

# JPS Reliability

A Reliable Plant is a Profitable Plant

**PROfessional services for PROactive maintenance**

[info@jpsreliability.com](mailto:info@jpsreliability.com) <https://jpsreliability.com>

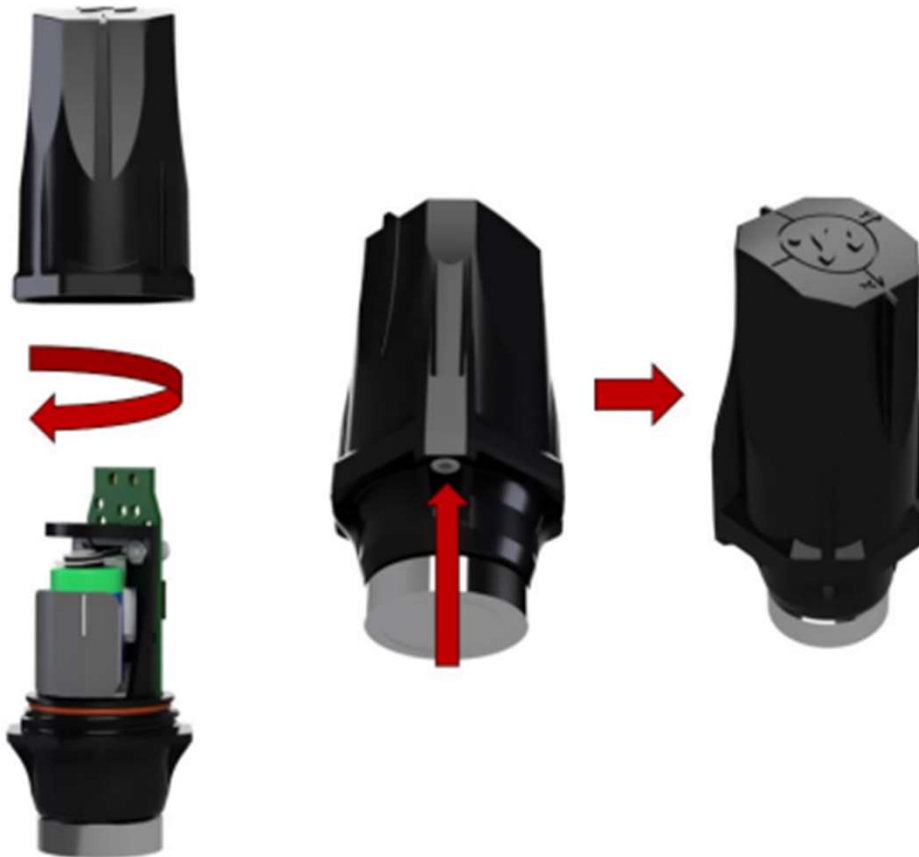
Registered in England: 12547245. VAT. No: 346156693





## SENSOTEQ KAPPA X TRIAL

- Technical management JPS Reliability Ltd
- **Kappa X Wireless Sensor** (Developed by Sensoteq and RMS)



# Kappa X

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- Tri-Axial Sensor (X,Y,Z)
- Atex Zone 0 approval process ongoing
- 10KHz Fmax / 5KHz / 5KHz , 3200 – 6400 LOR
- 64G Peak Vibration (128G Pk-Pk)
- Auto ranging
- IP69K Ingress Protection
- 5 Year Battery (User Replaceable)
- Standard ½ AA Size Battery for easy replacement with a T8
- Intelligent sleep mode
- 1 min sampling rate / Temp / Vib RMS Pk-Pk
- Long Term Spectrum, Time Waveform, Power bands (24hr)
- Wireless Radio Frequency Sub 1GHz (ISM) (Increased range/integrity)
- Very small profile base 36mmx36mm – 78mm height

# Sensotek Kappa X Trial

- Set up easy
- Plug and Play Technology
- Feedback from first set of data
- 89 Meter Length Drier



# Dryer Fan



Circulating Fan



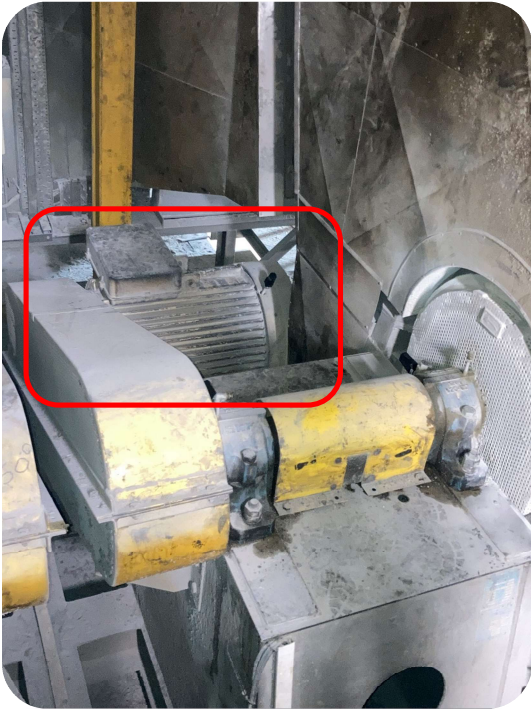
NDE Fan Bearing



DE Fan Bearing

# Dryer Fan Motor

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Circulating Fan



NDE Motor Bearing



DE motor Bearing

# Cloud Platform

The screenshot displays the 'Analytix by Sensotek' web application interface. The browser address bar shows the URL: <https://analytix.sensotek.com/site/04155417-d47b-490c-ada6-2d7ba4cec462/overview>. The interface includes a dark sidebar with navigation options: GLOBAL DATA, CHI DATA, ANALYSIS, ALARMS, REPORTS, and SETTINGS. The main content area is titled 'ETEX PORTBURY OVERVIEW' and features a map of the site labeled 'Site'. Below the map, there are three main sections: 'MACHINES' (1 machine installed), 'SITE MAP' (aerial view of the facility), and 'Current status' (No alarm issues detected, All gateways online, All machines online). The 'MACHINES' section lists 'BL2 DRYER FAN ZONE 1 RIGHT HAND SIDE' as 'Online (seen a few seconds ago)'. The 'Current status' section shows three green checkmarks indicating no alarm issues, all gateways online, and all machines online. The 'RECENT ALARM EVENTS' section lists three events: 'Sat Jan 15th, 10:15:53' (Vertical vibration power exceeded thresholds), 'Fri Jan 14th, 19:03:33' (Vertical vibration power exceeded thresholds), and 'Fri Jan 14th, 04:22:55' (Horizontal peak to peak exceeded threshold). Red arrows point from text labels to these specific elements: 'Site' to the map, 'Assets monitored' to the machine list, 'Current status' to the status summary, and 'Alarm History' to the recent alarm events.

# Cloud Platform

The screenshot displays the Sensotek Analytix web interface for a specific asset: **BL2 Dryer Fan Zone 1 right hand side**, which is marked as **Critical**. The interface is divided into several key sections:

- MEASURING POINTS:** A list of four sensors with their current status:
  - 1\_FAN DRIVE MOTOR NDE (SENSOR #1): Online (seen 2 minutes ago) - **Critical** (red icon)
  - 2\_FAN DRIVE MOTOR DE (SENSOR #2): Online (seen a minute ago) - **Good** (green icon)
  - 3\_FAN SHAFT DE BEARING (SENSOR #3): Online (seen a minute ago) - **Warning** (yellow icon)
  - 4\_FAN SHAFT NDE BEARING (SENSOR #4): Online (seen 2 minutes ago) - **Critical** (red icon)
- MACHINE STATUS:** A schematic diagram of the fan assembly with colored indicators (red, green, yellow) corresponding to the sensor statuses. A text overlay reads: "Live alarm status of each point – click on to drill to alarm".
- ALARM SCORE:** A line graph showing the alarm score over time from Wednesday to Saturday. The score starts at 0, rises to approximately 80 by Friday, and then fluctuates between 40 and 80. A callout indicates a "Live score 80".
- ALARM HISTORY:** A list of recent alarm events, including:
  - Today, 04:46:50: BL2 Dryer Fan Zone 1 right hand side - 3\_Fan Shaft DE bearing (Sensor #3) - Axial sensor velocity RMS greater than 12.9
  - Fri Jan 7th, 22:58:10: BL2 Dryer Fan Zone 1 right hand side - 1\_Fan Drive Motor NDE (Sensor #1) - Vertical vibration power (low res) exceeded band thresholds
  - Fri Jan 7th, 22:58:10: BL2 Dryer Fan Zone 1 right hand side - 1\_Fan Drive Motor NDE (Sensor #1) - Vertical vibration power (low res) exceeded band thresholds
  - Fri Jan 7th, 22:58:10: BL2 Dryer Fan Zone 1 right hand side - 1\_Fan Drive Motor NDE (Sensor #1) - Vertical peak to peak (low res) greater than 1200
  - Fri Jan 7th, 22:58:10: BL2 Dryer Fan Zone 1 right hand side - 1\_Fan Drive Motor NDE (Sensor #1) - Axial peak to peak (low res) greater than 1200
  - Fri Jan 7th, 22:42:08: BL2 Dryer Fan Zone 1 right hand side - 4\_Fan Shaft NDE Bearing (Sensor #4) - Vertical vibration power (low res) exceeded band thresholds
  - Fri Jan 7th, 22:42:08: BL2 Dryer Fan Zone 1 right hand side - 4\_Fan Shaft NDE Bearing (Sensor #4) - Horizontal vibration power (low res) exceeded band thresholds
- Image of asset:** A photograph of the physical fan machinery.

# Data Review Day 1



# Fan NDE Email Alarm Overnight

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Less than 24hrs after placing the sensor on the bearing.

Critical - vibration power (low res) alarm triggered!

 noreply@sensoteq.com  
To: James Sylvester

 If there are problems with how this message is displayed, click here to view it in a web browser.

[View in Analytix](#)

### Critical - vibration power (low res) alarm triggered!

ALARMS

**Critical** Critical - Horizontal vibration power (low res) exceeded band thresholds

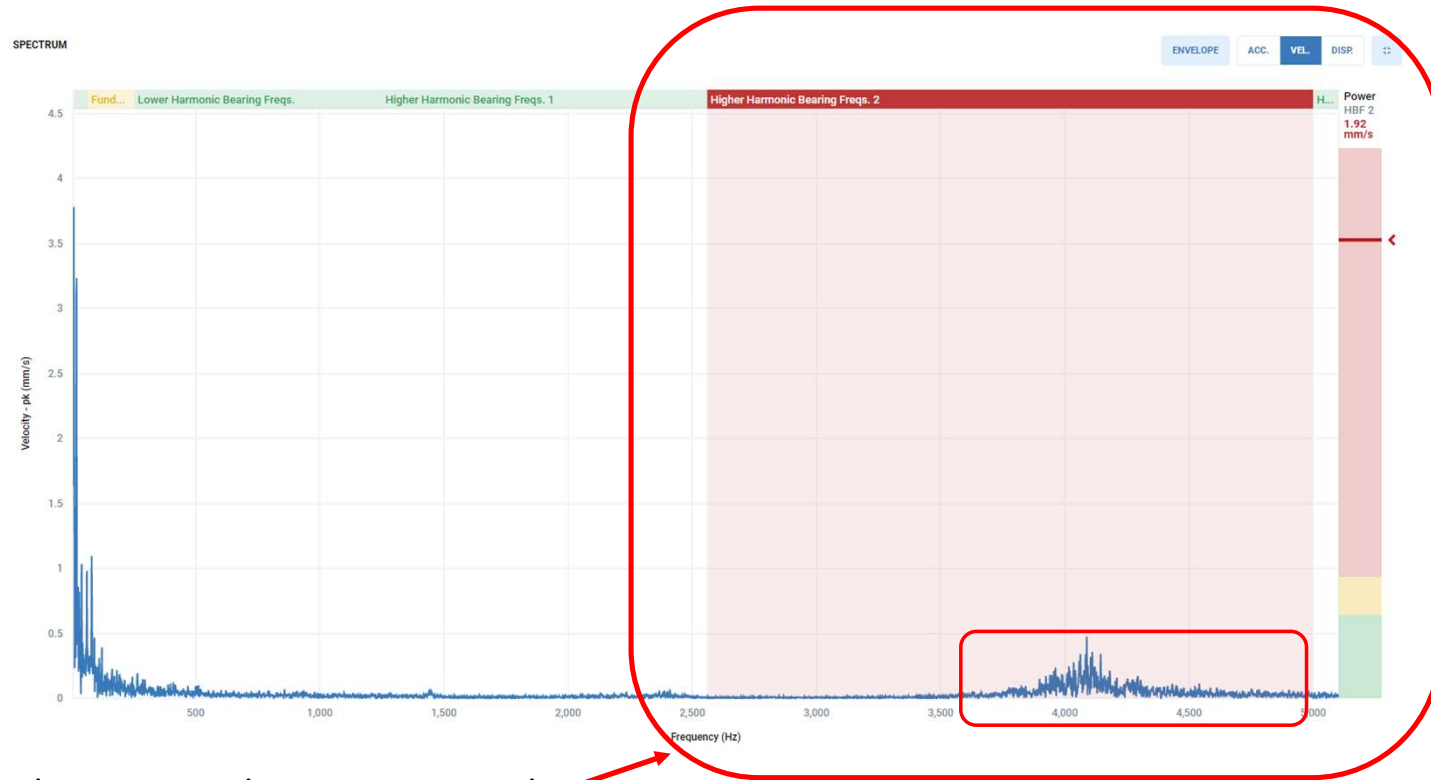
ID: c30e4810-9c29-4b5d-be7b-536b388c6628  
Fri Jan 07 2022 22:42:08 GMT+0000

#### Alarm Information

|                                 |   |
|---------------------------------|---|
| Site:                           |   |
| Machine:                        | BL2 Dryer Fan Zone 1 right hand side              |
| Measuring point:                | 4_Fan Shaft NDE Bearing (Sensor #4)               |
| Vib direction:                  | Horizontal  |
| Vibration power bands breached: | Bands surpassed: Higher Harmonic Bearing Freqs. 2 |

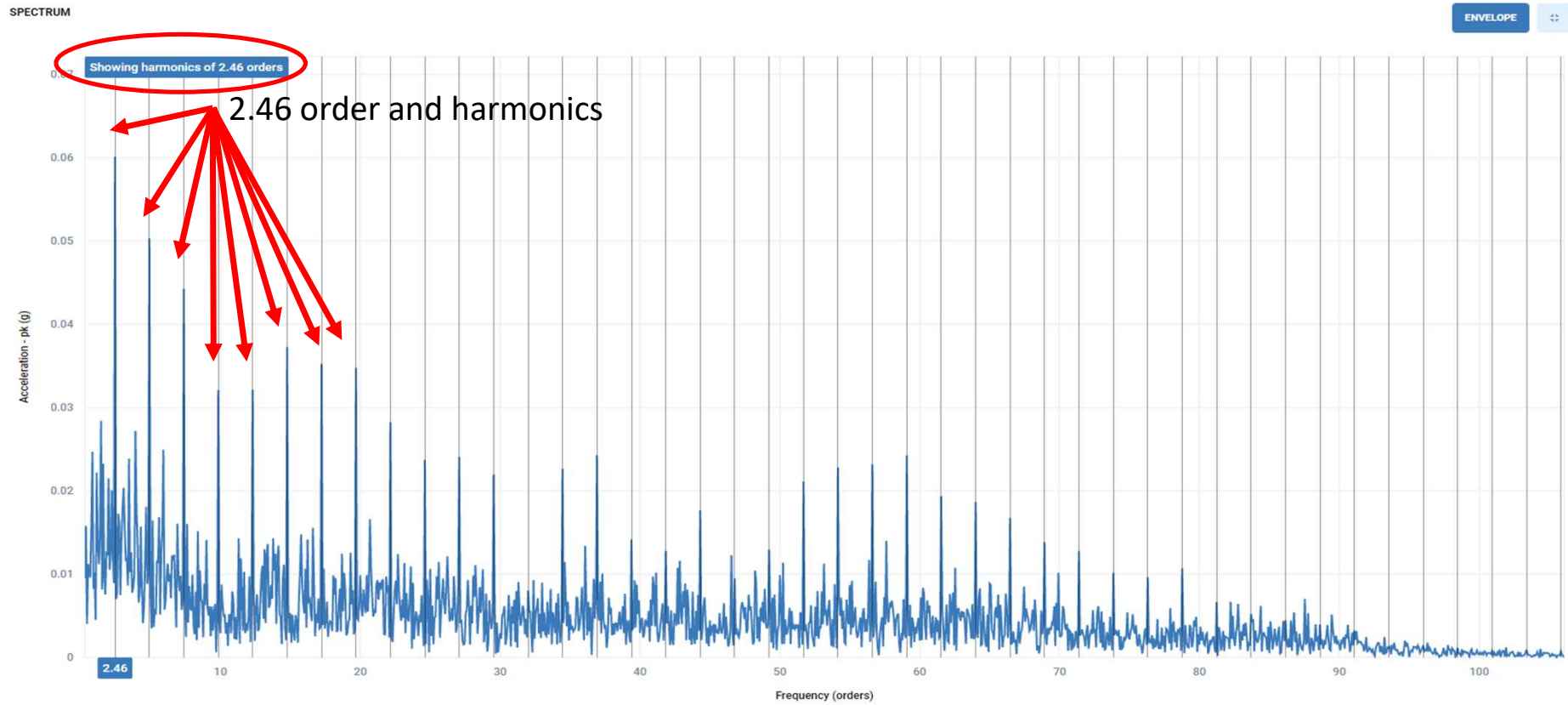
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# Power Band Alarming in Velocity



