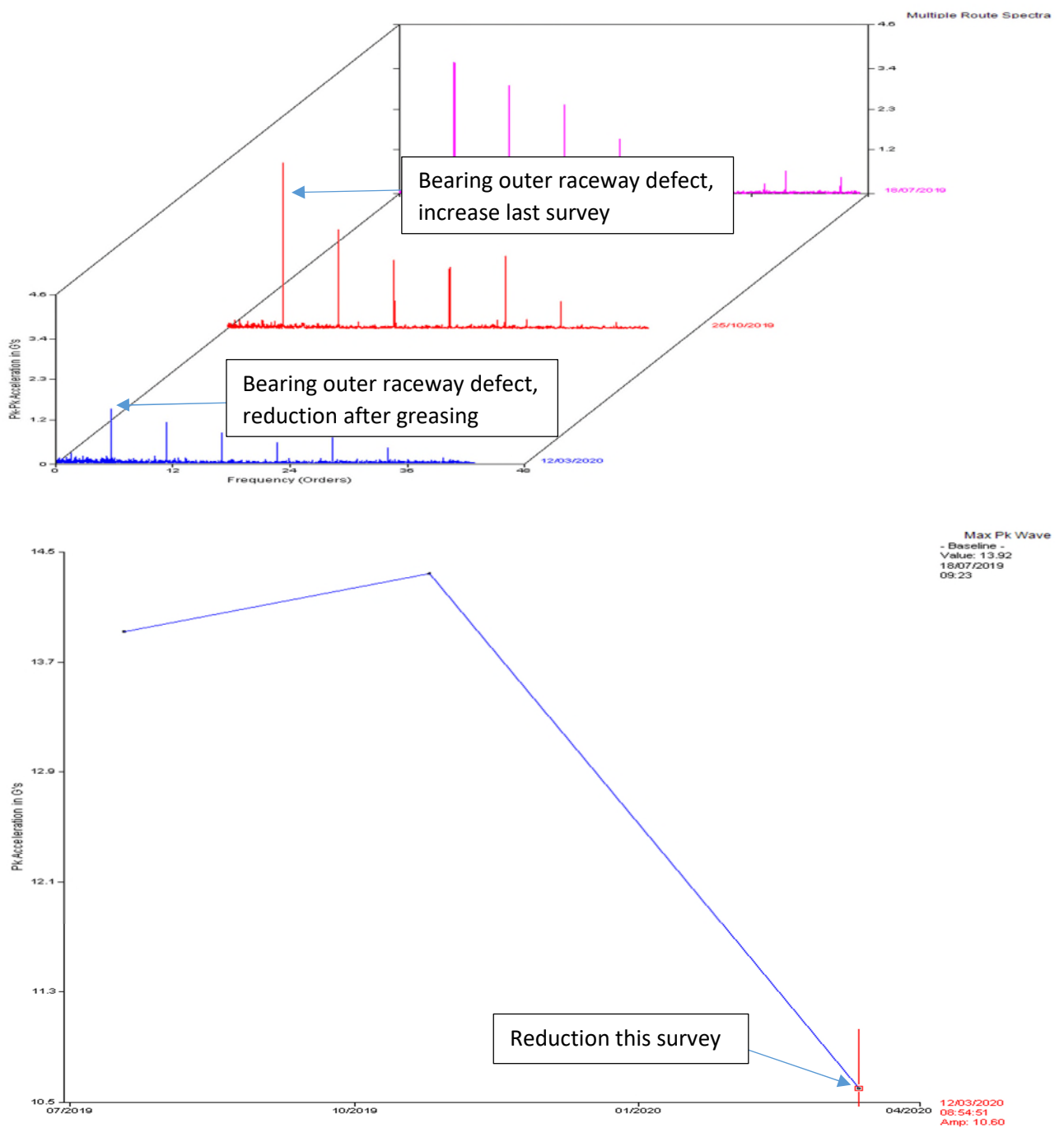
SRB Blower 3

Vibration Data: Motor

Figure 4 top plot is the PeakVue spectra's from the drive end of the motor, this shows the increase last survey and the reduction in the amplitude of the defect this month. The bottom plot is the PeakVue Acceleration trend and shows the previous increase and reduction after lubrication this survey.

Continue with lubrication schedule and long-term plan in bearing change.

Fig 4:



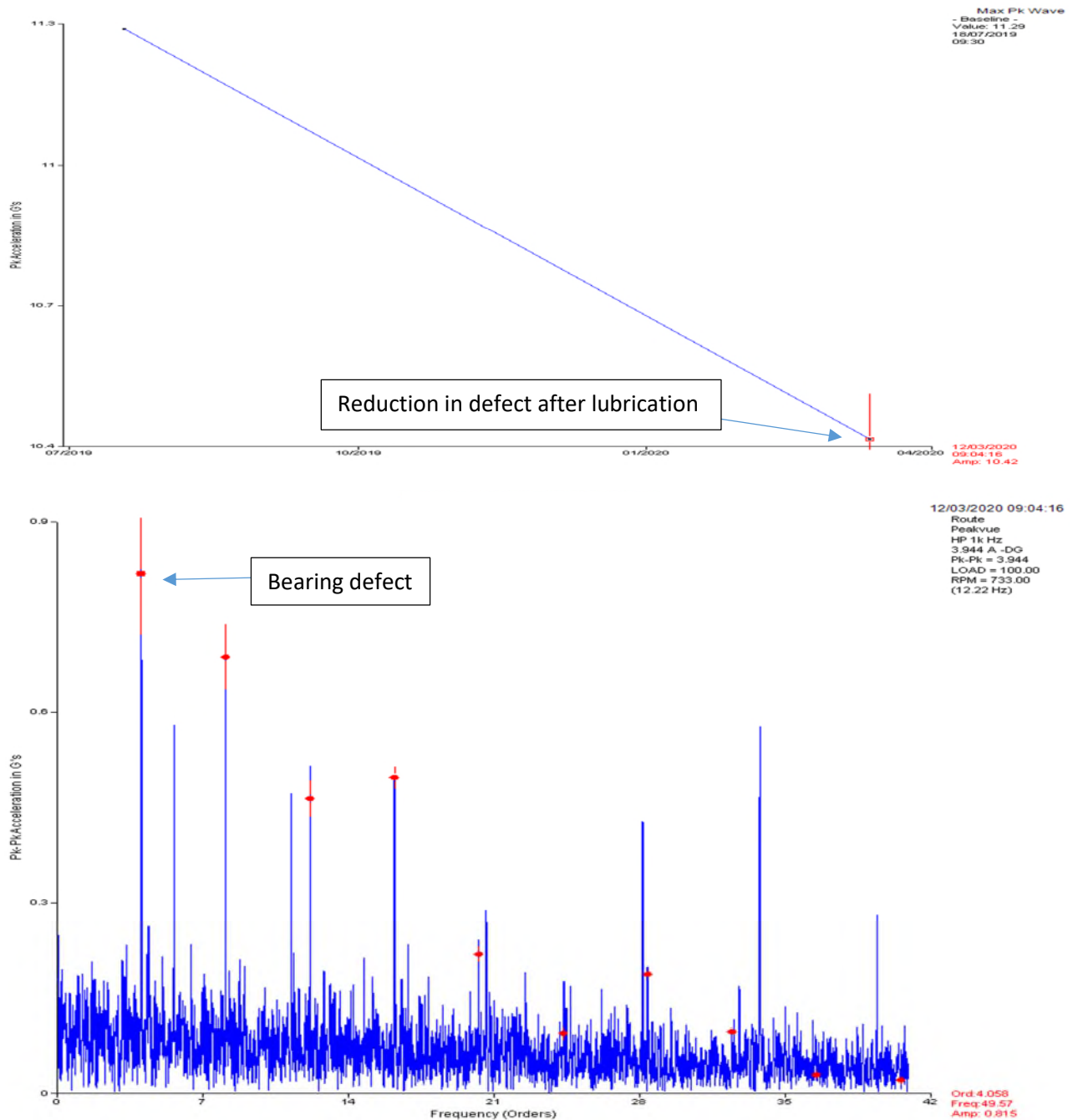
SRB Blower 4

Vibration Data: Motor

Figure 5 top plot is the PeakVue trend and it shows a reduction in the bearing defect. The bottom plot is the PeakVue spectrum and this shows the bearing defect is still evident.

Continue with lubrication schedule.

Fig 5:



SRB Blower 5

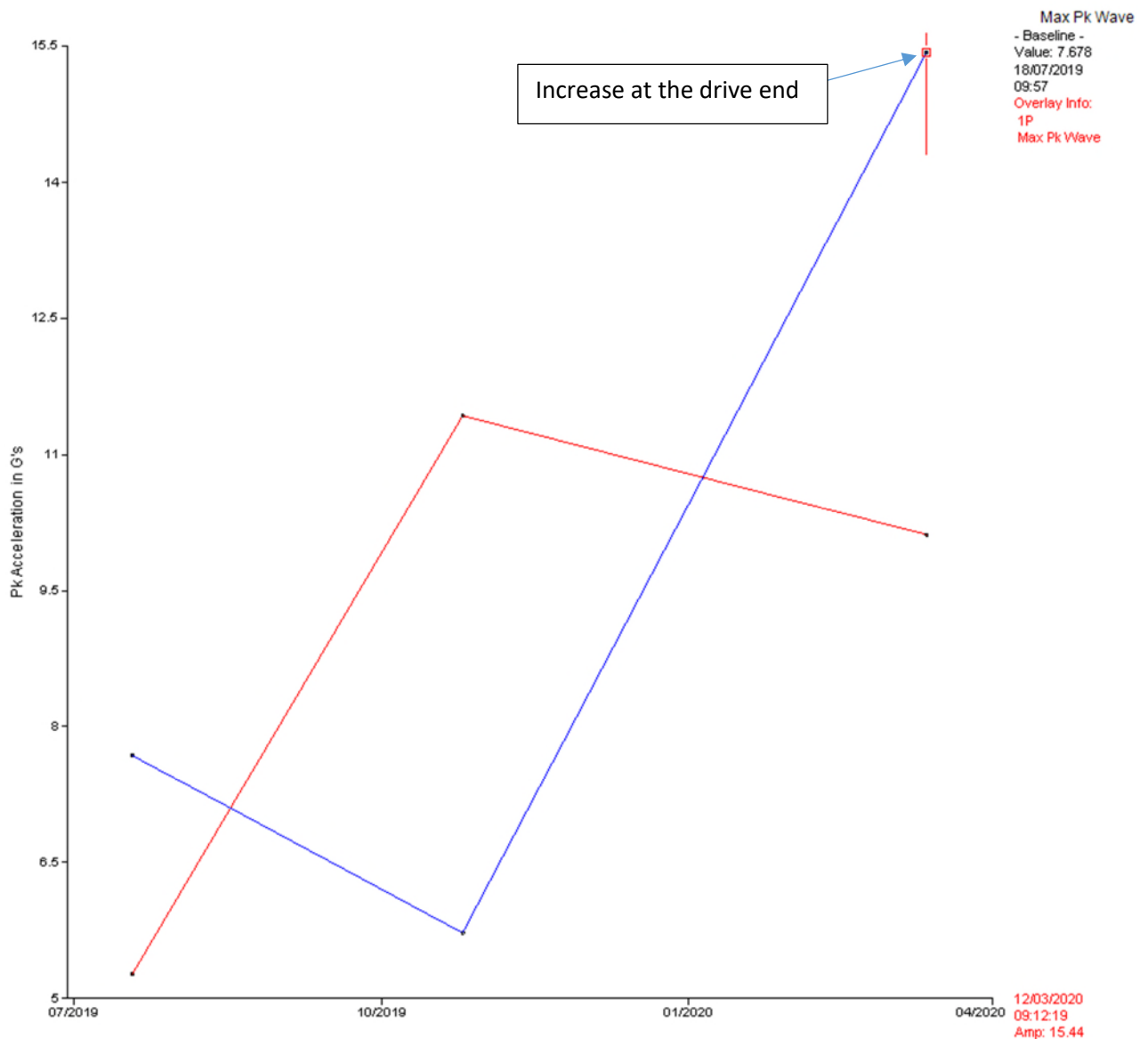
Vibration Data: Motor

Figure 6 compares the drive and non-drive end PeakVue bearing trends.

This shows steady levels at the non-drive end and an increase at the drive end.

Please lubricate both motor bearings.

Fig 6:



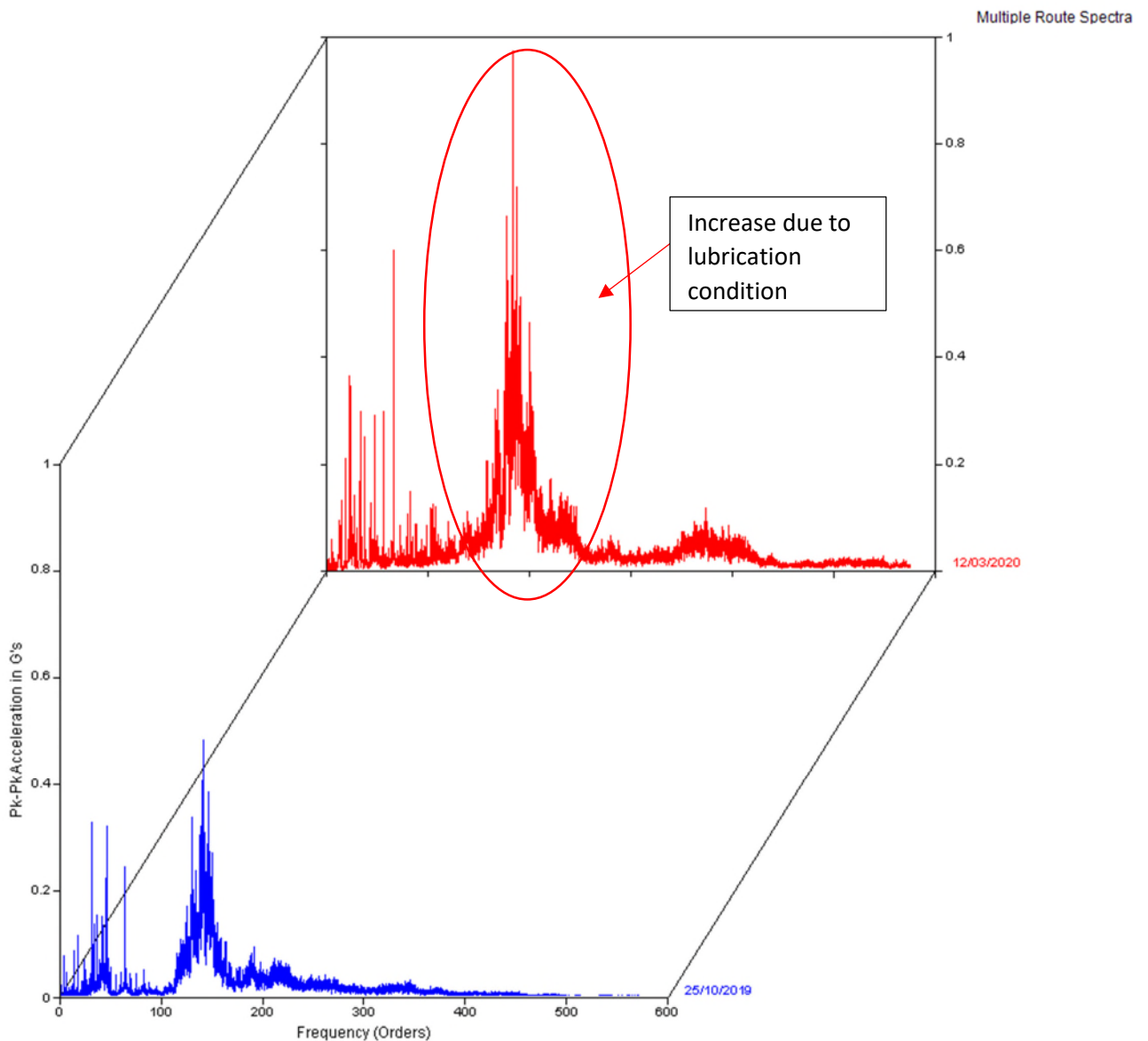
SRB Blower 6

Vibration Data: Motor

Figure 7 shows the last two Acceleration spectra's, this shows the mound of high frequency activity has increased due to the reduction of the lubrication condition.

Please lubricate the motor drive end bearing.

Fig 7:



Storm Outfall Pumps

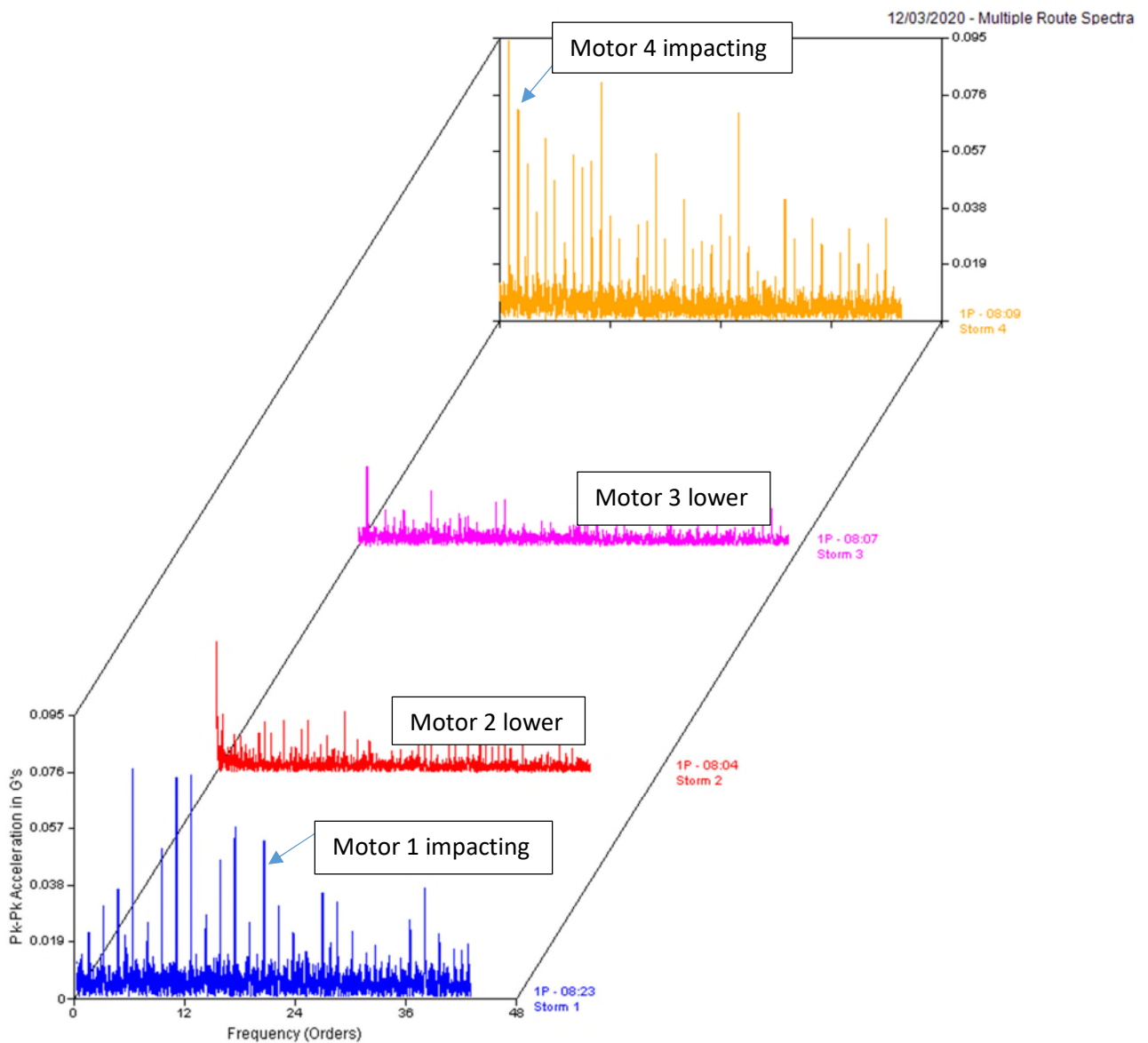
Vibration Data: Motors

Figure 8 compares the PeakVue spectra's from the non-drive end of the motors.

