BRCE
BEARING RELIABILITY CONFERENCE & EXPO

# Cut Through the Complexity of Machinery Analysis with High Frequency Vibration Analysis

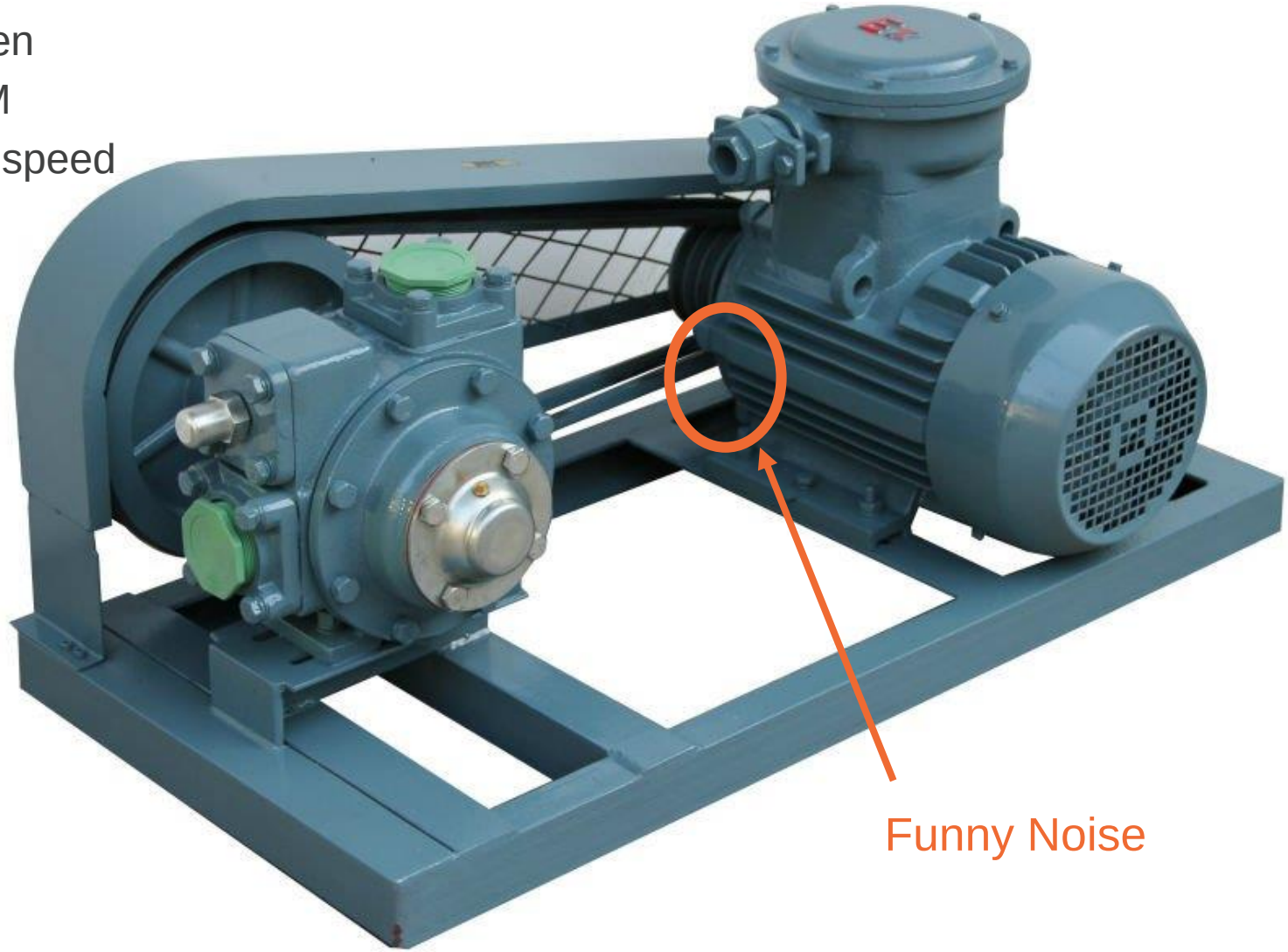
Dieter Charle
Business Development Manager - Europe