High Warning Alarm Power Band

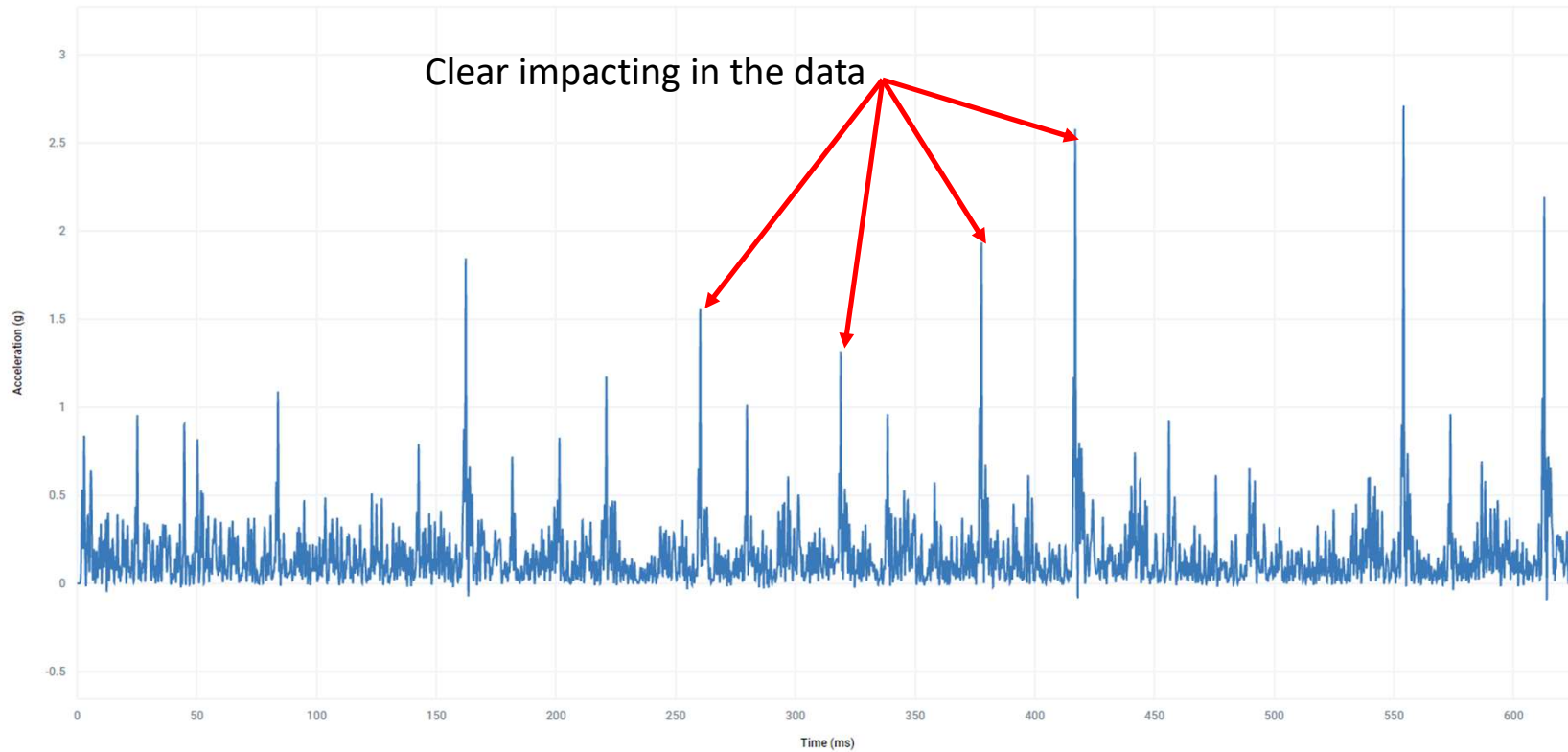
# Envelope spectrum Fan NDE



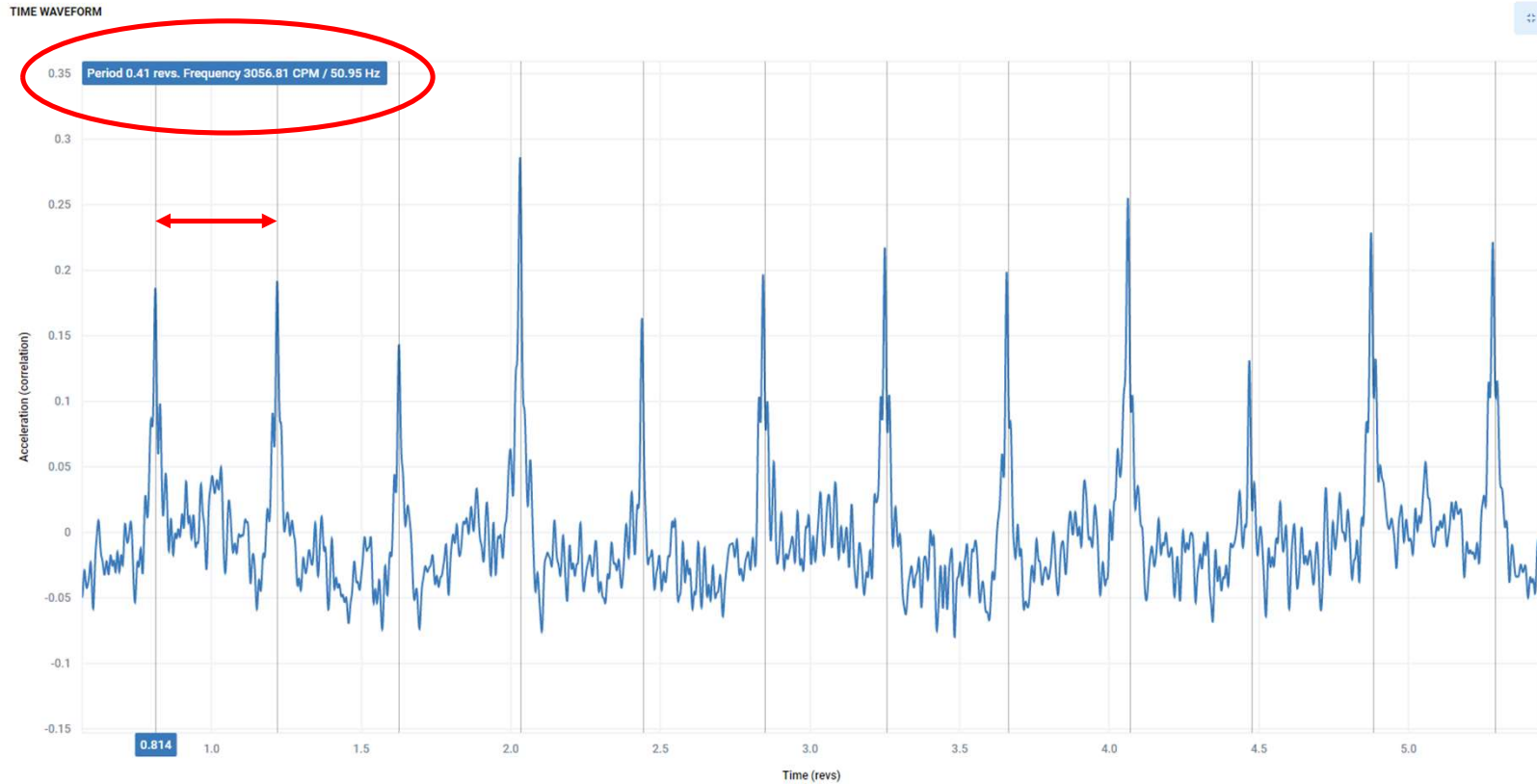
# Envelope Time waveform impacting

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TIME WAVEFORM



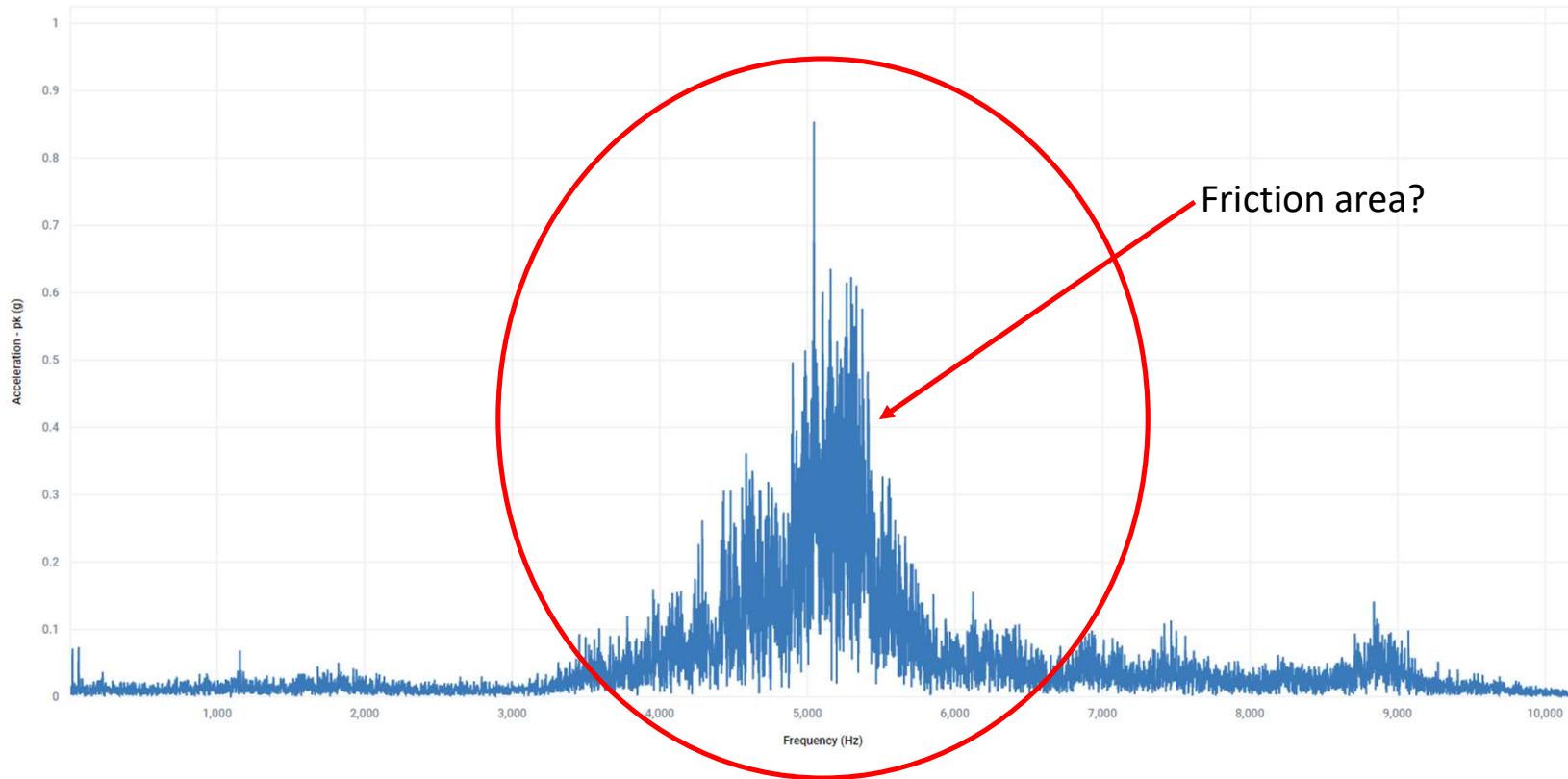
# Envelope Time waveform Autocorrelated 0.41 orders



# 10KHz Acceleration Spectrum

SPECTRUM

ENVELOPE ACC. VEL. DISP. ⇅

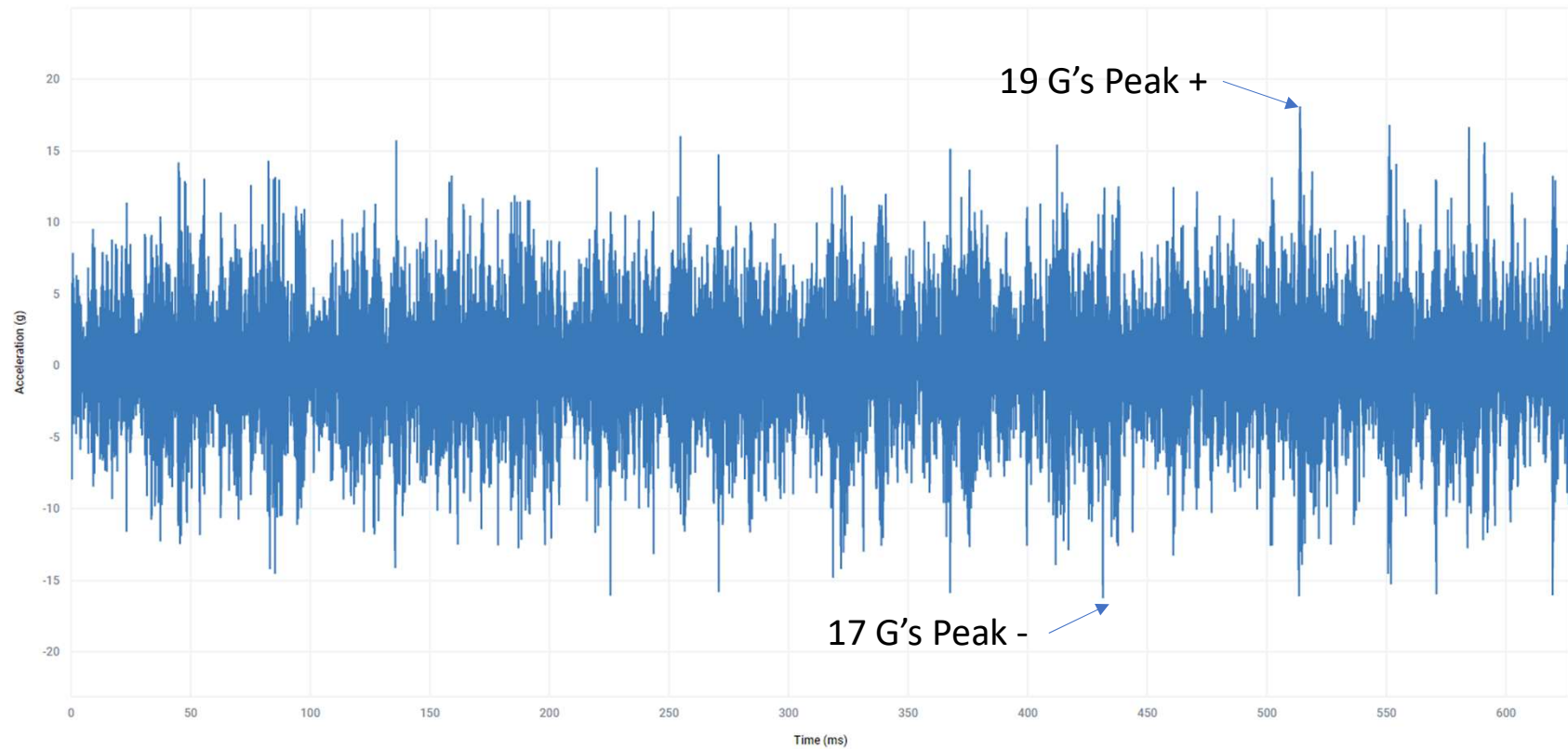


# Acceleration TWF (full spectrum)

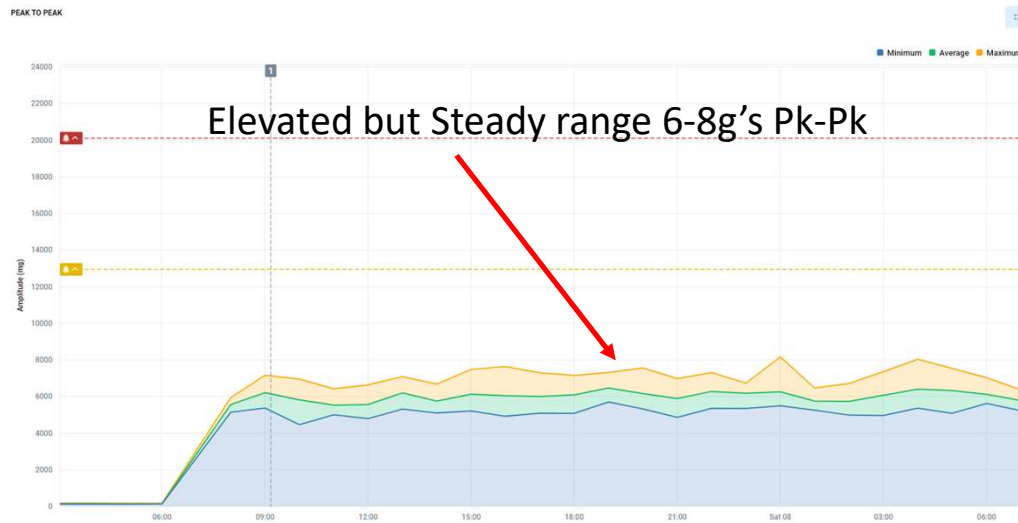


TIME WAVEFORM

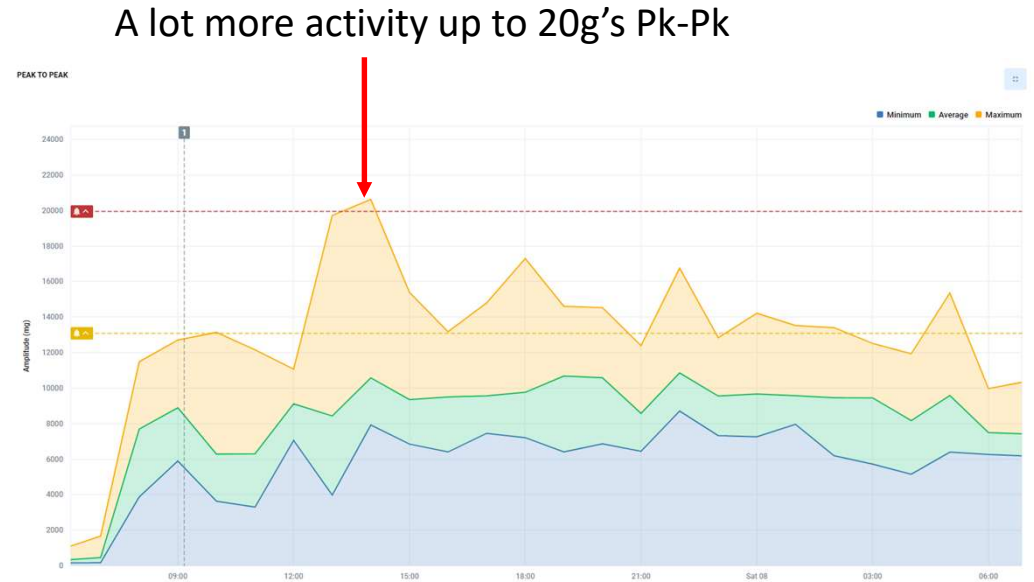
ACC. VEL. DISP. 