Motor 1 and 4 show an increase in the periodic impacting at the top (non-drive end). This may be related to the brush condition or looseness in the bearing as it is occurring once per revolution of the shaft.

First action grease the bearings and inspect the brush condition.

Fig 8:



Storm Outfall Pumps

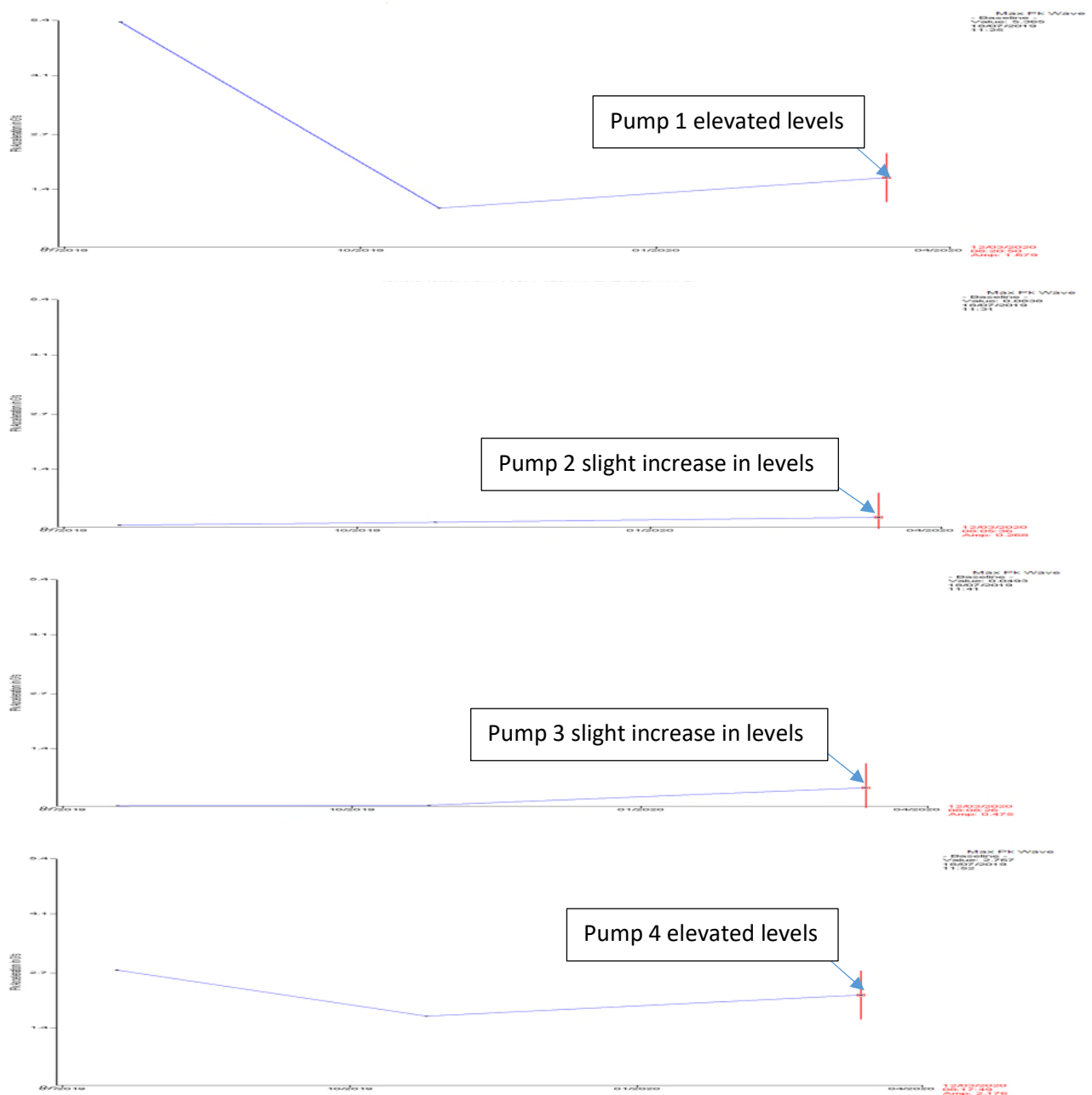
Vibration Data: Pump

Figure 9 compares the top drive end bearing Peak Acceleration trends from the pump barrels.

There has been a slight increase on Pump 2 and 3, the impacting levels from Pump 1 and 4 remain high but steady.

Lubricate the pump bearings, the additional lubrication is extending the bearing life.