EMERSON

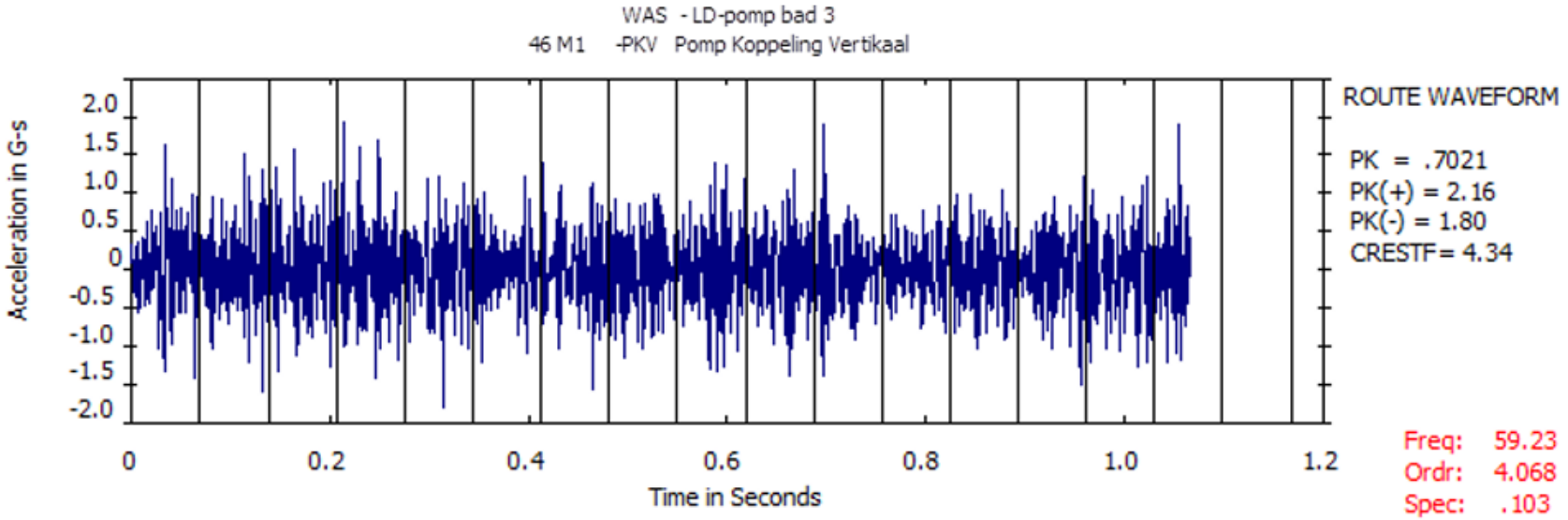
# Centrifugal pump

BRCE
BEARING RELIABILITY CONFERENCE & EXPO

- Belt driven
- 869 RPM
- Variable speed

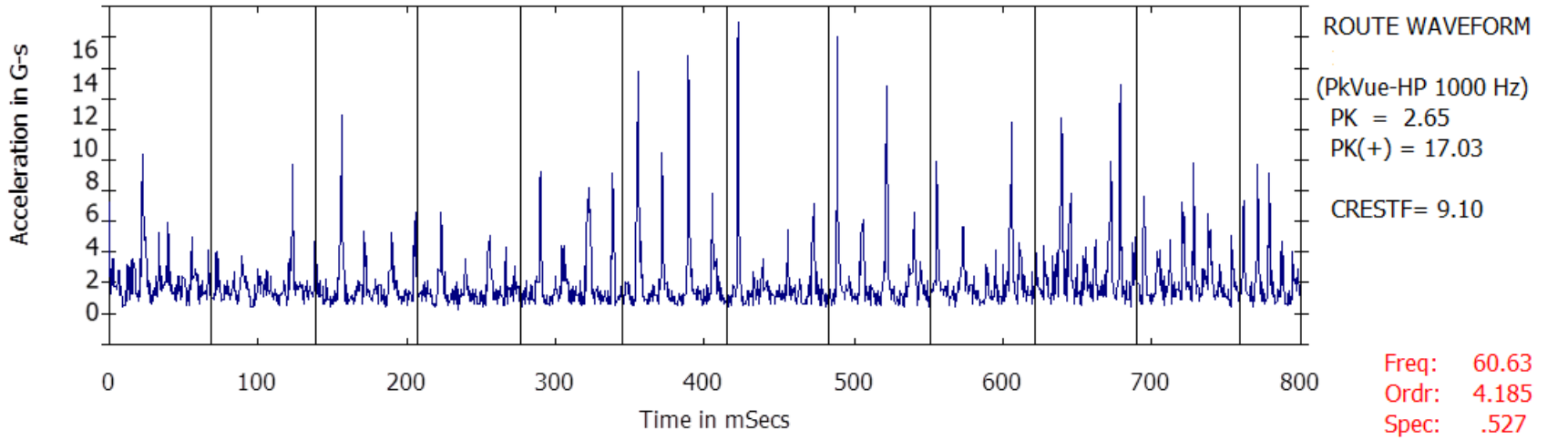