# Fan NDE and DE Pk-Pk Acceleration Trends



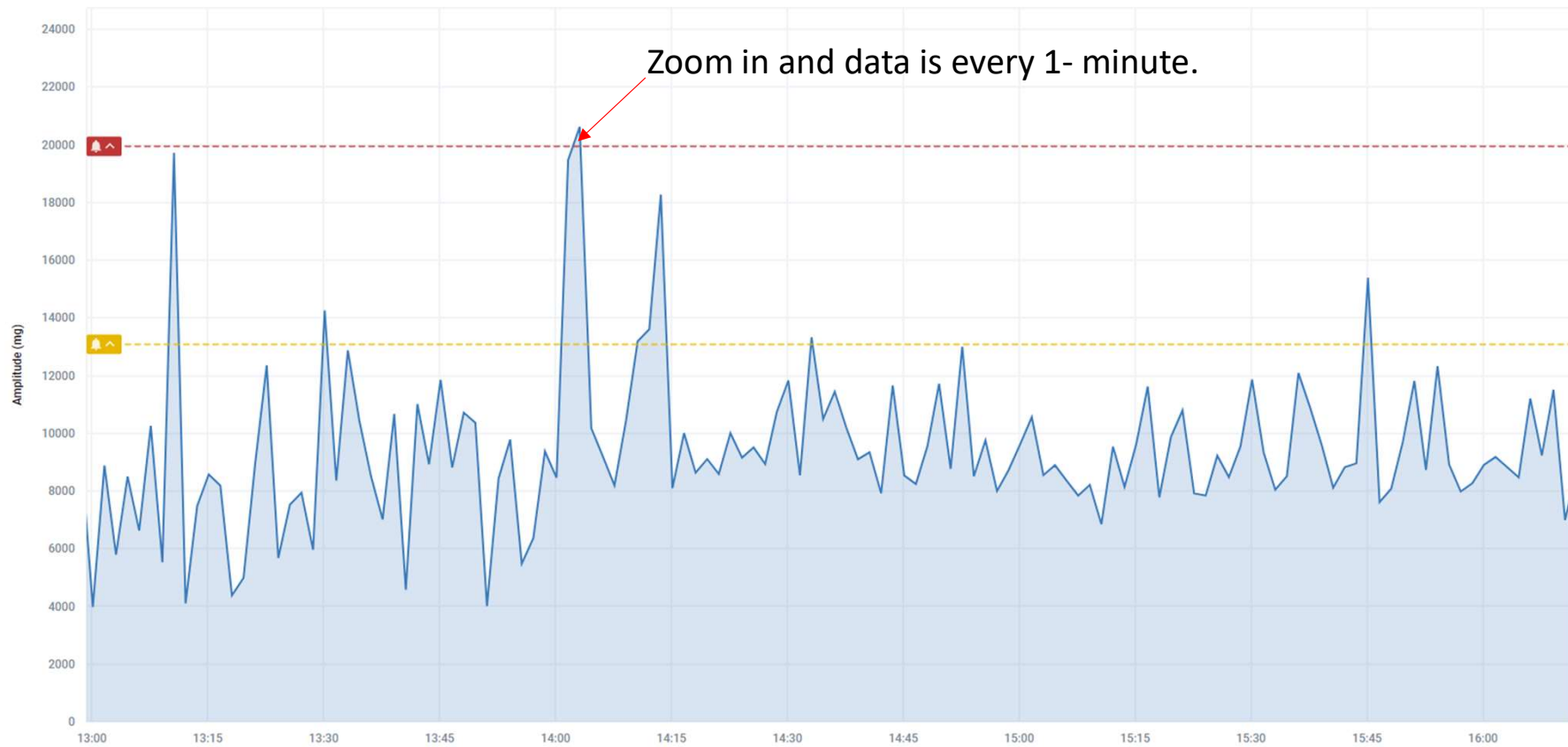
Fan DE Trends 1 Day (1hr interval)



Fan NDE Trends 1 Day (1hr interval)

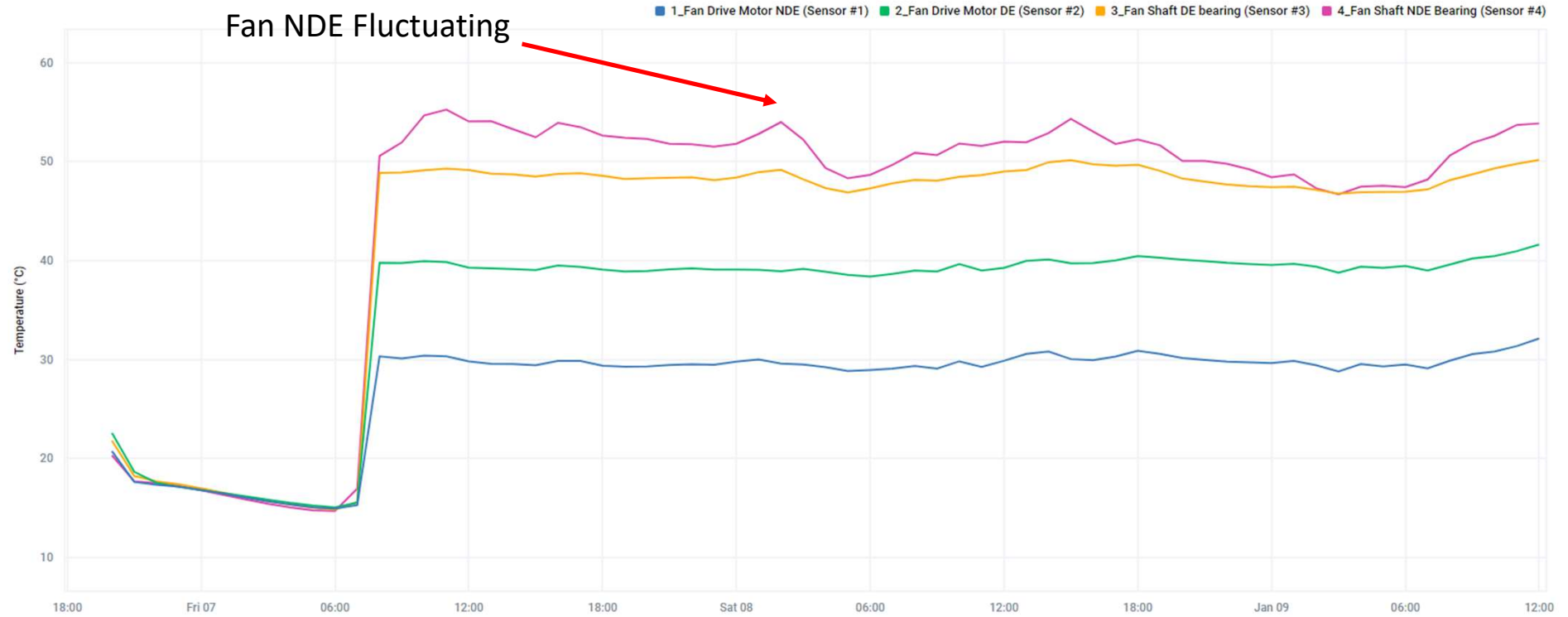
# Fan NDE and DE Pk-Pk Acceleration Trends

PEAK TO PEAK



# Asset Sensor Temperature Trends

SENSOR TEMPERATURES




# Motor NDE Email Alarm Overnight

---

Less than 24hrs after placing the sensor on the bearing.

Warning - vibration power (low res) alarm triggered!

 noreply@sensoteq.com  
To: James Sylvester

 If there are problems with how this message is displayed, click here to view it in a web browser.

[View in Analytix](#)

### Warning - vibration power (low res) alarm triggered!

ALARMS

**Warning** Warning - Axial vibration power (low res) exceeded band thresholds

ID: 2fc5e2bb-3d3c-4417-b8eb-791717f5e354  
Fri Jan 07 2022 22:42:08 GMT+0000

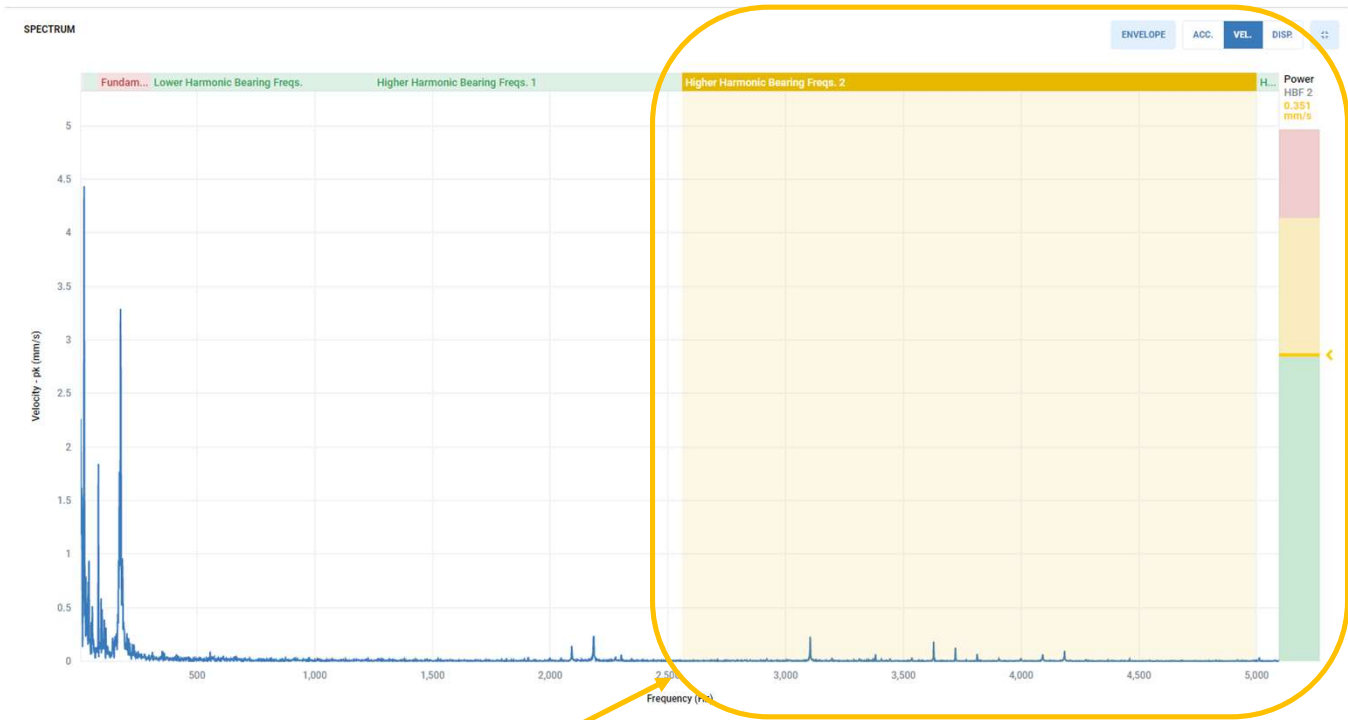
#### Alarm Information

|                                 |  |
|---------------------------------|--|
| Site:                           | [REDACTED]   |
| Machine:                        | BL2 Dryer Fan Zone 1 right hand side               |
| Measuring point:                | 4_Fan Shaft NDE Bearing (Sensor #4)                |
| Vib direction:                  | Axial  |
| Vibration power bands breached: | Bands surpassed: Fundamental Bearing Defect Freqs. |

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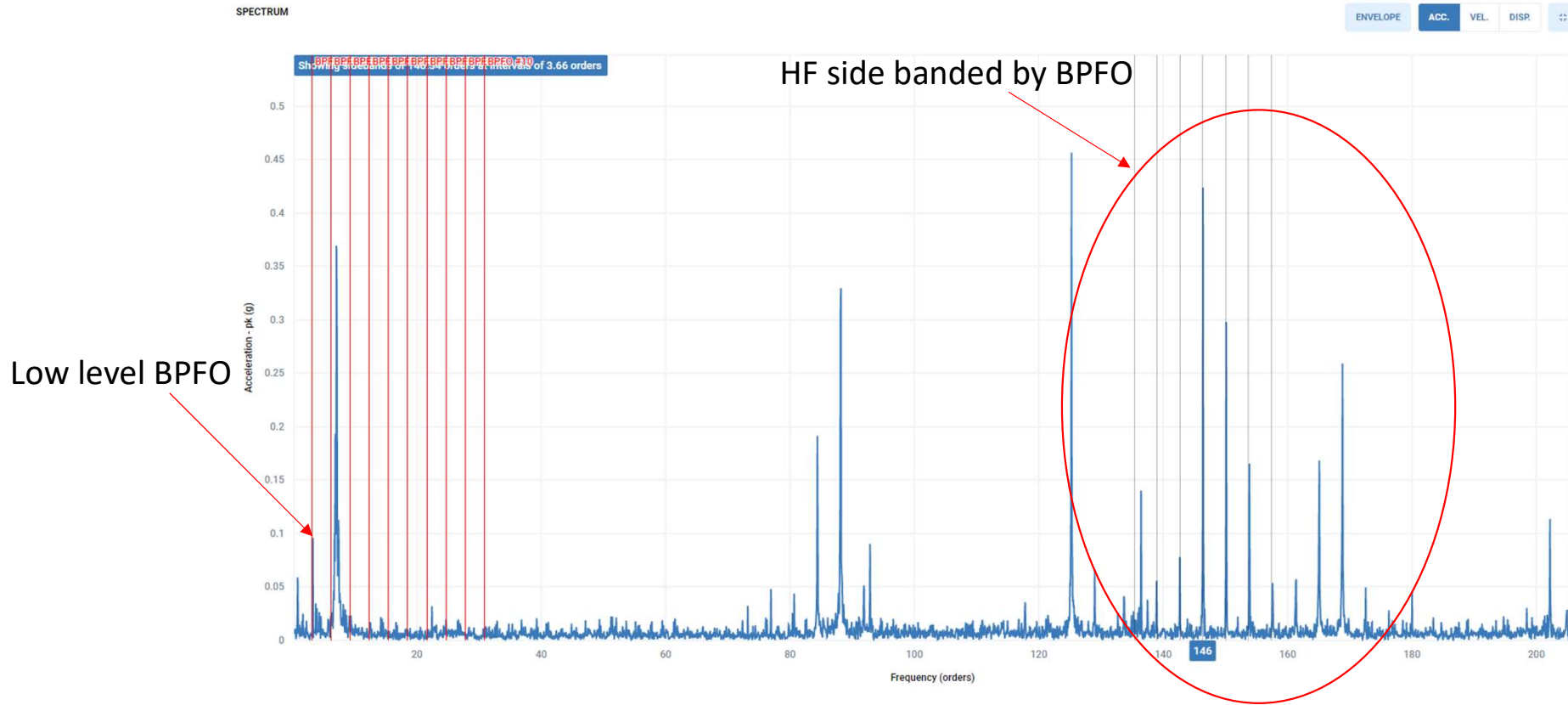
# Power Band Alarming in Velocity

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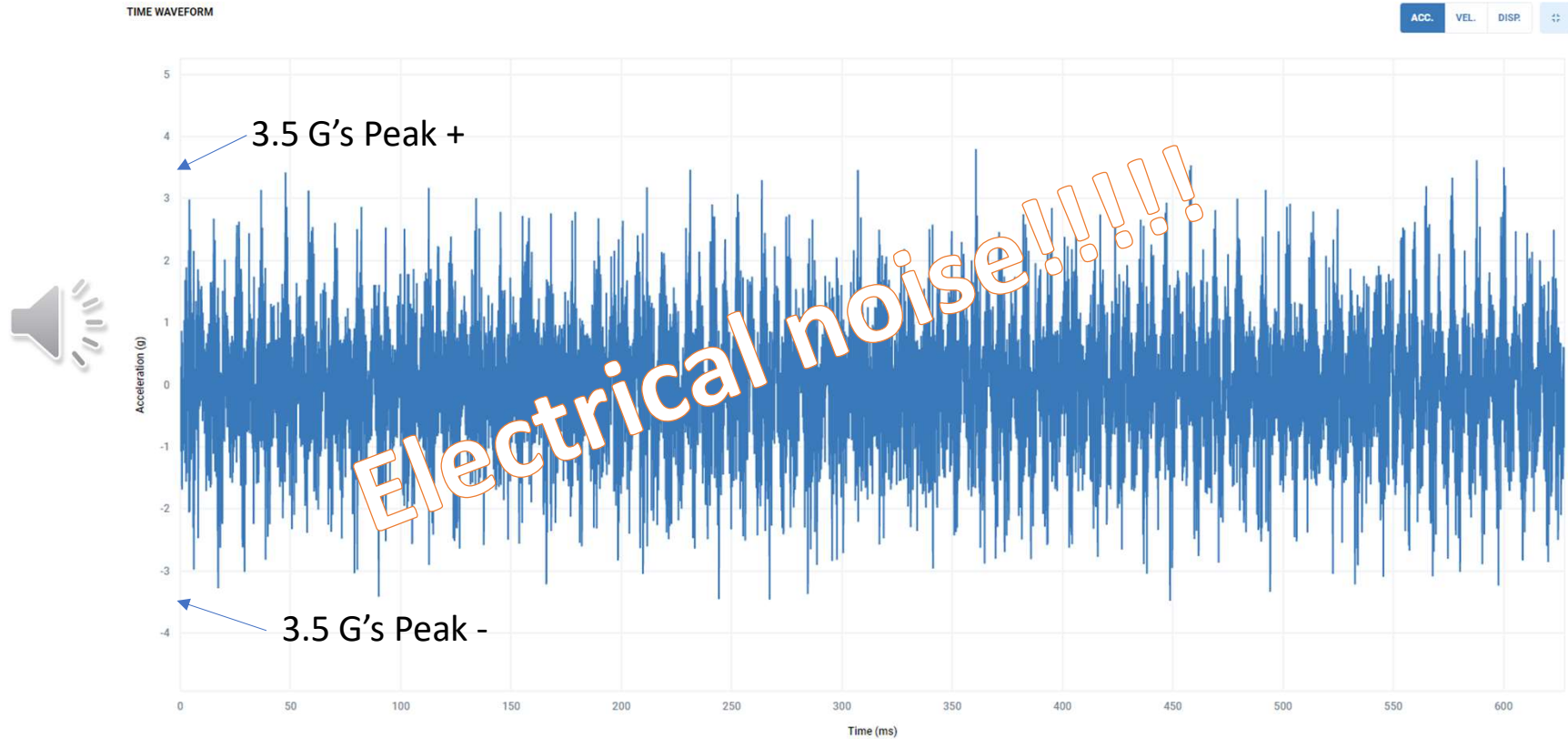
Early Warning Alarm

# Acceleration spectrum – sings of BPFO due to VSD



# Motor NDE Acceleration TWF


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# Day 1 Data Review Summary

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1. The wireless system is resolving the known motor electrical anomaly due to the variable speed drive operation.
2. The wireless system has highlighted a potential reliability issue with the fan NDE bearing.