Fig 9:



THP 2

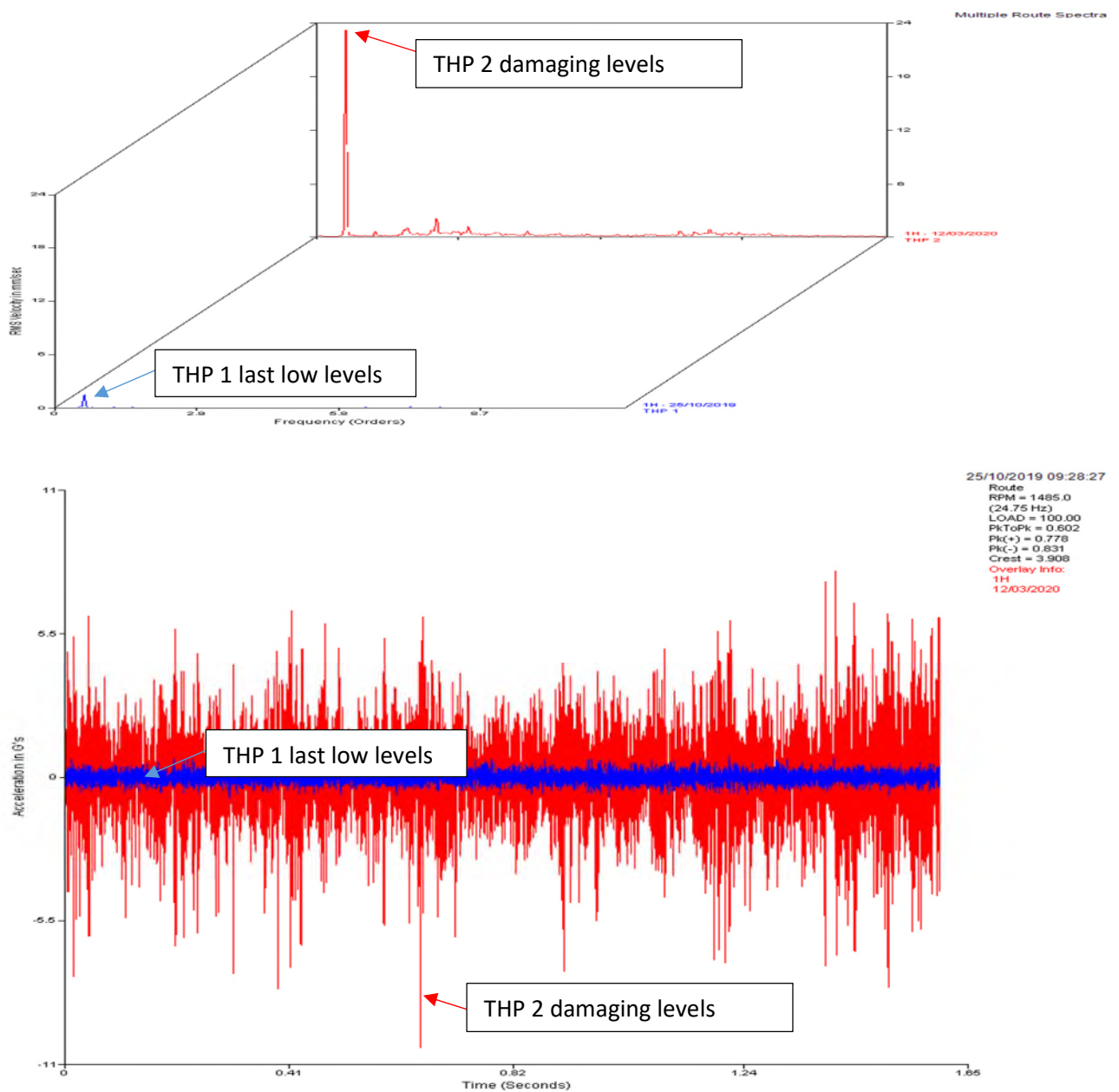
Vibration Data: Motor

Figure 10 top plot shows THP 1 last level at 1.51mm/s RMS compared to the very high THP 2 at 23.149 mm/s RMS. The bottom plot compares the last THP 1 impacting levels at 1.609g's compared to the very high damaging levels THPO 2 at 18.26g's.

This is the first set of data and the motor is running in a damaged mode. This is visually and audibly loud and knocking. Site have lubricated the bearings with little affect.

Remove the motor for service, check the gearbox oil and drive coupling condition.

Fig 10:



Centrifuge

Visual Data: Motors

Image 2 shows that the motor drive end bearing is in a tight location.

It is important that the motor bearings are greased.