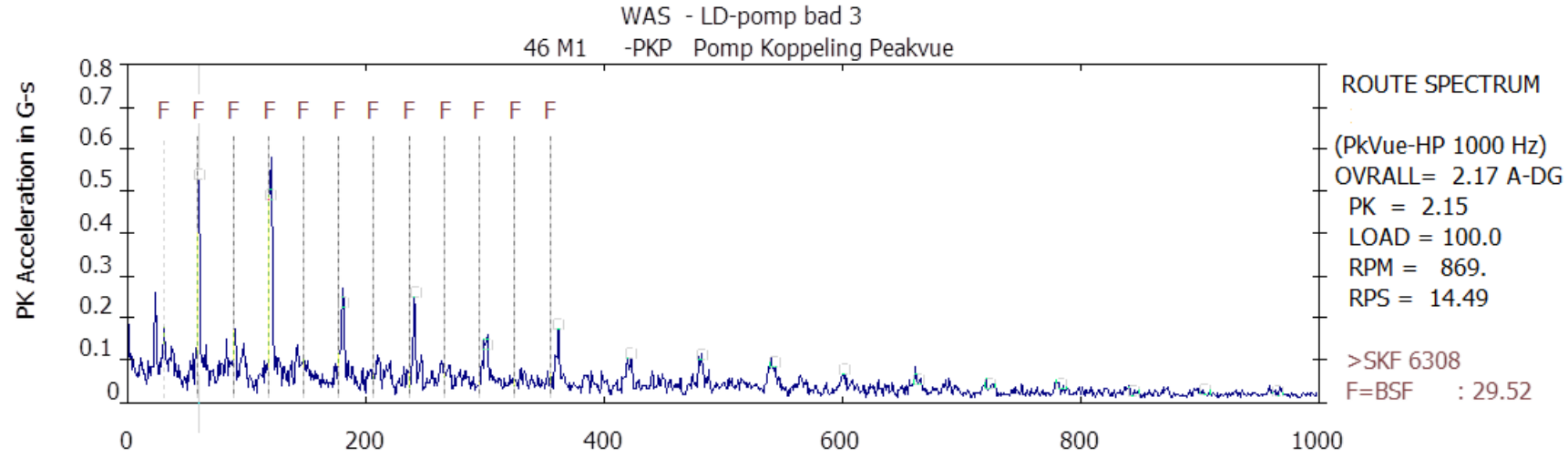
# Standard vibration data



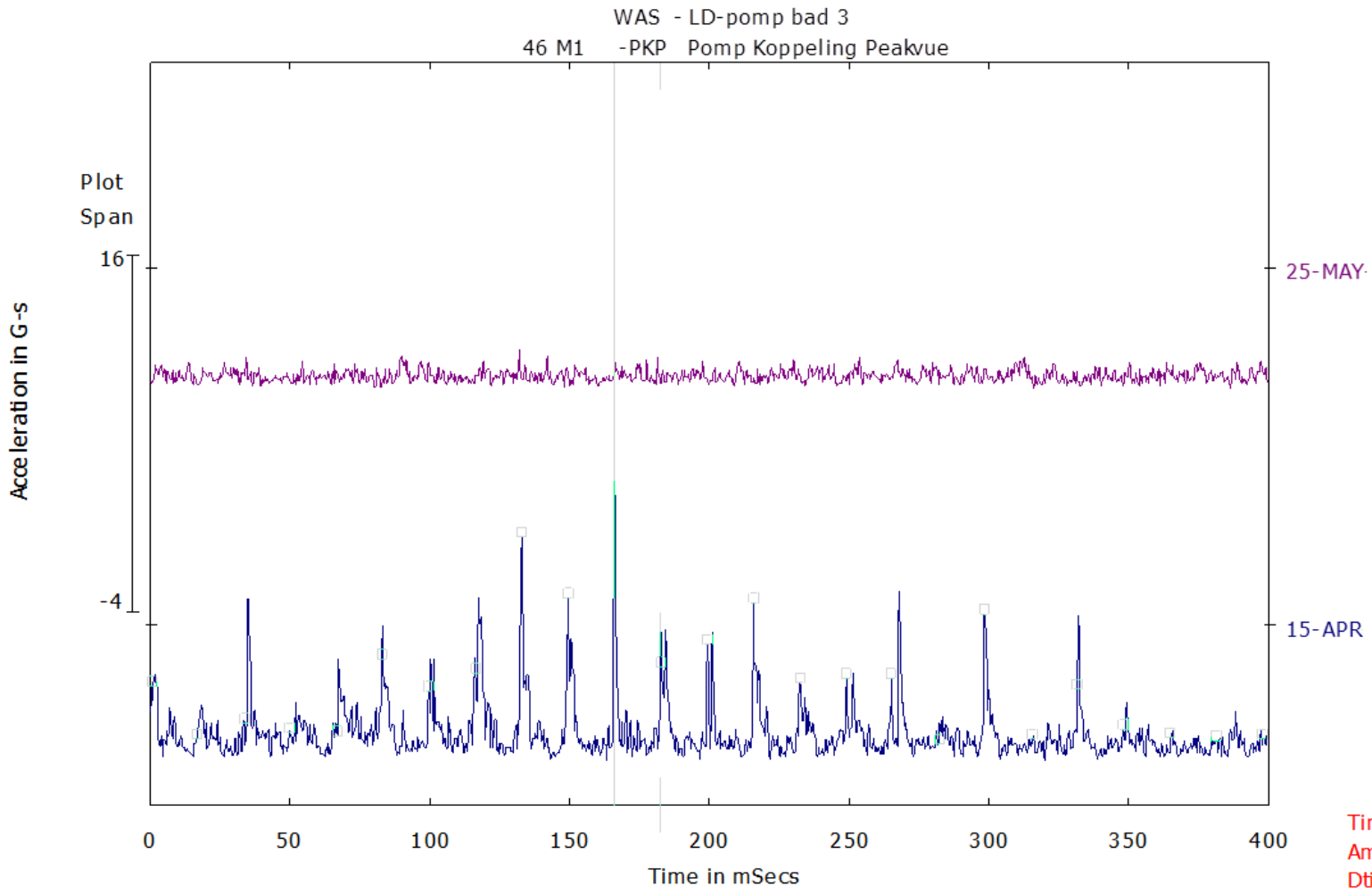

- Relative low impacting in waveform ~4Gs
- No clear defect frequencies in the FFT spectrum