After two days of  
monitoring  
On the run  
maintenance

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# Temperature Comparisons

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- Temperature manually rerecorded with a thermal gun compared to the sensors.  
Data taken 10:40-10:44
- Motor NDE = **52.9°**
- Motor DE = **63°**
- Fan BRG DE = **61°**
- Fan BRG NDE = **71°**

11th Jan, 10:41 - 1\_Fan Drive Motor NDE (Sensor #1)  
**34.2 °C**

11th Jan, 10:41 - 2\_Fan Drive Motor DE (Sensor #2)  
**44.2 °C**

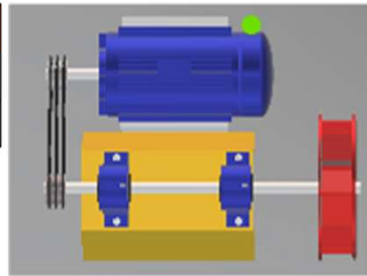
11th Jan, 10:47 - 3\_Fan Shaft DE bearing (Sensor #3)  
**53.1 °C**

11th Jan, 10:42 - 4\_Fan Shaft NDE Bearing (Sensor #4)  
**58.3 °C**

# Maintenance Actions – Controlled Lubricaiton

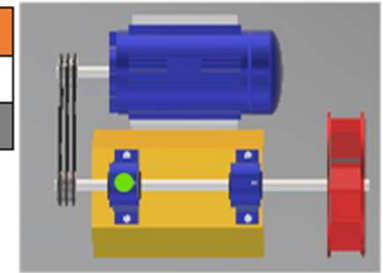
## MOTOR NDE

| Before Grease   | After Grease    |
|-----------------|-----------------|
| 12:00           | 12:03           |
| 46 dB's @ 25kHz | 46 dB's @ 25kHz |



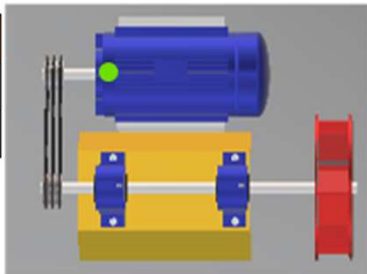
## FAN DE BRG

| Before Grease   | After Grease    |
|-----------------|-----------------|
| 11:35           | 11:38           |
| 58 dB's @ 22kHz | 44 dB's @ 22kHz |



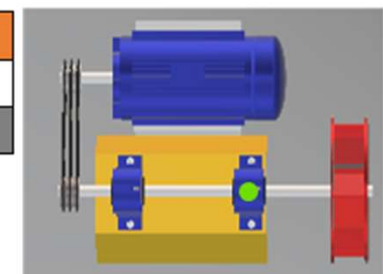
## MOTOR DE

| Before Grease   | After Grease    |
|-----------------|-----------------|
| 12:06           | 12:08           |
| 43 dB's @ 25kHz | 33 dB's @ 25kHz |



## FAN NDE BRG

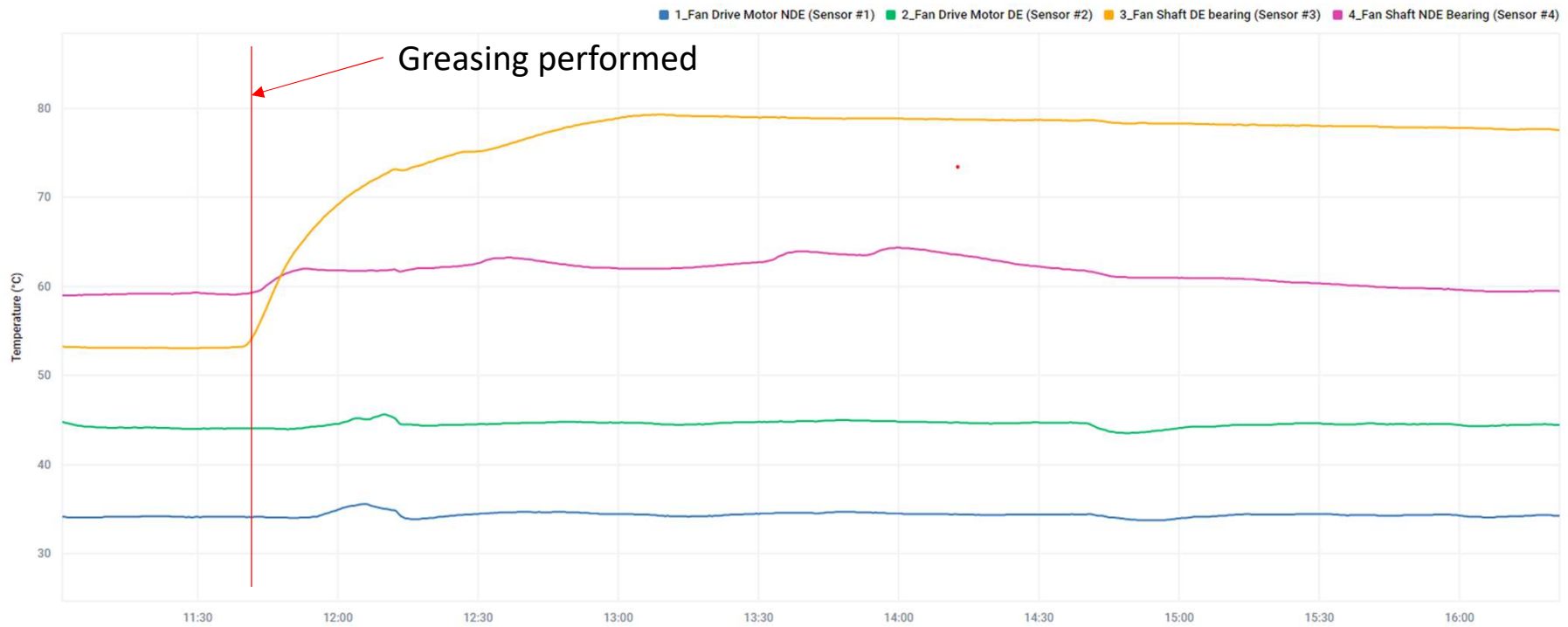
| Before Grease   | After Grease    |
|-----------------|-----------------|
| 11:30           | 11:40           |
| 53 dB's @ 22kHz | 34 dB's @ 22kHz |



Performed by Matt Blacker

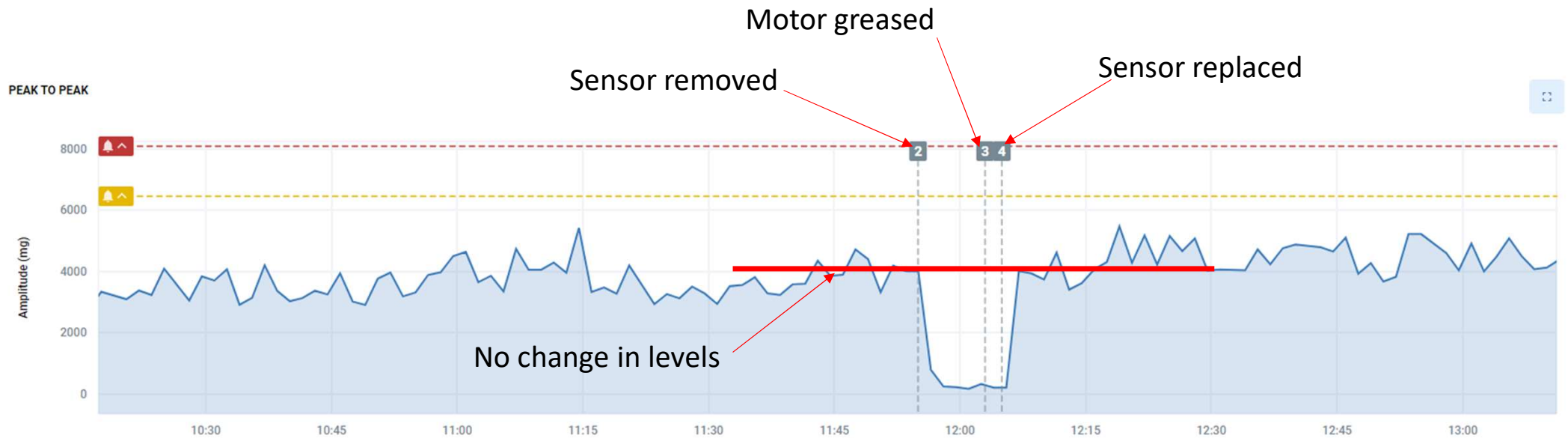
# Sensor Temperature After Greasing

SENSOR TEMPERATURES



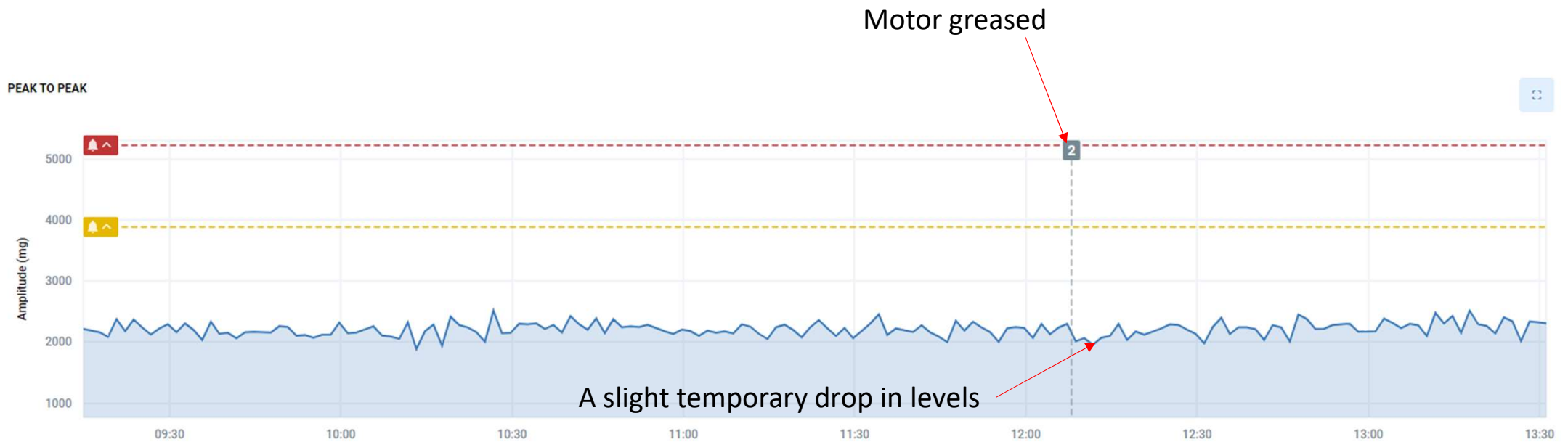
# Motor NDE

No change in the dB on greasing – No change in the VA data



# Motor DE

43dB to 33dB on greasing – Slight temporary change in the VA data



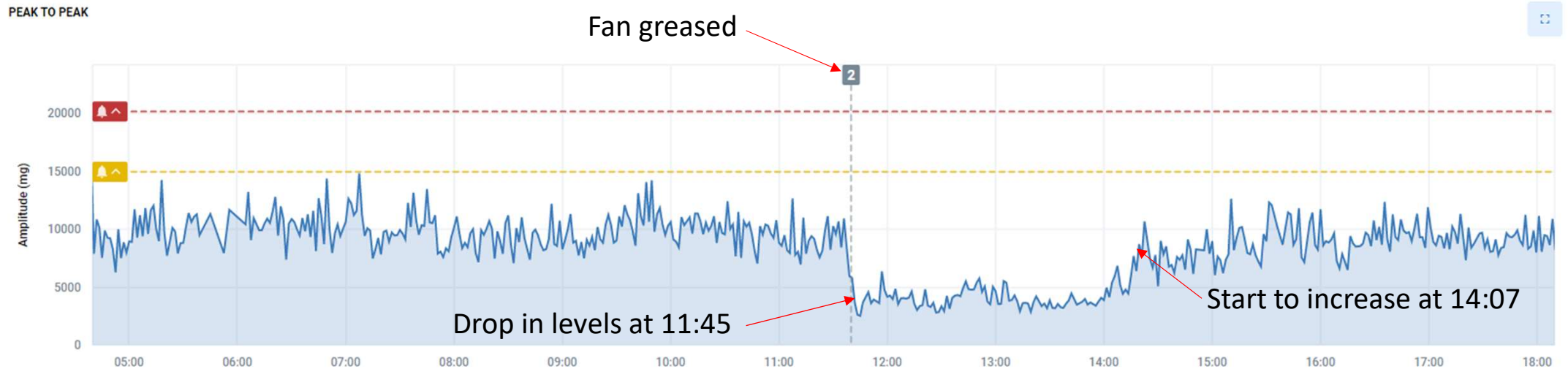
# Fan DE

58dB to 34dB on greasing – Drop in the VA data



# Fan NDE

53dB to 34dB on greasing – Drop in the VA data for just over 2 hours



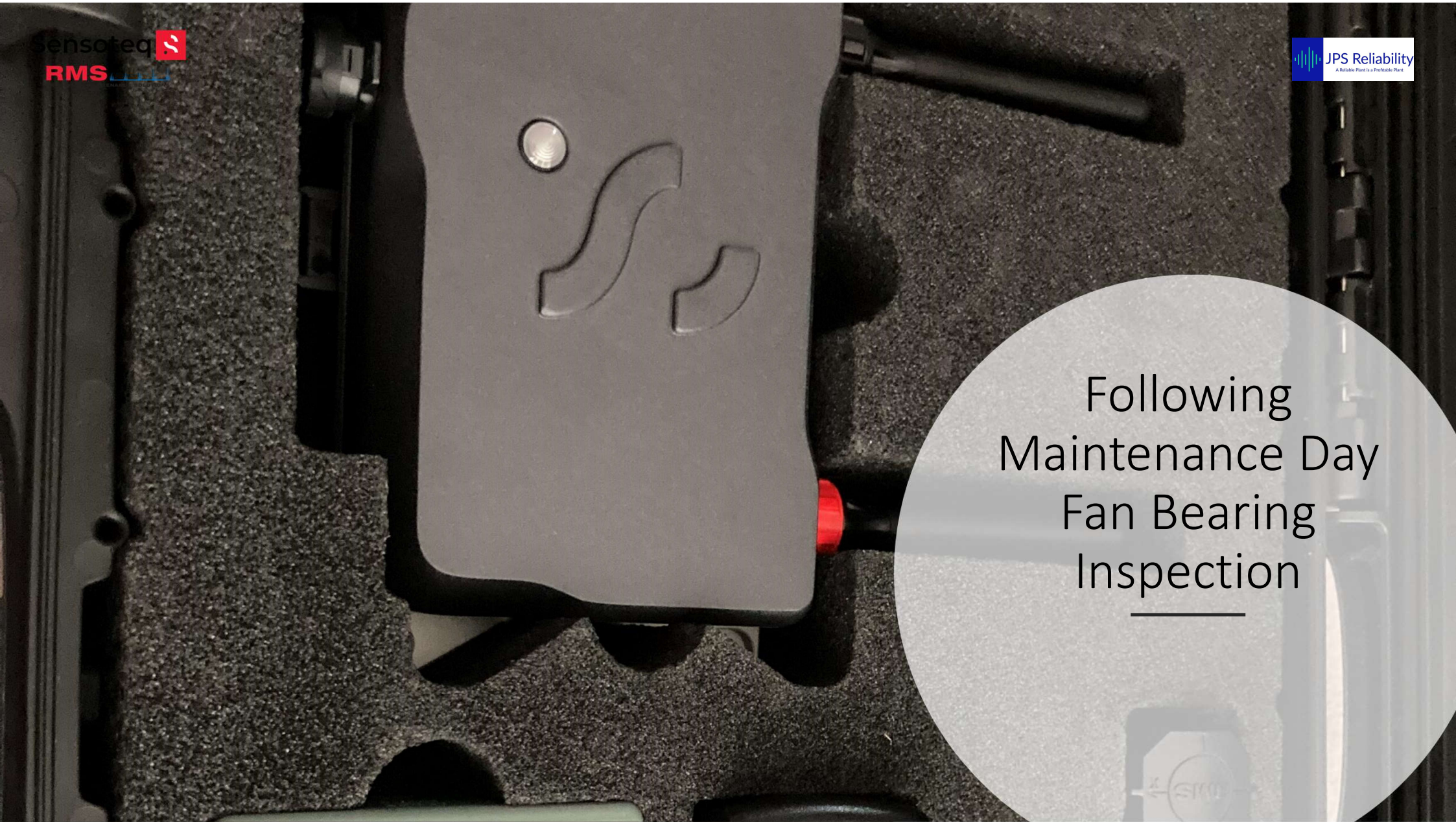
# On The Run Maintenance Data Review Summary

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1. Manual temperature comparisons show that the wireless sensors have the same pattern of temperature levels.
2. The wireless system is very sensitive and can detect temperature and vibration changes on lubrication.
3. Inspection of the Fan bearings required.