Image 2:



Centrifuge

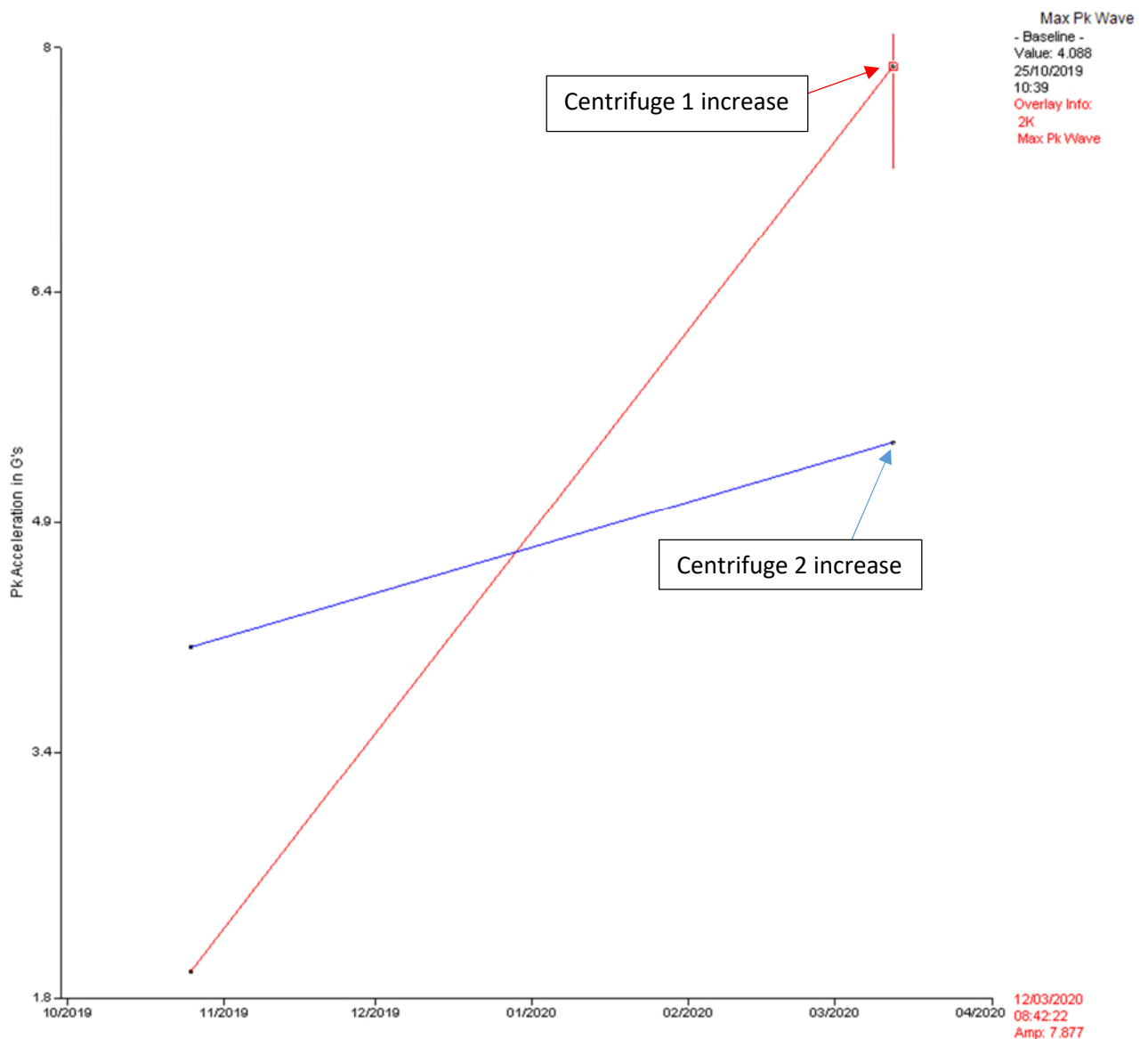
Vibration Data: Motors

Figure 11 is the Acceleration trend from the drive end bearing on the two centrifuges.

This was flagged up last survey as requiring lubrication, it has increased further this survey.

It is important that the motor bearings are fully greased, note the difficulty in accessing the drive end grease nipple.

Fig 11:



Centrifuge

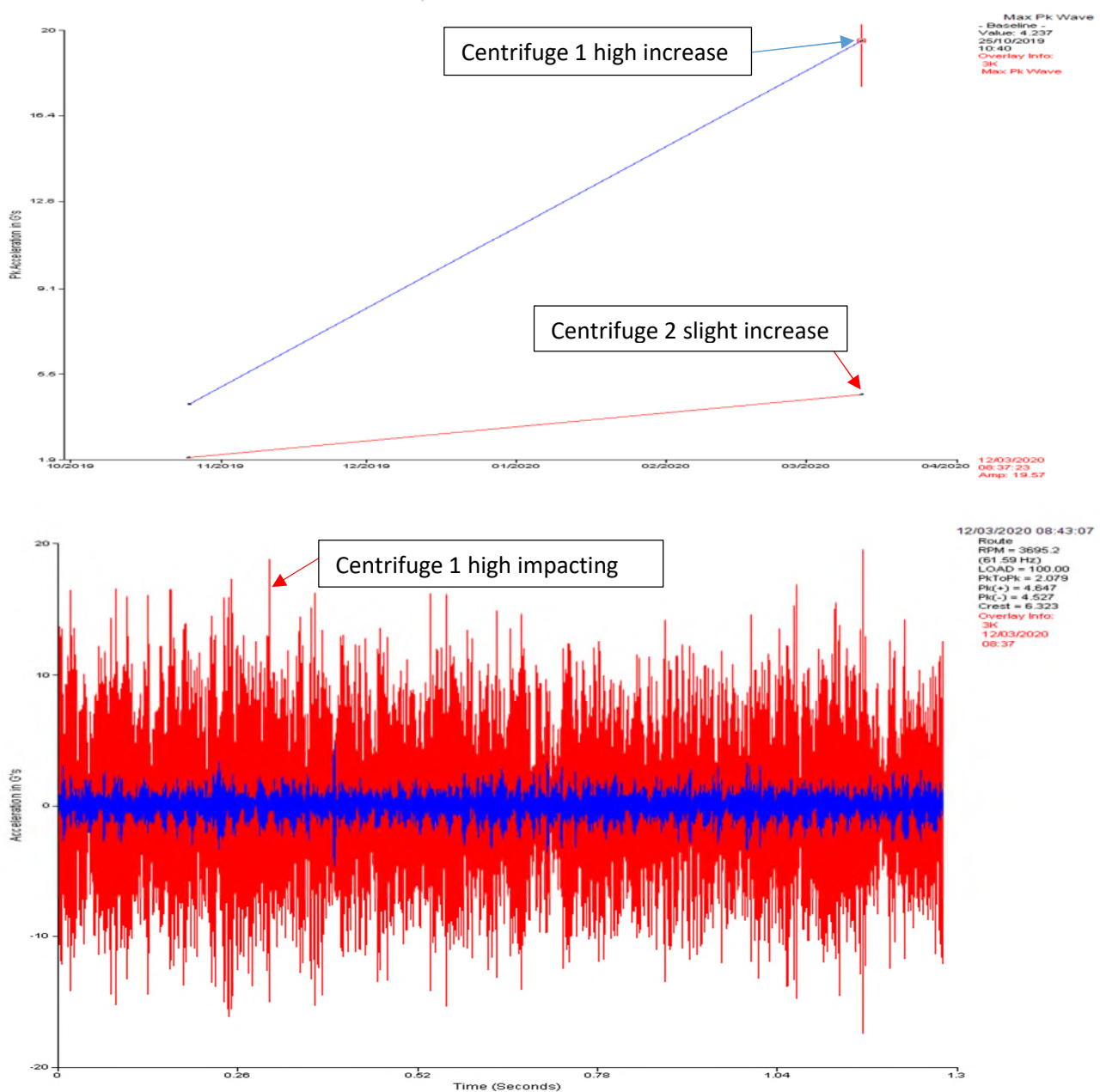
Vibration Data: Main Rotors

Figure 12 top plot compares the drive end centrifuge bearing showing the high increase on Centrifuge 1. The bottom compares the Acceleration time waveforms from Centrifuge 1 at 36.99 g's (red data) and Centrifuge 2 at 9.2 g's (Blue data).

There is a concerning increase at the drive end bearing of Centrifuge 1. The impacting is very high.

First action, change the drive belts checking the belt pulley condition. Fully grease purge Centrifuge drive end bearing and then re-gather data to see if this reduced the impacting from the bearing.

Fig 12:





RELIABILITY SERVICES - MACHINE STATUS TRAFFIC LIGHT REPORT

For

company name - location



MACHINE I.D	Equipment Component	18 July 2019	25 October 2019	12 March 2020				Comments
Process Plant								
SRB Blower 1	Motor							Lubricate Bearings
	Blower							Oil Sample and Oil Change
SRB Blower 2	Motor							
	Blower							Trend anomaly
SRB Blower 3	Motor							Bearing change
	Blower							Oil Sample and Oil Change
SRB Blower 4	Motor							Trend anomaly
	Blower							Trend anomaly
SRB Blower 5	Motor							Lubricate Bearings
	Blower							Trend anomaly
SRB Blower 6	Motor							Lubricate Bearings
	Blower							Trend anomaly
Storm Outfall Pump 1	Motor							Mechanical Looseness
	Pump							Lubricate Bearings
Storm Outfall Pump 2	Motor							
	Pump							Lubricate Bearings
Storm Outfall Pump 3	Motor							
	Pump							Lubricate Bearings
Storm Outfall Pump 4	Motor							Mechanical Looseness
	Pump							Lubricate Bearings
THP Feed Pump 1	Motor							
	Gearbox							
THP Feed Pump 1	Pump							
	Motor							Replace Asset
THP Feed Pump 1	Gearbox							
	Pump							
Centrifuge 1	Motor							Lubricate Bearings
	Centrifuge							Lubricate Bearings
Centrifuge 2	Motor							Lubricate Bearings
	Centrifuge							

Status Key	
Fault - Urgent Action Required	
Warning - Planned Action Required	
Satisfactory- No Action Required	
Activity - Continue Monitoring	
Not In Service/Unable to collect data	

Additional:

In the interests of reliability and case history, we would appreciate feedback on work undertaken and the details of components used.

The data was recorded with an Emerson Process Management data collector (CSI 2140) with data being stored on RBM Machinery Health Manager Software V5.61.

Any observations or recommendations we have made are supported with accompanying vibration data.

We trust that this will be acceptable to your requirements, however, should you require any additional information please contact the undersigned.

Kind Regards

Technician

Technician

Reliability Services



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