# Time waveform & PeakVue Spectrum



# PeakVue time waveform after & before



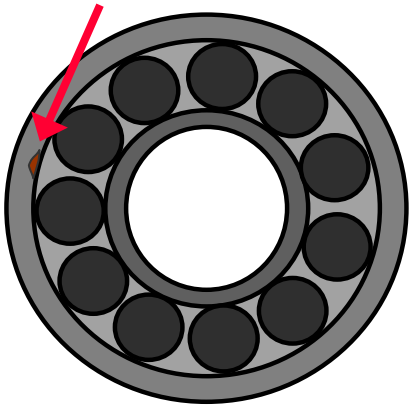
# Visible damage

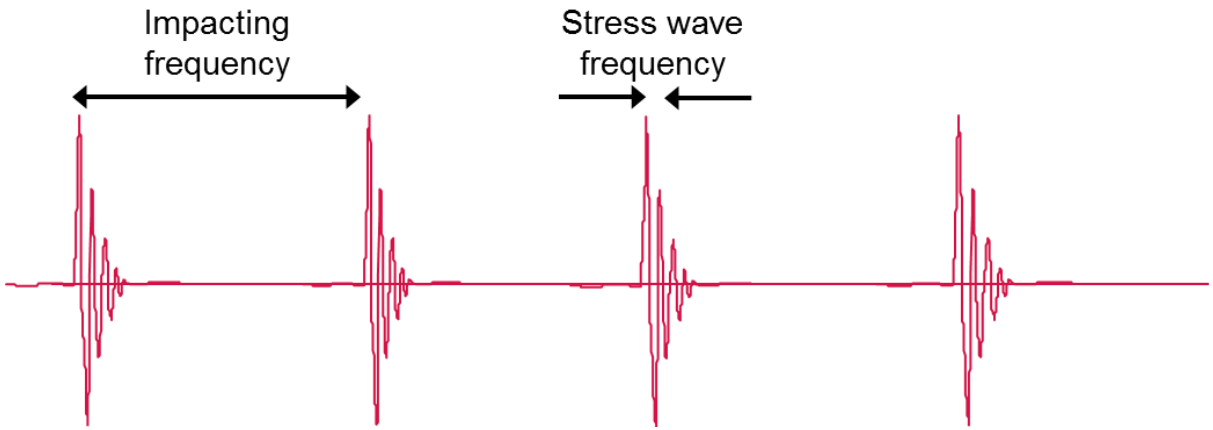
# What is PeakVue?