Following  
Maintenance Day  
Fan Bearing  
Inspection

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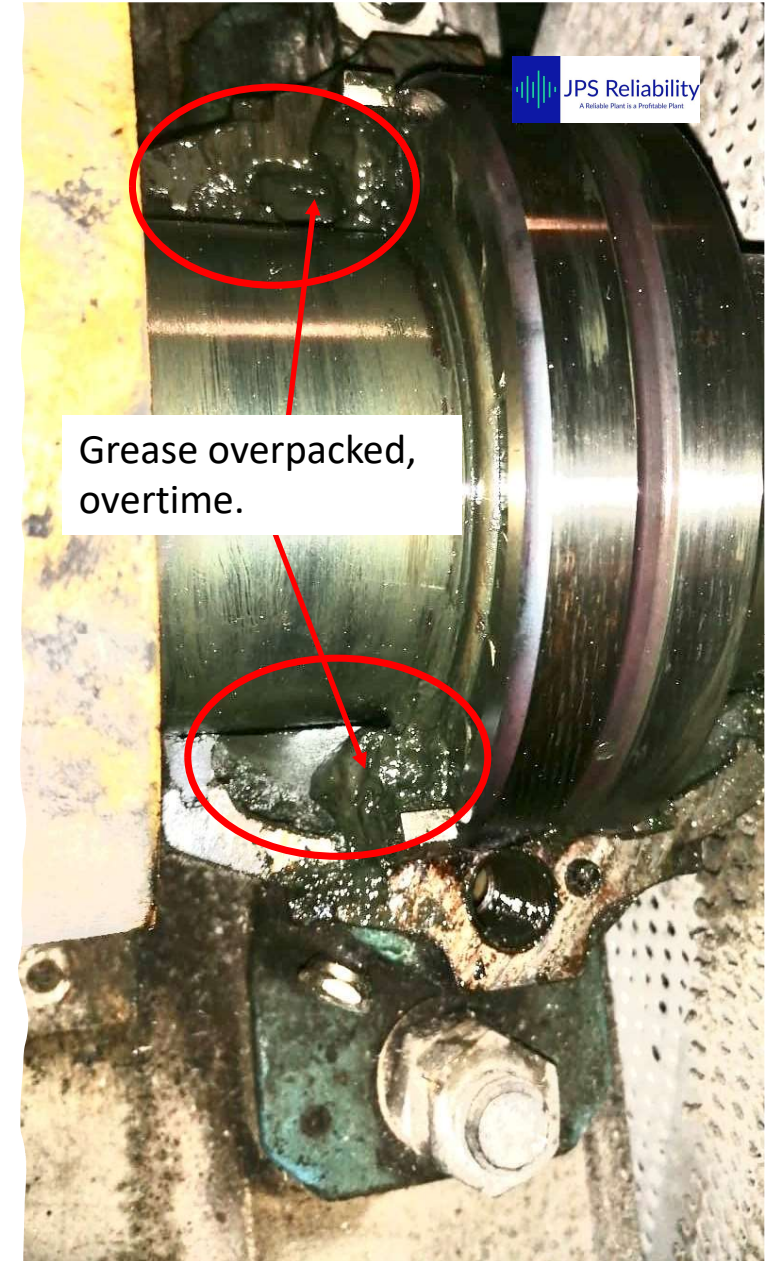


# DE Fan Bearing

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Bearing overpacked with grease.

This bearing the Acceleration levels reduced but the bearing temperature increased and remained high.



# NDE Fan Bearing

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Bearing overpacked with grease.

With grease the levels only reduced temporary.



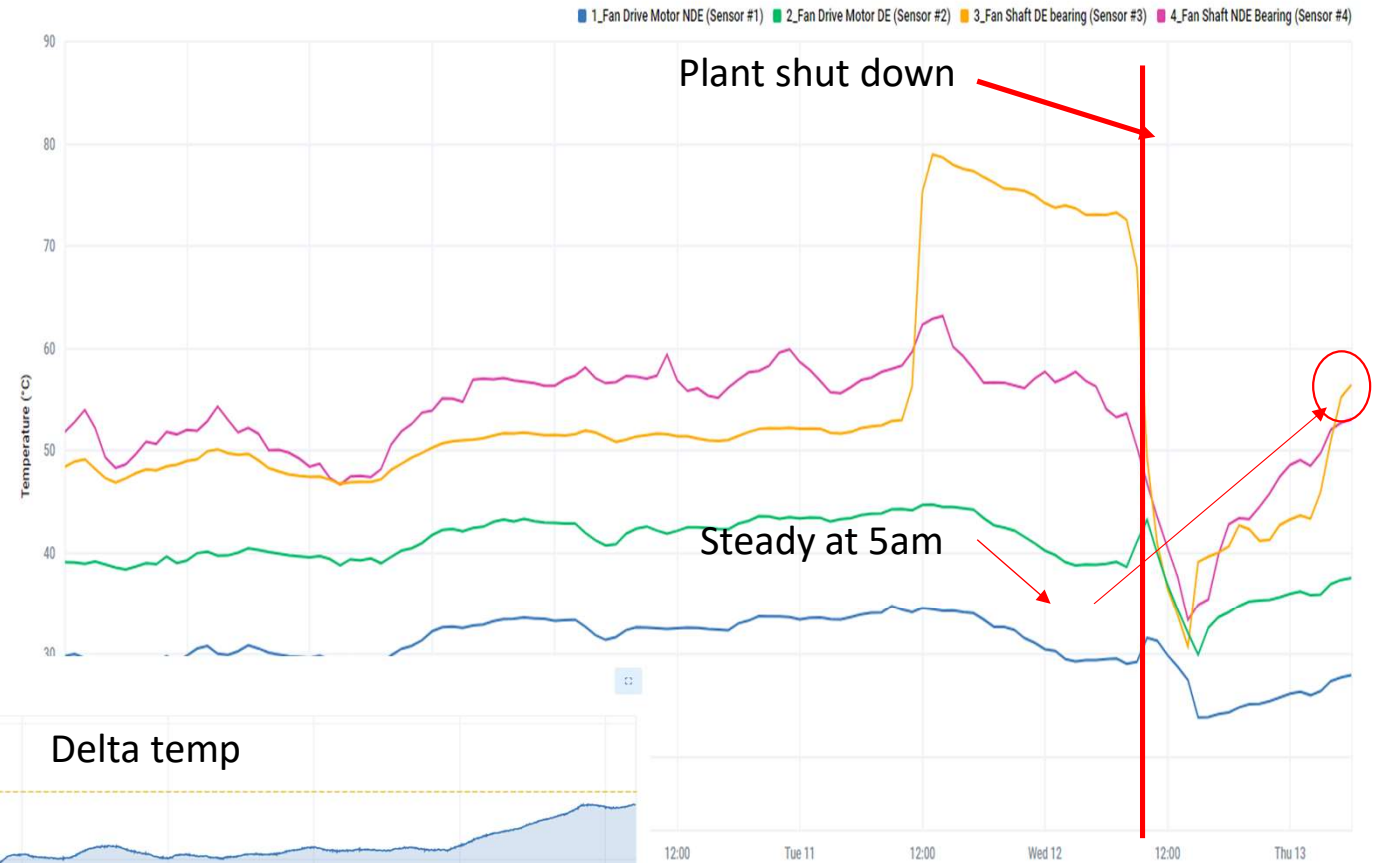
Day after bearing  
full maintenance  
clean and regrease

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# All Sensor Temperature Trends after repack

- 12 hours after start-up
- NDE temperature levels remains lower
- DE did peak and then return steady at 5am

SENSOR TEMPERATURES

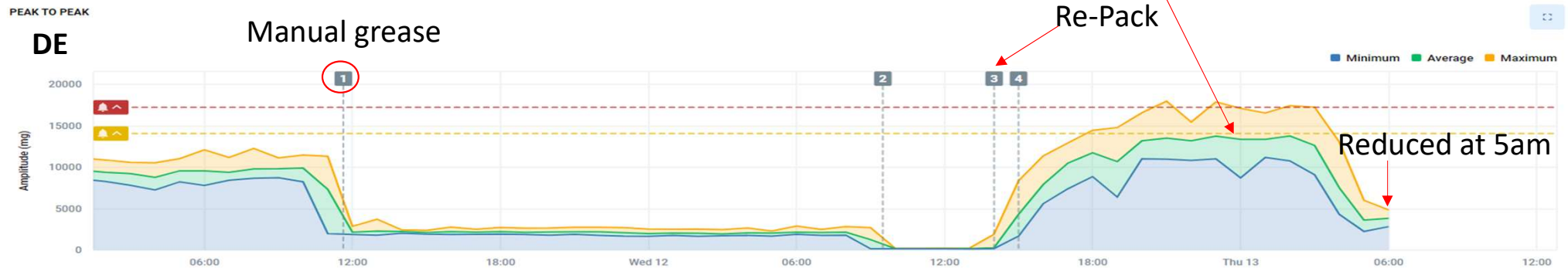
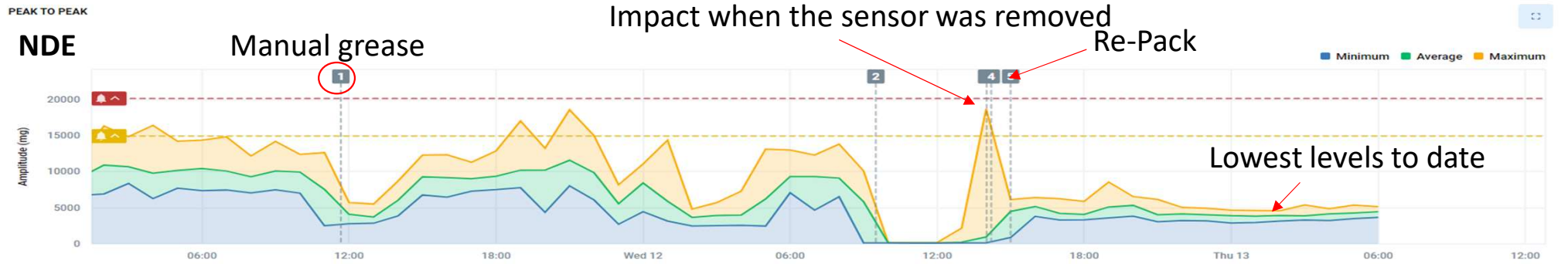


DELTA TEMPERATURE (SENSOR MINUS AMBIENT)



# Fan DE and NDE Comparisons

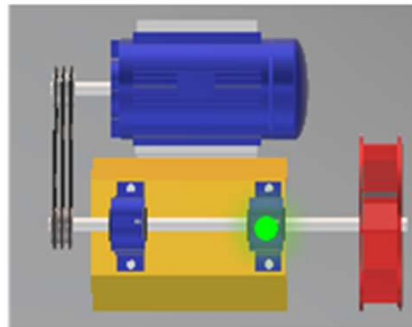
- The Fan NDE has remained at the lowest record levels
- The Fan DE had a peak increase in Acceleration and at 5am started to settled back down



# Next Maintenance actions

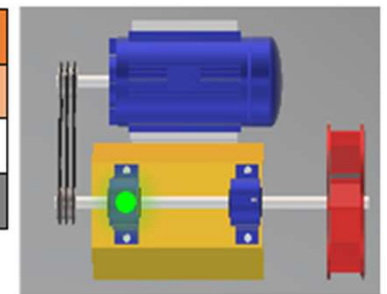
- Using the ultrasound test the fan bearings to confirm if the DE has enough grease after clean out and repack
- The fan DE bearing was greased only

| 12/01/22        | 13/01/22        |
|-----------------|-----------------|
| 11:40           | 13:41           |
| 34 dB's @ 22kHz | 53/57dB @ 22KHz |



Fan NDE

| 12/01/22      | 13/01/22         | 13/01/22       |
|---------------|------------------|----------------|
|               | Before Greasing  | After Greasing |
| 11:38         | 13:42            | 13:48          |
| 44 dB @ 22kHz | 47/49Kdb @ 22KHz | 35dB @ 22KHz   |



Fan DE

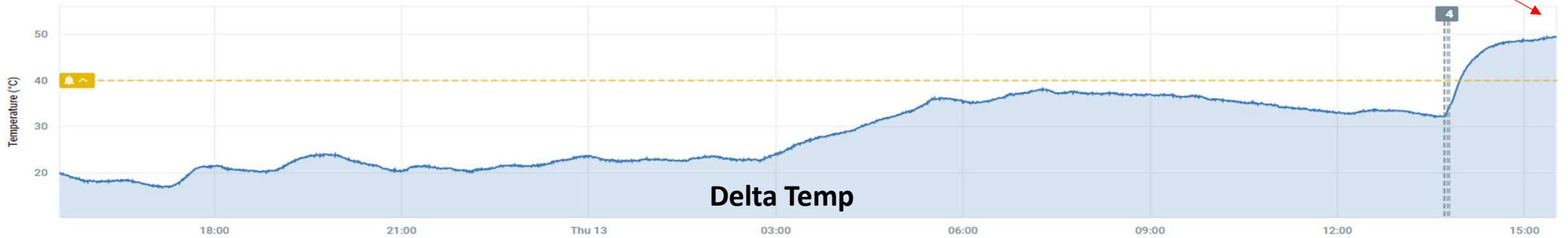
Performed by Matt Blacker

# Fan DE Delta Temp and Vibe

Comparisons after grease

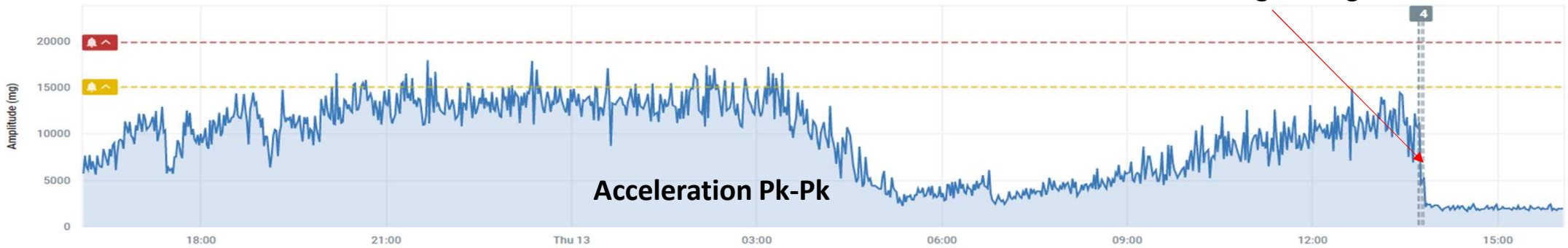
DELTA TEMPERATURE (SENSOR MINUS AMBIENT)

Temp steady increase with greasing



PEAK TO PEAK

Acceleration instant reduction with greasing



# Summary of Maintenance Actions


- The first on the run greasing of the fan bearings had very little affect on the NDE, on the DE it reduced but the bearing temperature increased
- After bearing inspection it was found that both bearings were packed with old grease, this was removed
- After re-pack the NDE was at the lowest recorded levels, the DE however increased but then reduced back dow (probably as the grease was moving/settling in the bearing)
- Further controlled greasing of the DE fan bearing only


17<sup>th</sup> January  
Alarm

# Fan DE warning alarm

First warning alarm 5 days  
since maintenance, day 10  
of trial.

Warning - sensor acceleration RMS alarm triggered!

 noreply@sensoteq.com  
To: James Sylvester-

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[View in Analytix](#)

**17/01/22**

## Warning - sensor acceleration RMS alarm triggered!

ALARMS

**Warning**    **Warning - Horizontal sensor acceleration RMS greater than 1524**

ID: af1752f6-d184-4fb5-b1e9-aa65d4b4bf44  
Tue Jan 18 2022 01:55:05 GMT+0000

### Alarm Information

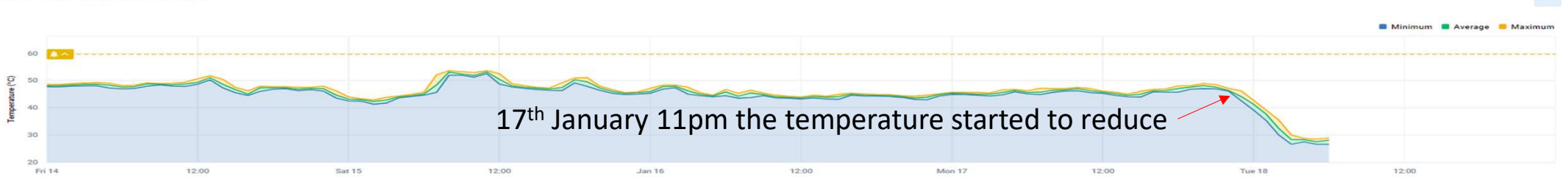
|                                   |                                      |
|-----------------------------------|--------------------------------------|
| Site:                             | Etex Portbury                        |
| Machine:                          | BL2 Dryer Fan Zone 1 right hand side |
| Measuring point:                  | 3_Fan Shaft DE bearing (Sensor #3)   |
| Vib direction:                    | Horizontal                           |
| Sensor acceleration RMS received: | 1648                                 |

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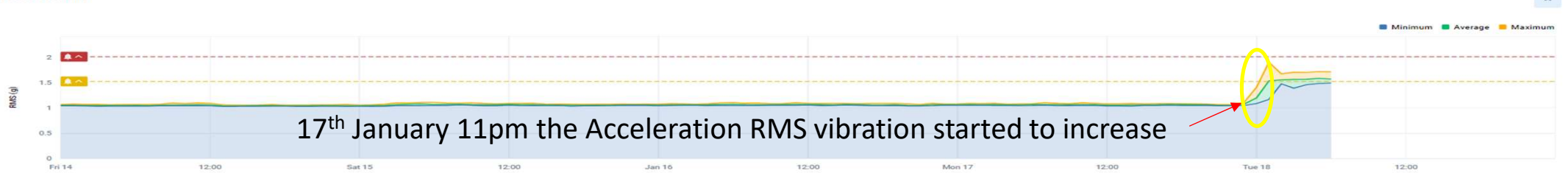
# Fan DE delta Temp and Acceleration



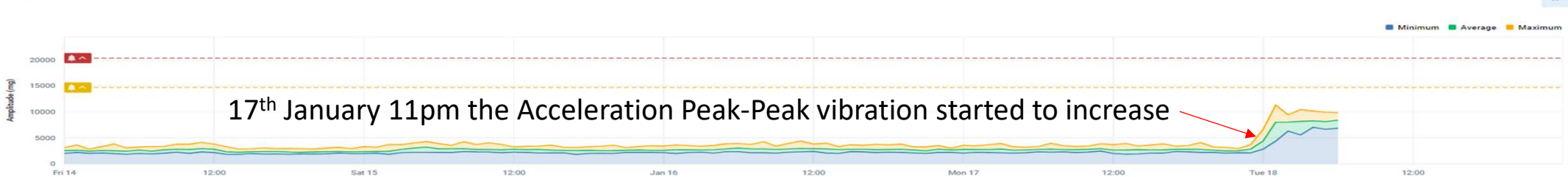
DELTA TEMPERATURE (SENSOR MINUS AMBIENT)



ACCELERATION RMS



PEAK TO PEAK



# Fan DE Before and after Temp/Vibe Change



## 3\_Fan Shaft DE bearing (Sensor #3) No alarm issues

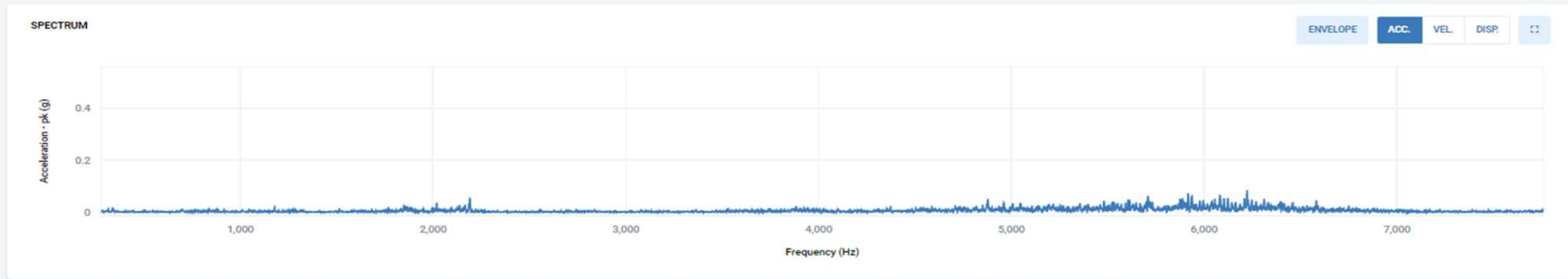
Application - DE / IB

< > EDIT

LATEST CUSTOM DATE January 17th 2022 TIME 07:05:22 FULL SPECTRUM HIGH RES. HORIZ. VERT. AXIAL

| INFORMATION  |                          |                        |
|--------------|--------------------------|------------------------|
| TIME         | 07:05:22 on 17th January |                        |
| OA VEL.      | 4.08 mm/s                | 0.161 in/s             |
| OA ACC.      | 0.805 g                  | 311 in/s <sup>2</sup>  |
| PK-PK ACC.   | 9.16 g                   | 3536 in/s <sup>2</sup> |
| CREST FACTOR | 5.05 (ratio)             |                        |
| SAVED RPM    | 1256                     |                        |

ANALYSIS OPTIONS  
 These settings are not saved



## 3\_Fan Shaft DE bearing (Sensor #3) No alarm issues

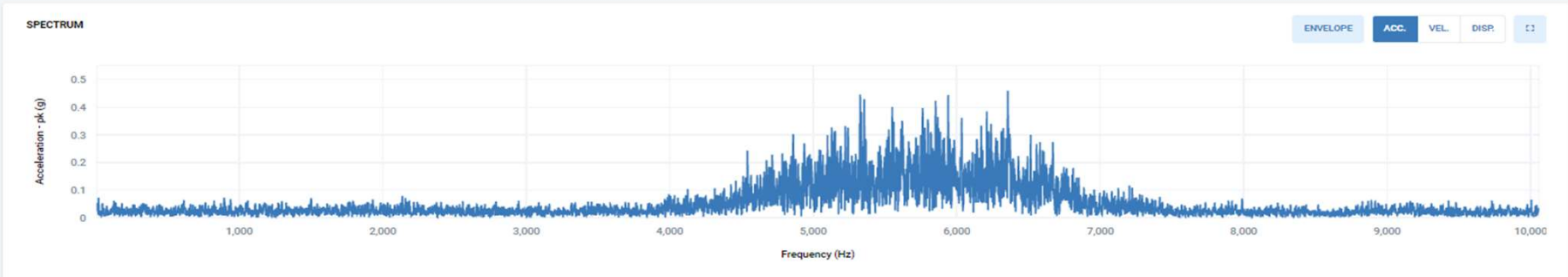
Application - DE / IB

< > EDIT

LATEST CUSTOM DATE January 18th 2022 TIME 12:58:23 FULL SPECTRUM HIGH RES. HORIZ. VERT. AXIAL

| INFORMATION  |                          |                         |
|--------------|--------------------------|-------------------------|
| TIME         | 12:58:23 on 18th January |                         |
| OA VEL.      | 16.6 mm/s                | 0.654 in/s              |
| OA ACC.      | 6.41 g                   | 2476 in/s <sup>2</sup>  |
| PK-PK ACC.   | 58.5 g                   | 22578 in/s <sup>2</sup> |
| CREST FACTOR | 3.97 (ratio)             |                         |
| SAVED RPM    | 1256                     |                         |

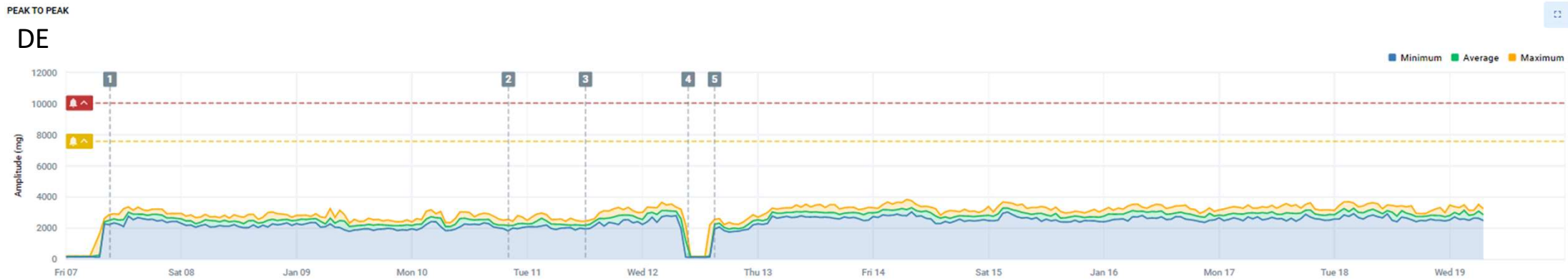
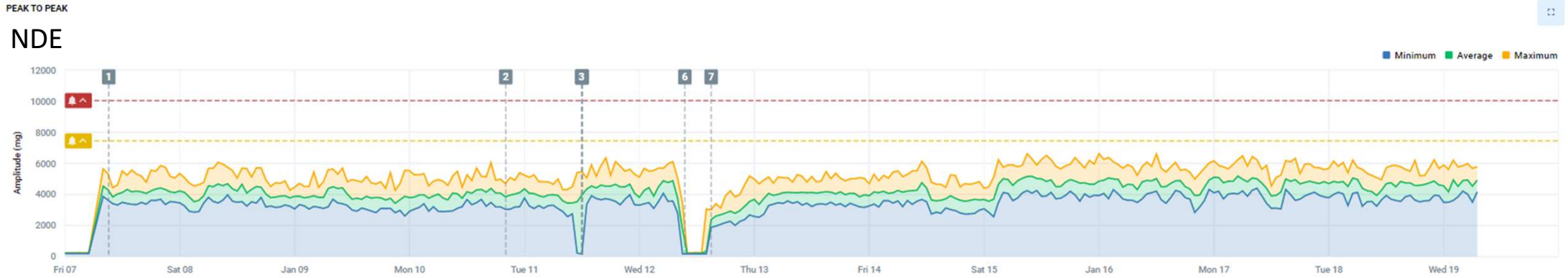
ANALYSIS OPTIONS  
 These settings are not saved



# Data Summary

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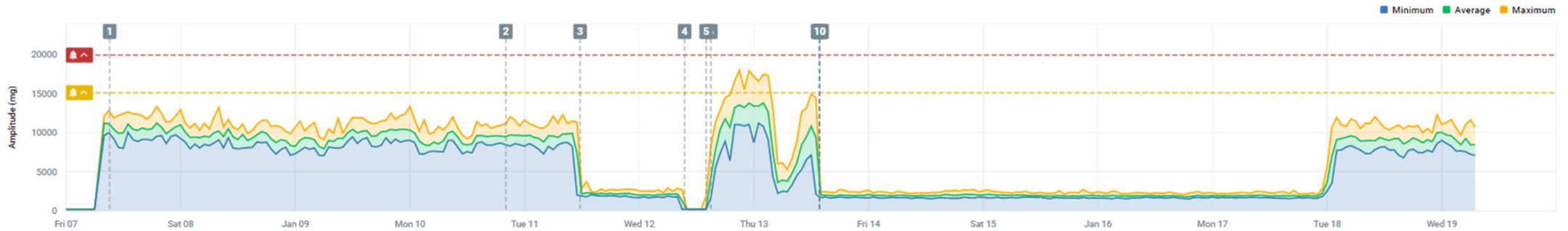
# Motor NDE and DE Pk-Pk Acceleration Long Time Trends



# Fan DE and NDE Pk-Pk Acceleration Long Time Trends

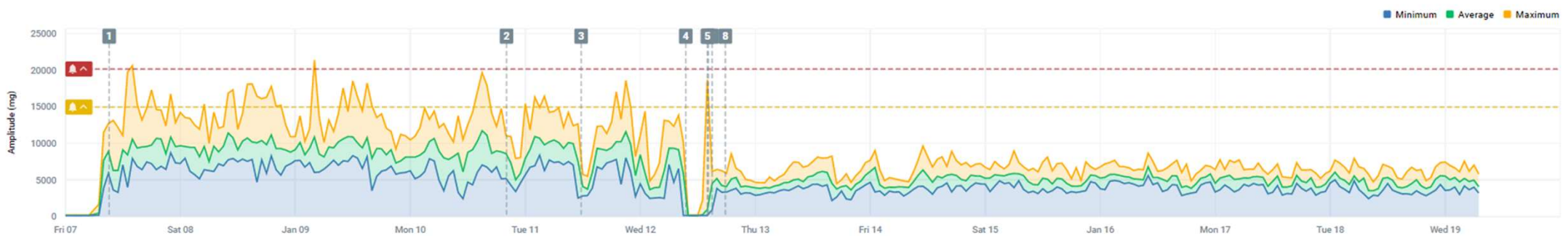
PEAK TO PEAK

DE

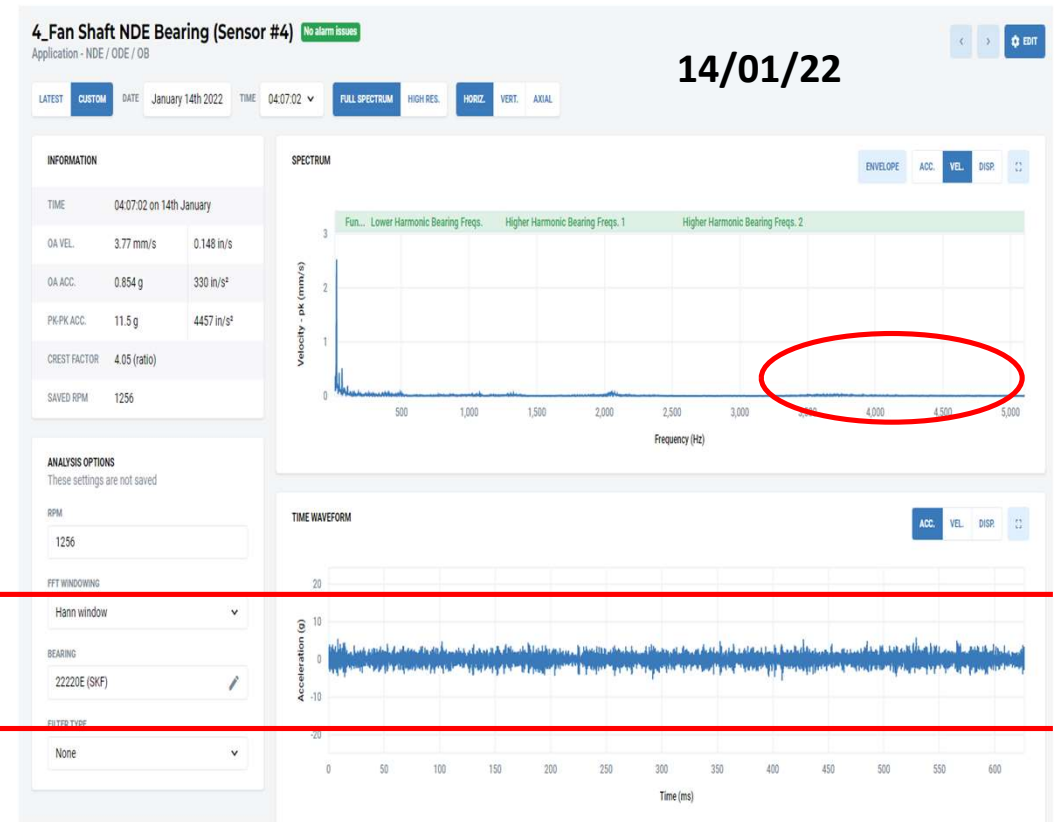
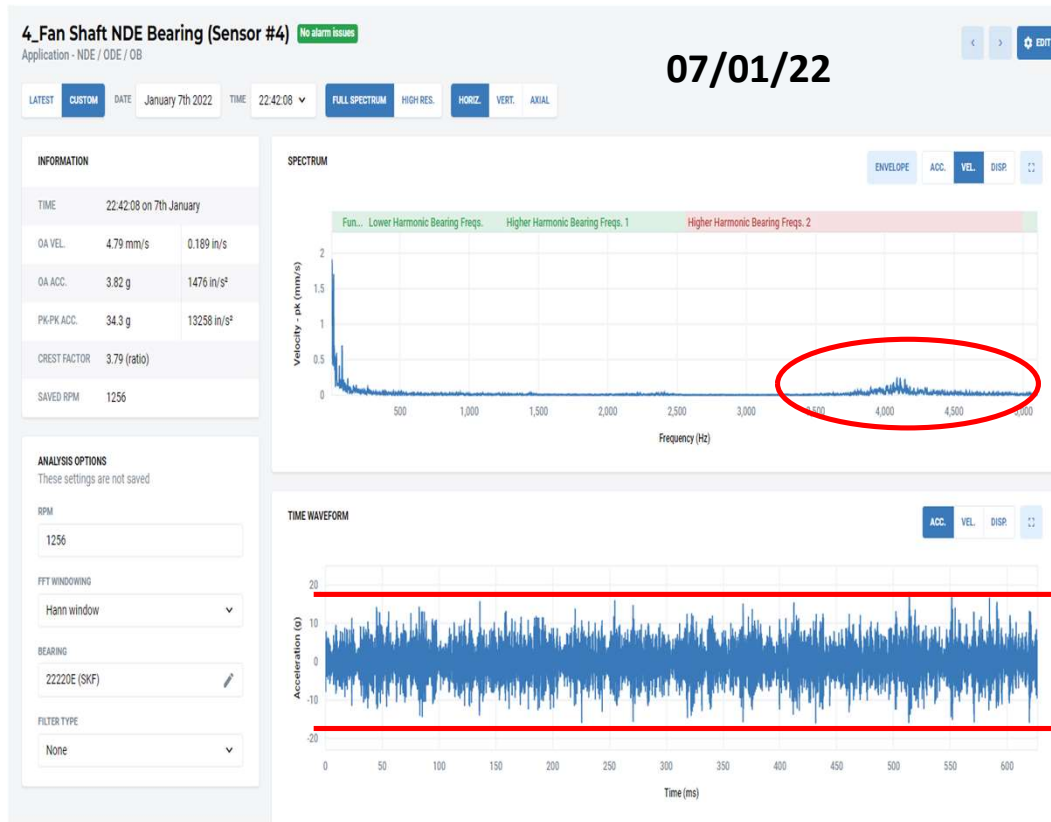


PEAK TO PEAK

NDE



# Fan NDE bearing of Concern



# Summary of Asset Health

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Motor: There is early outer race activity to the motor bearings, most probable due to the VFD. Action: keep to grease schedule and monitor to get the most out of the motor.