**PeakVue is a method that detect high frequency vibrations in an early stage that often originates from impacting (metal to metal contact)**

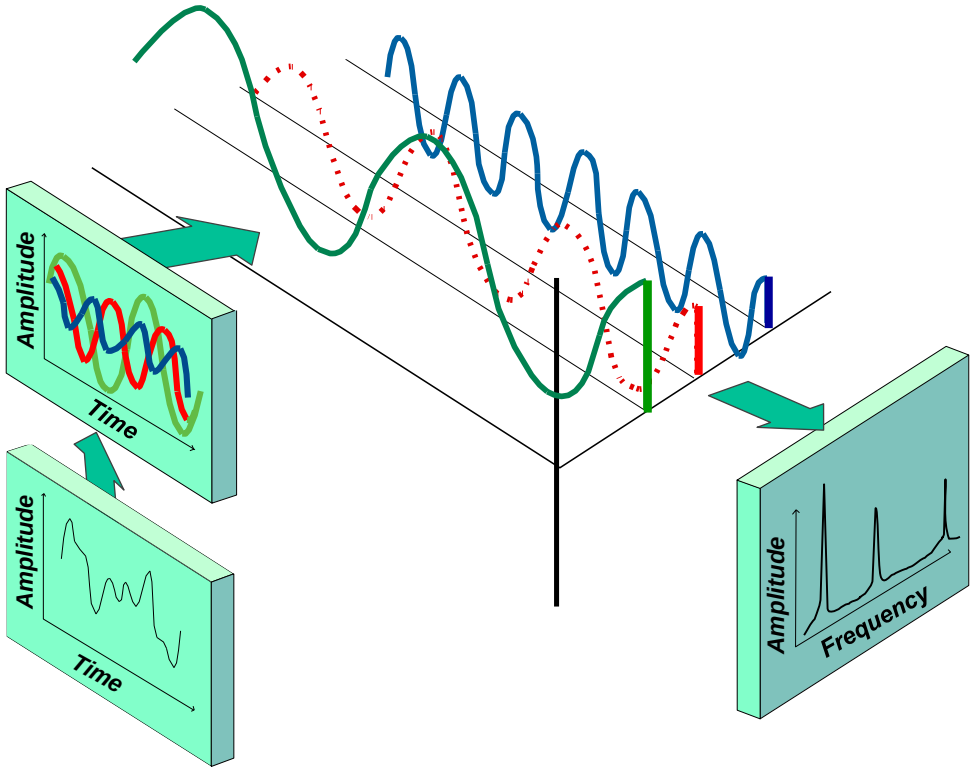
Common machine faults that generate stress waves are:

- Bearing faults
- Gear mesh in gear boxes
- Looseness
- Lubrication faults
- Cavitation

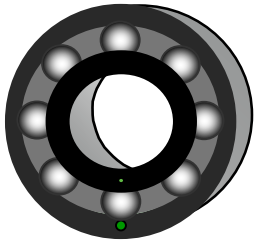


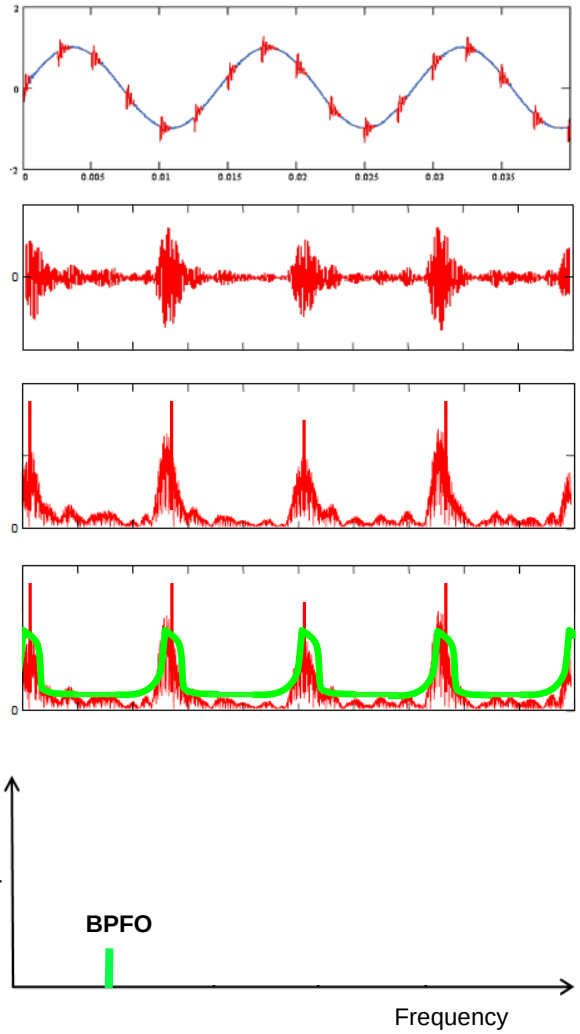


# How creating a Vibration Spectrum



# Demodulation






Raw measurement data - Waveform

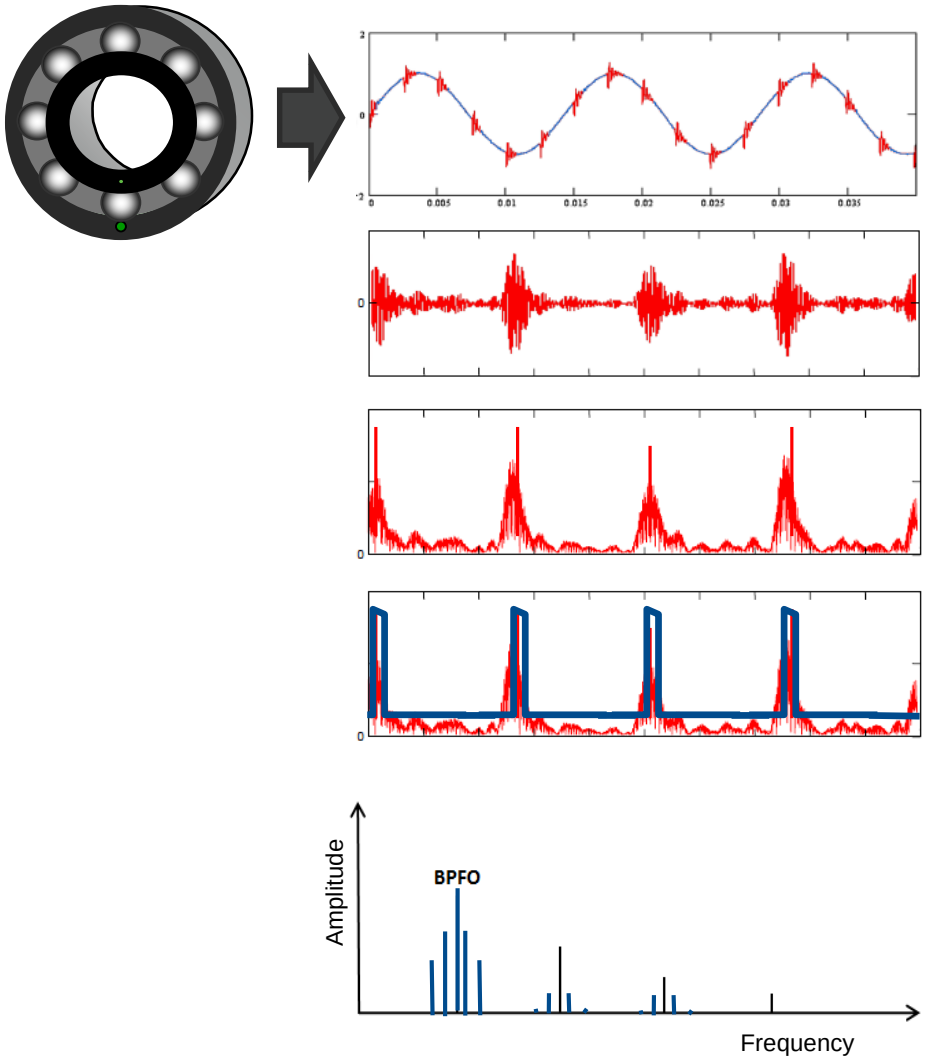
Signal after band pass filter

Signal after rectifying

Enveloping registers (Demodulation)