Fan: The Fan NDE bearing shows signs of general bearing wear. Corrective actions has helped to reduce the bearing stress levels.

Fan: The Fan DE bearing shows a correlation to bearing temperature and bearing health though the Acceleration levels.

Grease: We have shown how critical the right amount of grease at the correct time is so important.

Further: Given that all the six circulation fans are likely the same age it would be prudent to monitor, and risk assess the six fans for bearing health.



Other Software  
options

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# Alarm Score

Asset health overall metrics – Score out of 100 based on type, site, machine or measurement point.

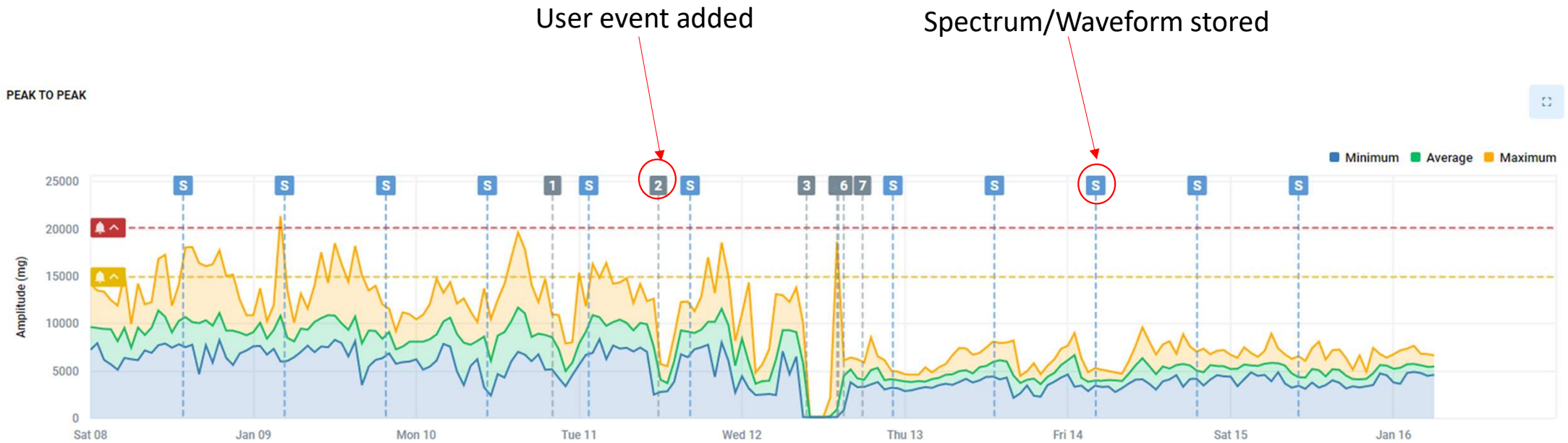
ALARM SCORE

1W 1M 



# Overall Timelines

Three critical parameters, Velocity RMS, Acceleration RMS and Acceleration Pk-Pk



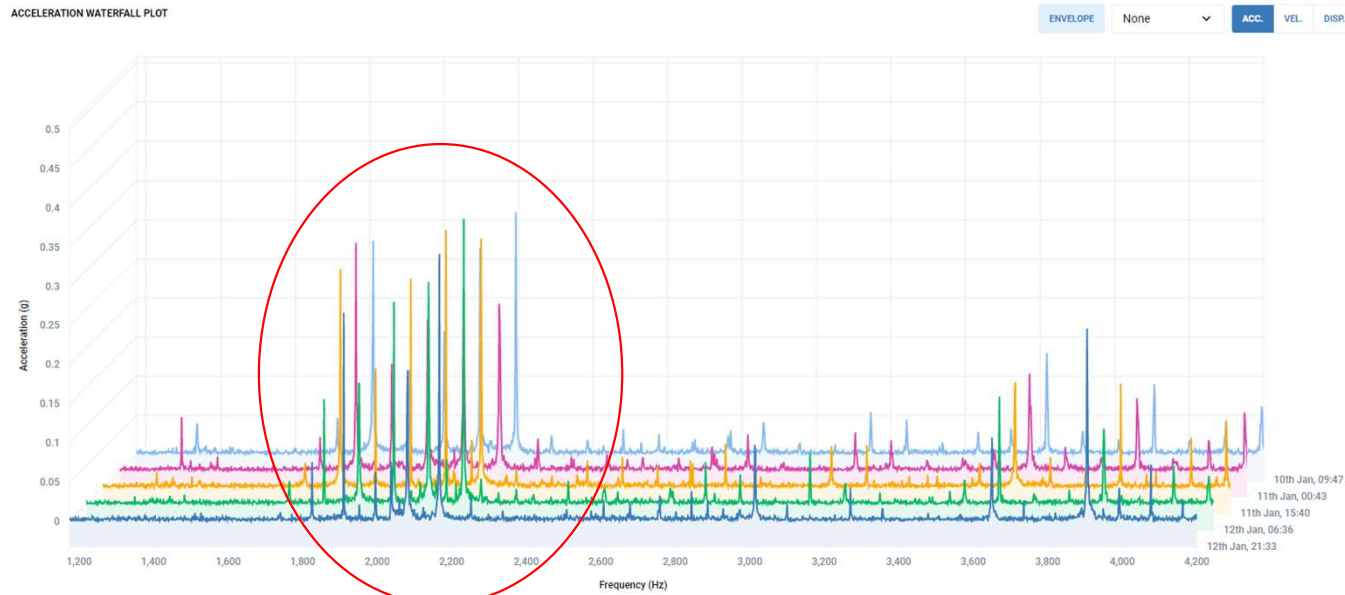
# Overall Timelines

## Sensor Temperature Long Time Trends



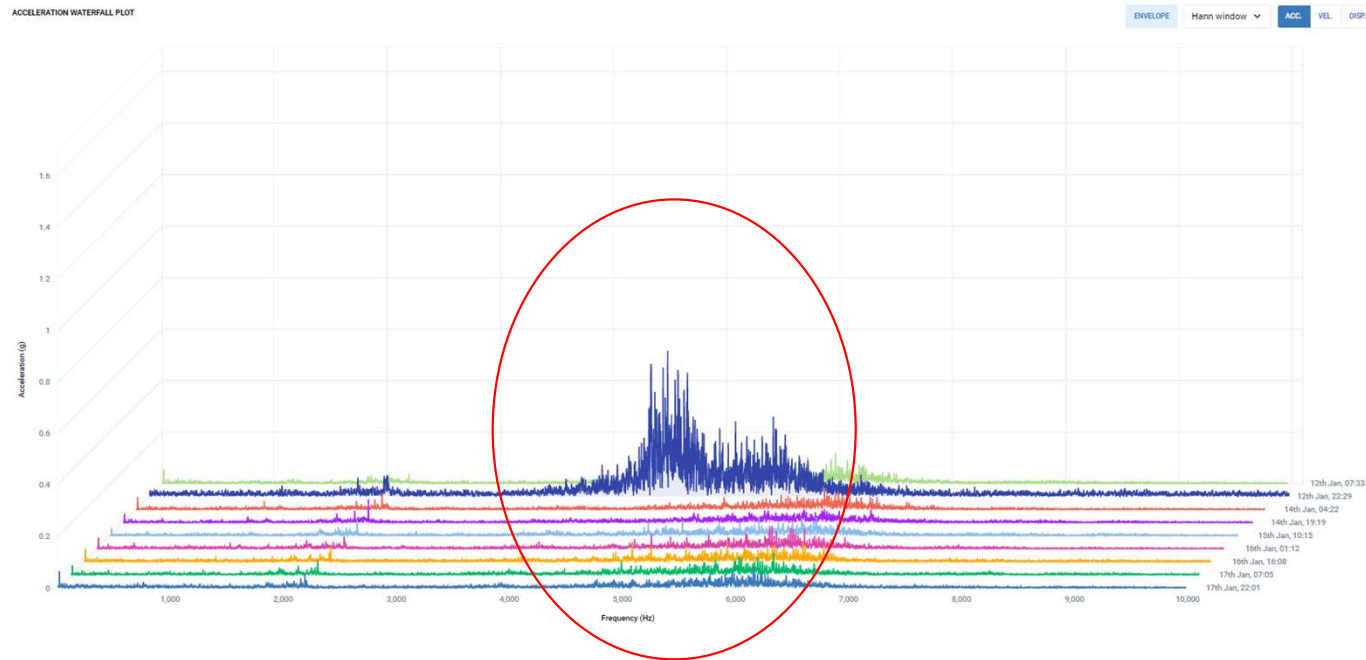
# Waterfall

Here we can have a waterfall highlighting the electrical activity on the motor due to the VFD.



# Waterfall

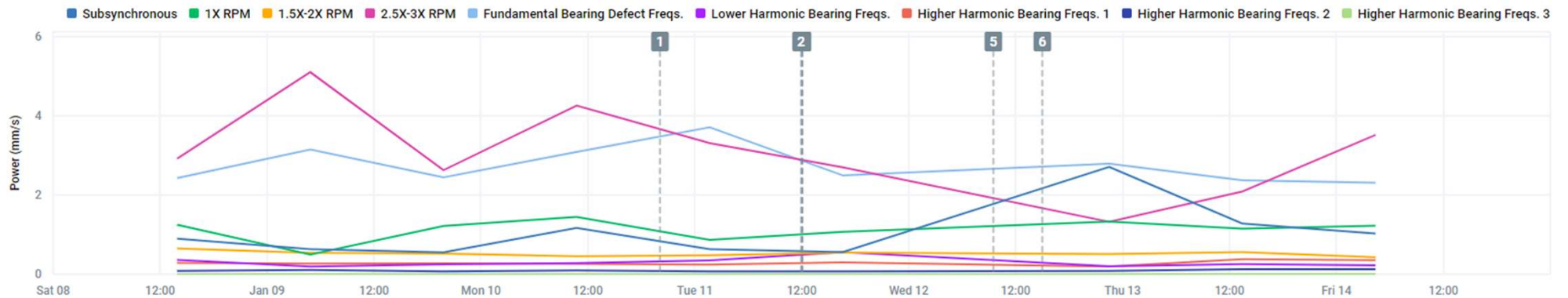
Here we can have a waterfall highlighting the high friction then reduction after greasing



# Powerband Trends

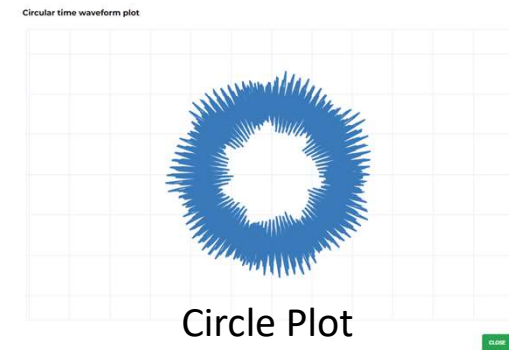
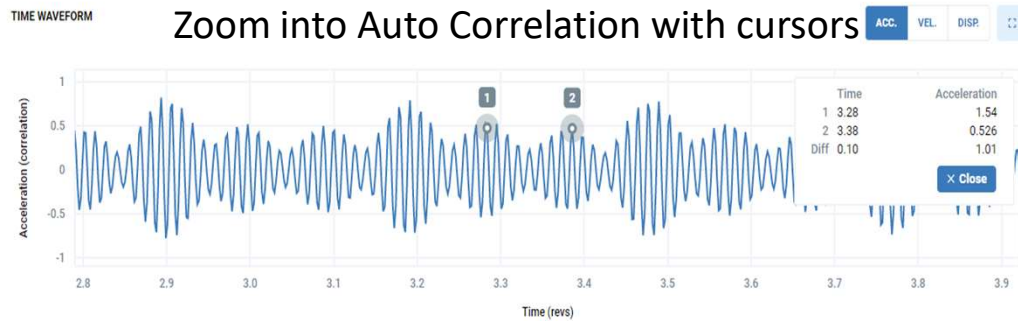
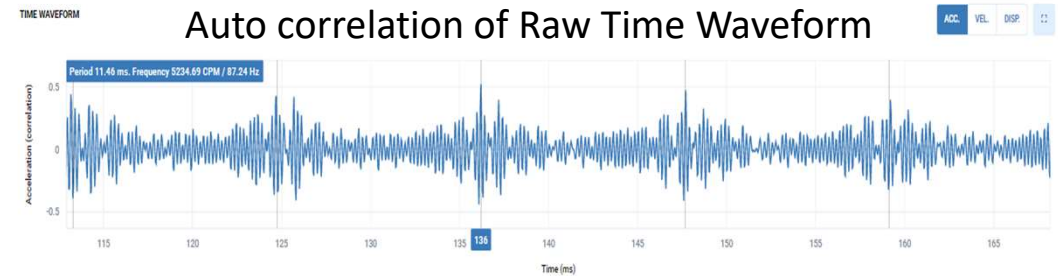
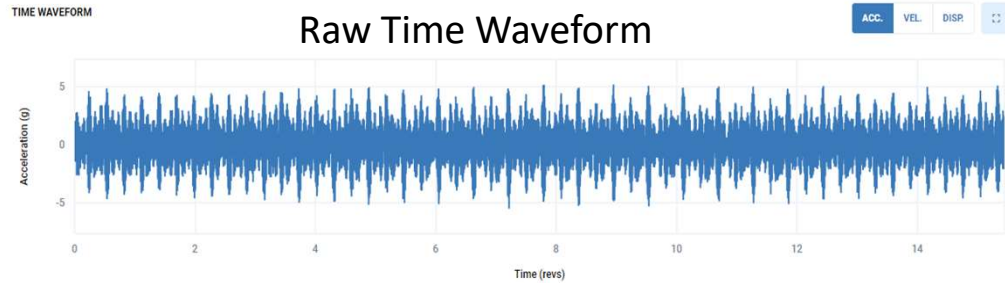
For each Spectrum Saved where there will be a powerband trend over time

POWER BANDS



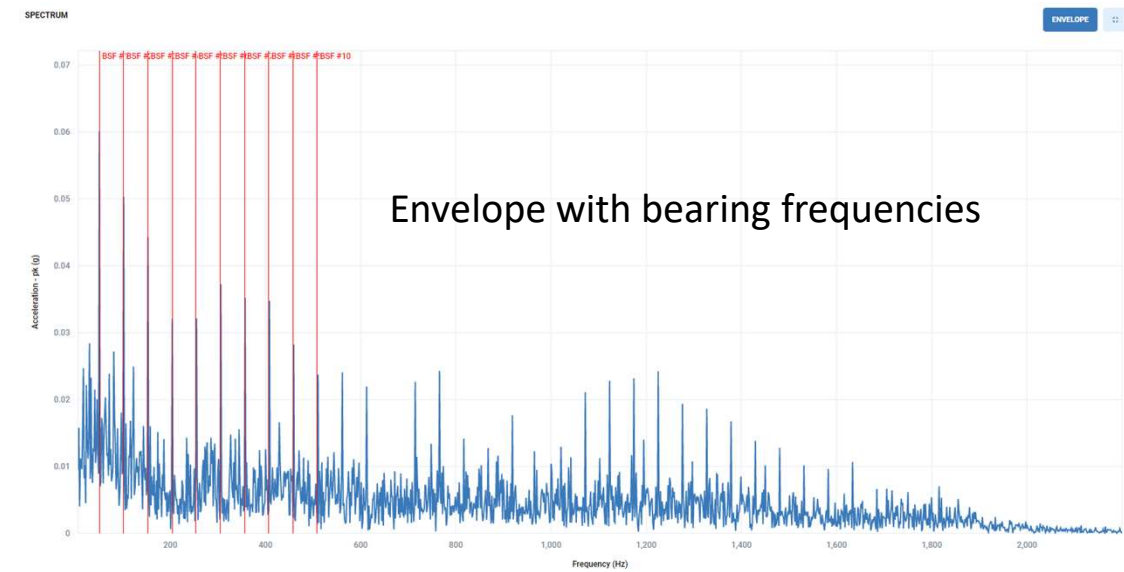
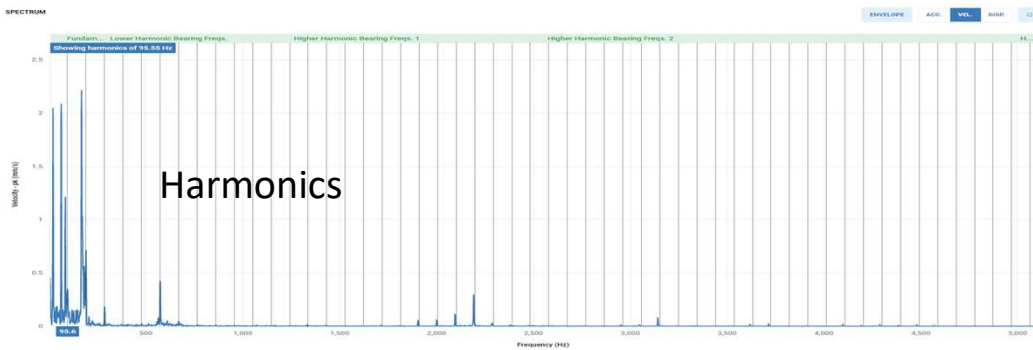
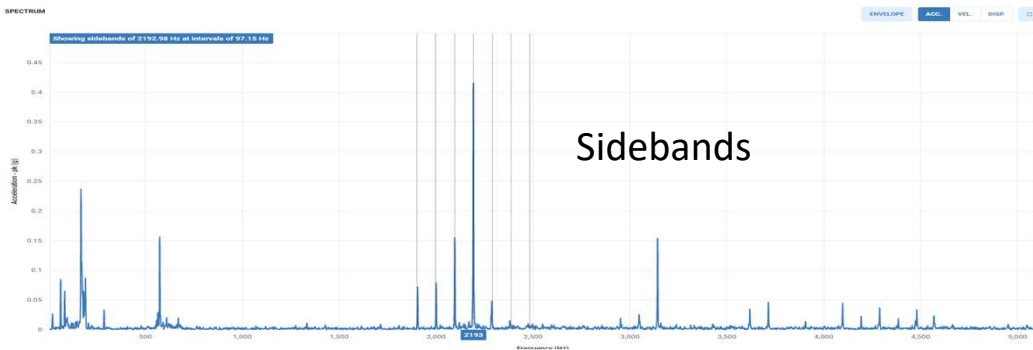
# Time Waveforms

For Analysis you can have the Raw Time Waveform, Autocorrelated time waveform, Zoom in to measure the period and also a circular plot of the data



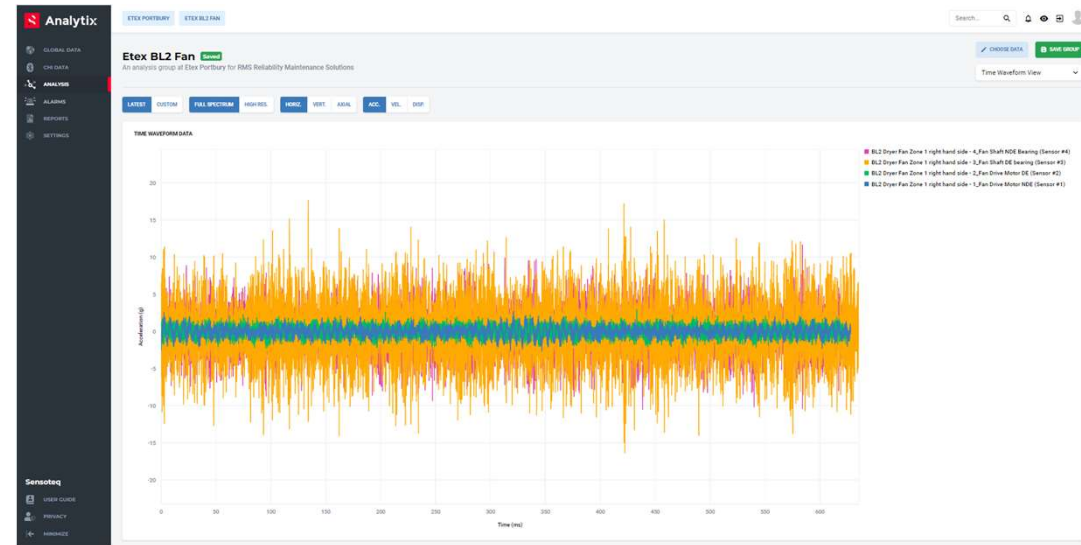
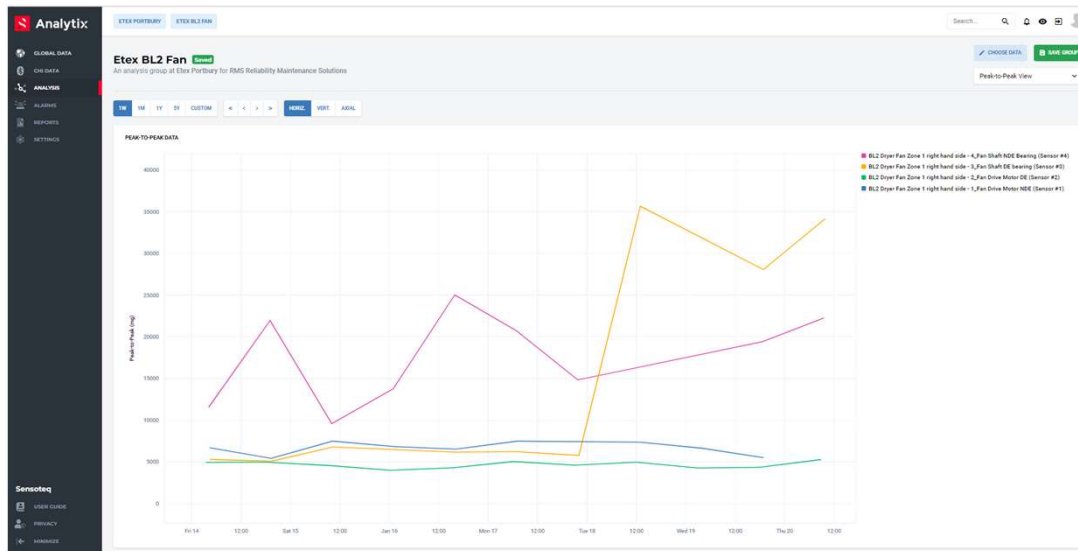
# Spectrum

For analysis we have Acceleration, Velocity, Displacement and Envelope Spectrum choice. We can apply Harmonics, Sidebands and Bearing frequencies can be displayed.



# Analysis groups

User analysis groups can be created across various machines and points



# Reports

User adjustable reports can be created

| Etex Portbury - Critical issue       |           |                |
|--------------------------------------|-----------|----------------|
| Machine                              | 1W Alarms | Status         |
| BL2 Dryer Fan Zone 1 right hand side | 9         | Critical issue |
| Elevator 11 Head Shaft               | 0         | OK             |
| Left Saw Motor                       | 0         | OK             |
| Right Saw Motor                      | 0         | OK             |

On initial data set up a possible defect has been detected at the fan NDE bearing.

This is the fan DE bearing Pk-Pk Trend every 3 mins showing a steady 6-7 gs



BL2 Dryer Fan Zone 1 right hand side - 3\_Fan Shaft DE bearing (Sensor #3) - Peak-to-Peak

| # | Name            | Description    | Date                |
|---|-----------------|----------------|---------------------|
| 1 | James Sylvester | Initial Instal | Jan 7th 2022, 09:10 |

In comparisons this is the fan NDE bearing with an elevated level of 8gs and random peaks to 20gs



BL2 Dryer Fan Zone 1 right hand side - 4\_Fan Shaft NDE Bearing (Sensor #4) - Peak-to-Peak



# Software comparisons

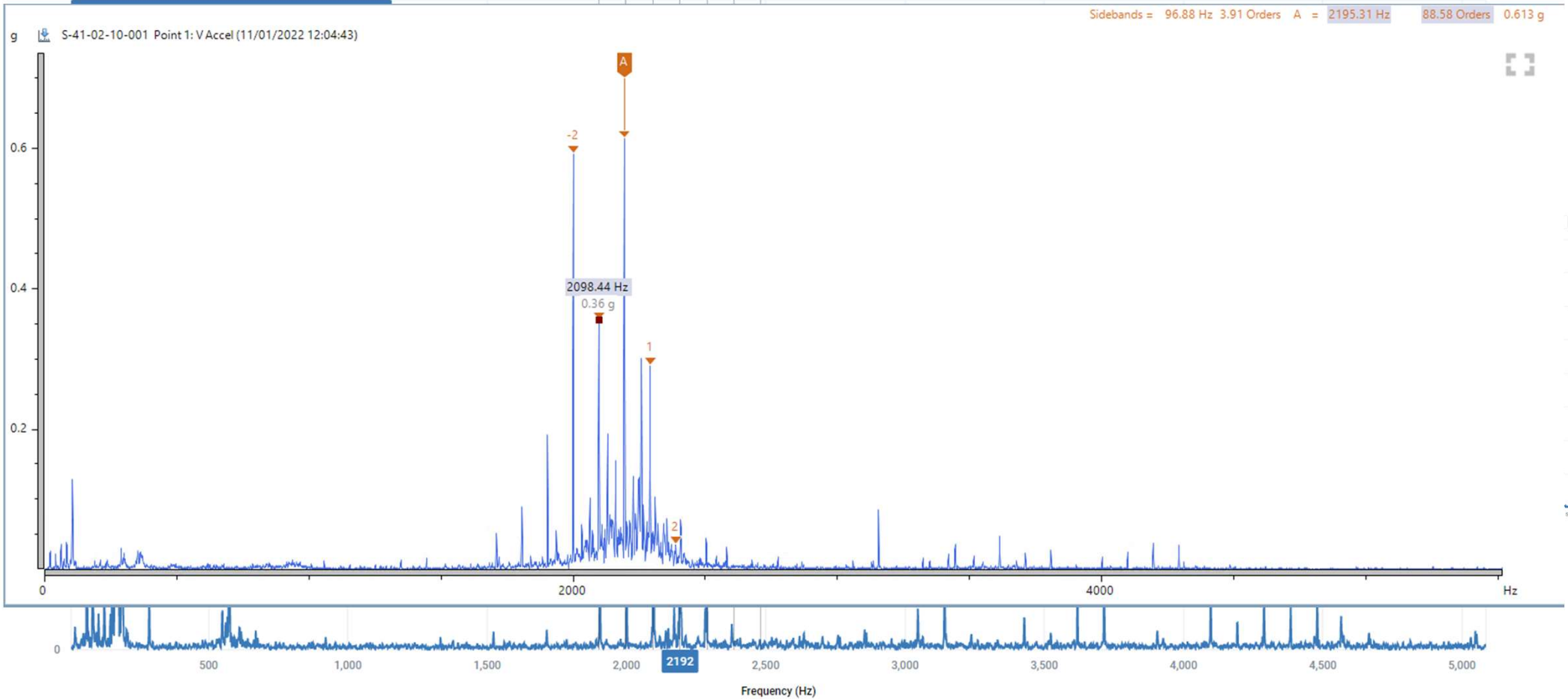
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# Motor NDE Data Comparison

SPECTRUM

ENVELOPE ACC. VEL. DISP.

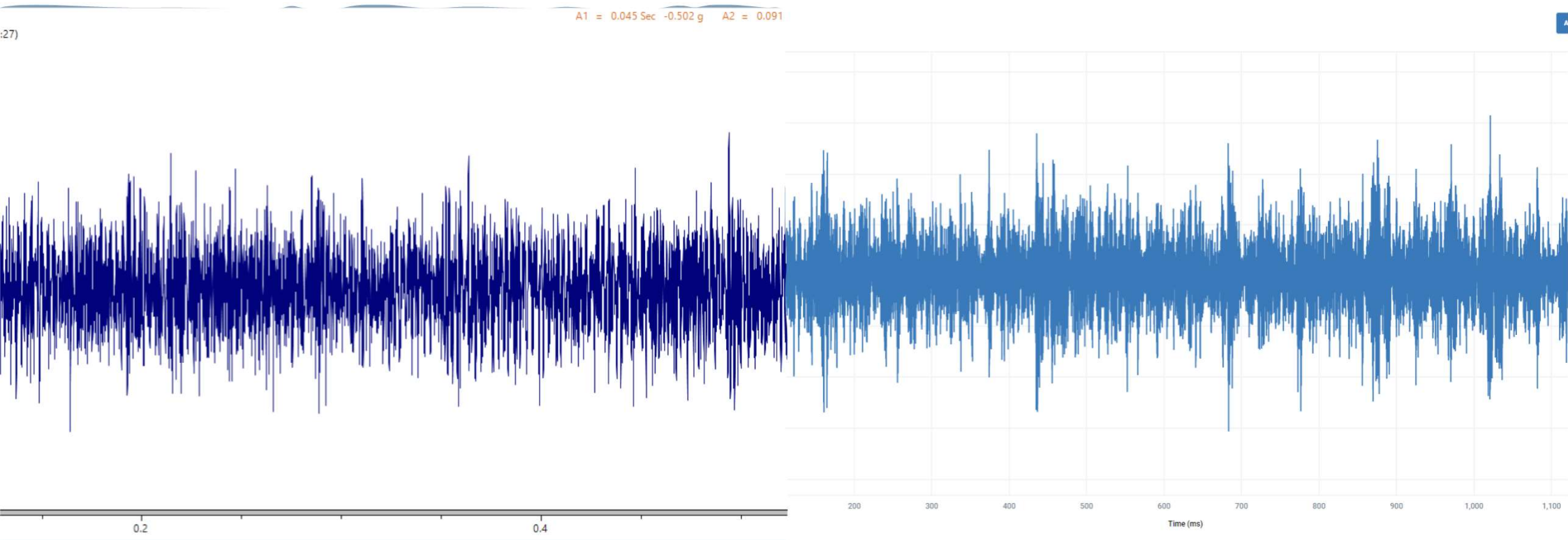


# Fan NDE Data Comparisons

Handheld 11/01/2022 11:45 Manual

Vs

Sensoteq 11/01/2022 16:21 Automatic



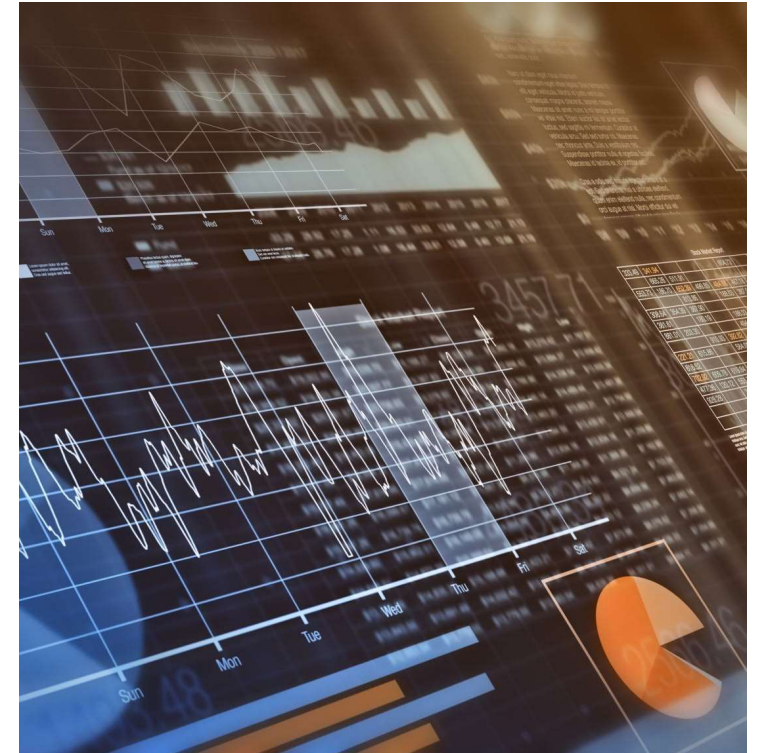


# Summary of Wireless trial

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# Summary - Technology

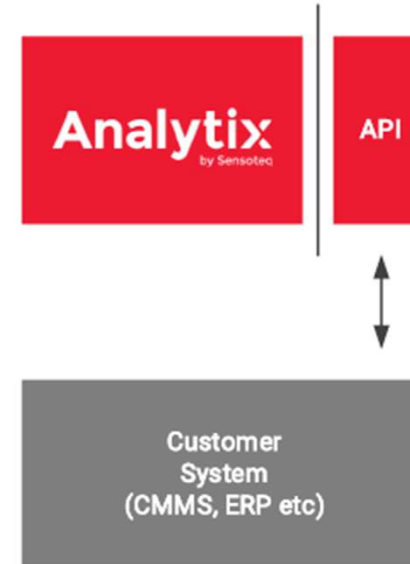
- No internal IT hassle or costs
- Moving from monthly data to 24/7 monitoring
- Automatic emails for alarms so 24/7 analytical monitoring
- Access to the data as long as you can get on the internet from anywhere at anytime
- Key vibration parameters every 1+ minutes and spectral and waveform data every day
- Temperature every 3 minutes – Ambient, sensor and delta temp
- More accurate temperature and vibration data as permanent sensors



# API

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- The Analytix API allows any piece of data you can see on the platform to be accessed by any program via the API calls.
- API functions will require software/IT specialist knowledge to be used in a way that is required for your application.
- The data can be pulled to other online applications to be used for alarms, creating job alerts, data collection and can even be used in AI systems.
- Sensoteq require an NDA to be signed by both parties as the API contains proprietary information. Once signed, they will send the full API documentation which contains all available endpoints.
- To request access to the API using your account or even a new dedicated API account, contact Sensoteq for a quick discussion.



| API Specification   |                           |
|---|---------------------------|
| <b>Physical</b>   |                           |
| Architecture  | RESTful                   |
| Requests  | HTTPS                     |
| Format  | JSON                      |
| Authentication  | JWT                       |
| Key Expiration  | Never                     |
| Access Control  | Via standard Analytix GUI |
| Key Generation  | Single generation         |
| The API is fully documented, and we can provide support if necessary. |                           |

Technical management, created and Presented by



# JPS Reliability

A Reliable Plant is a Profitable Plant

With support from

**Sensoteq** 

**RMS**   
RELIABILITY MAINTENANCE SOLUTIONS