FFT

# PeakVue




Raw measurement data - Waveform

Signal after band pass filter

Signal after rectifying

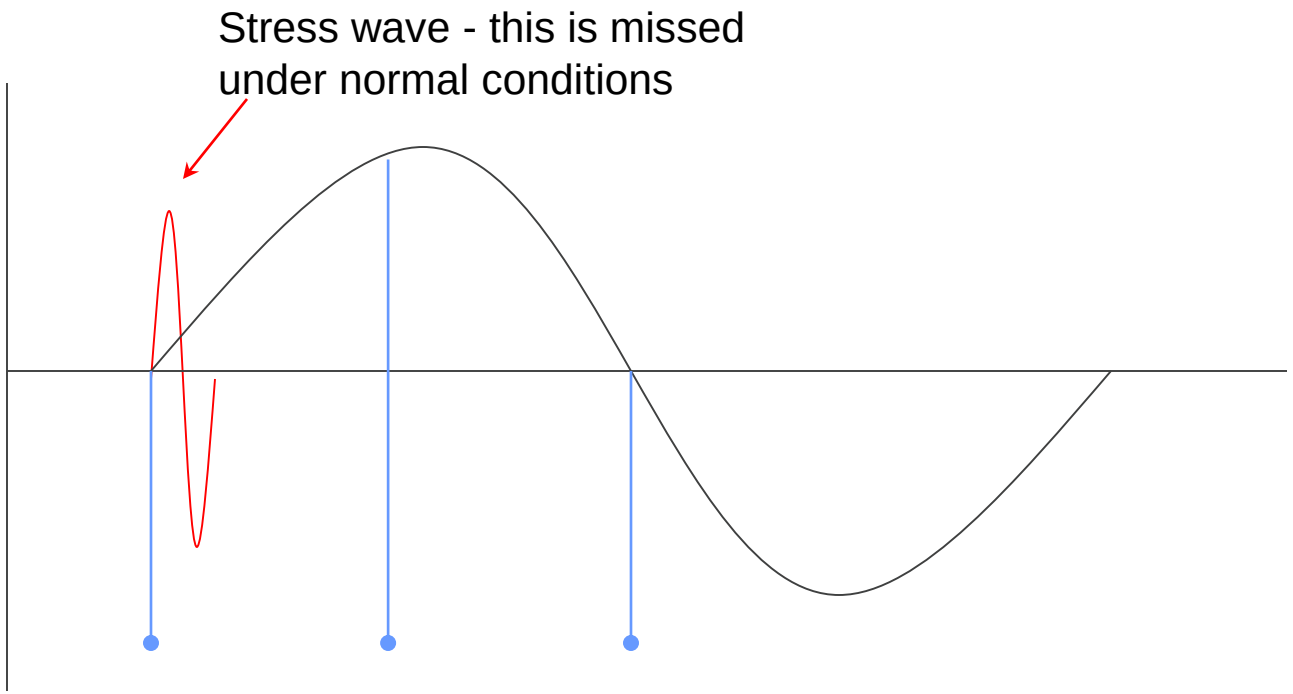
**Peak Impact** Detection registers

- Keep High Frequency Sample
- No Low Pass Filter

FFT

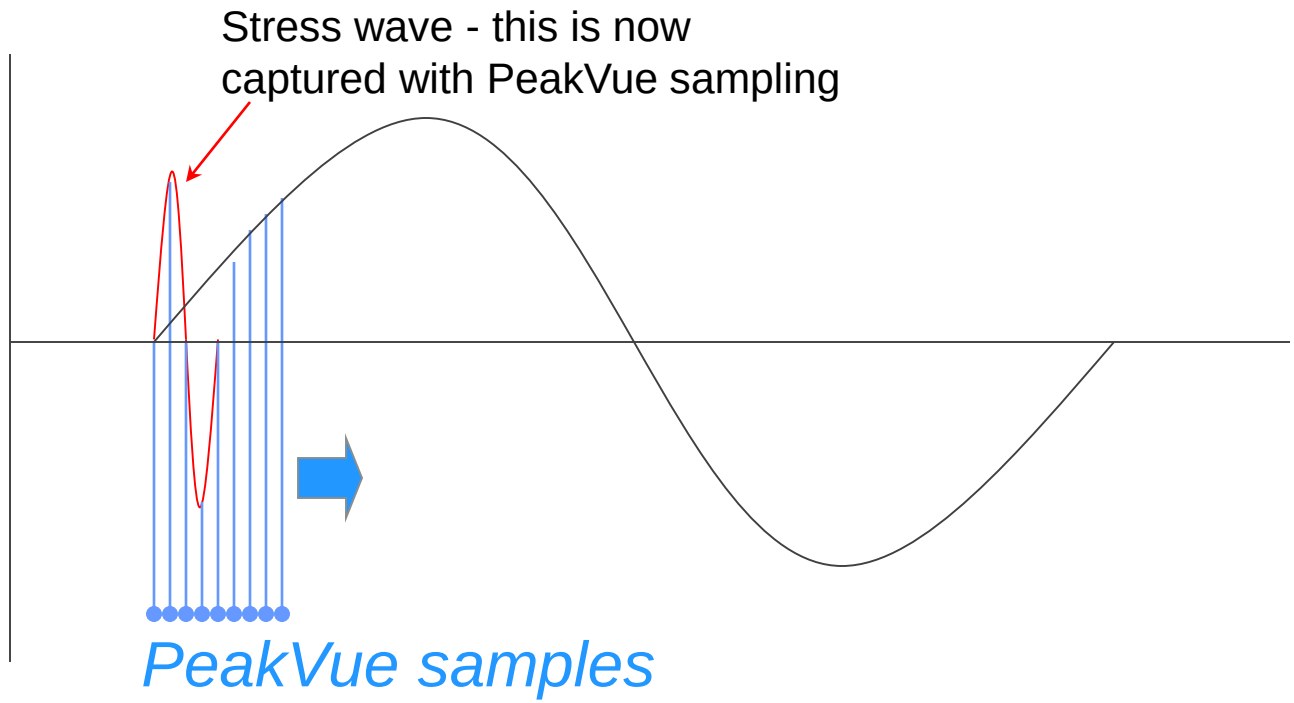
# How does it work?

The diagram below shows sampling of data using normal data collection



# How does it work?

The diagram below shows sampling of data using PeakVue data collection.

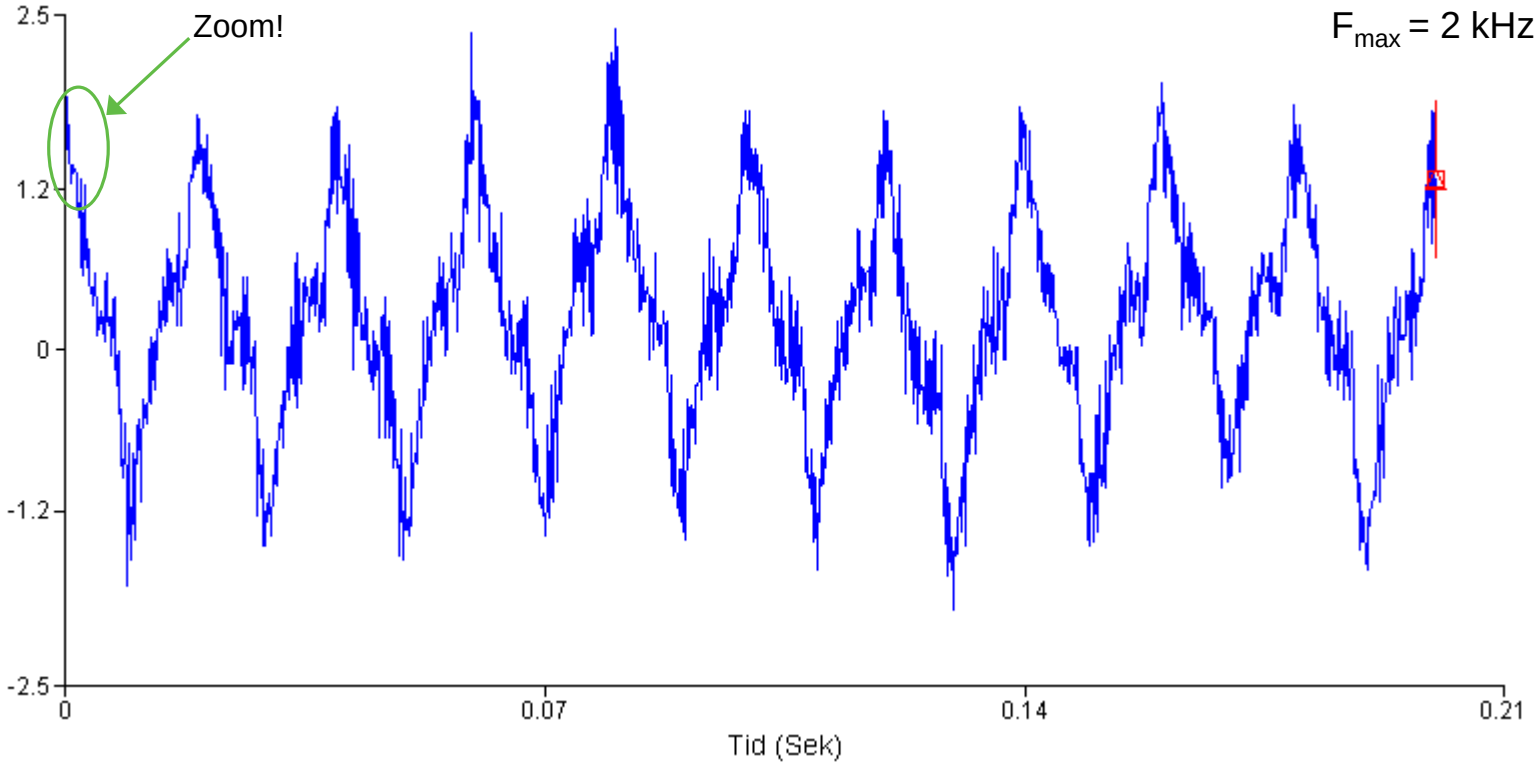


# How Does it work?

PeakVue uses Peak Hold-function to transform high frequency vibrations down to fundamental frequencies, allowing analysis of data to be done more quickly and easily

- For normal vibration measurements the $F_{max}$ setting in the analyzer determines the sampling frequency for the collected time waveform(e.g. 1000 samples/second)
- PeakVue always sample with over 100 000 samples/second
- After collecting all the samples PeakVue discard samples so there remain only as many samples per second as the regular data collection would use for a certain $F_{max}$

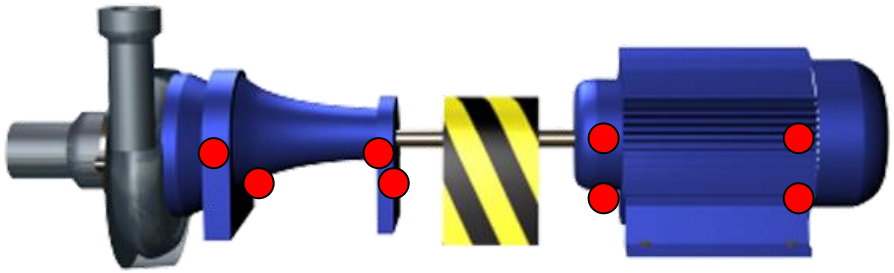
# How Does it work?



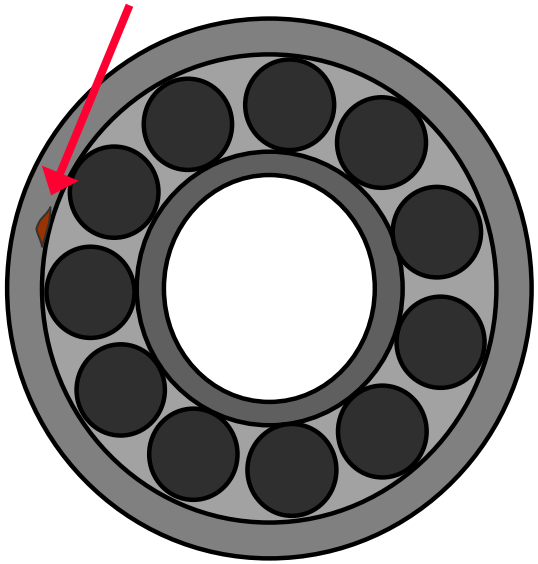
# When using PeakVue, keep in mind:

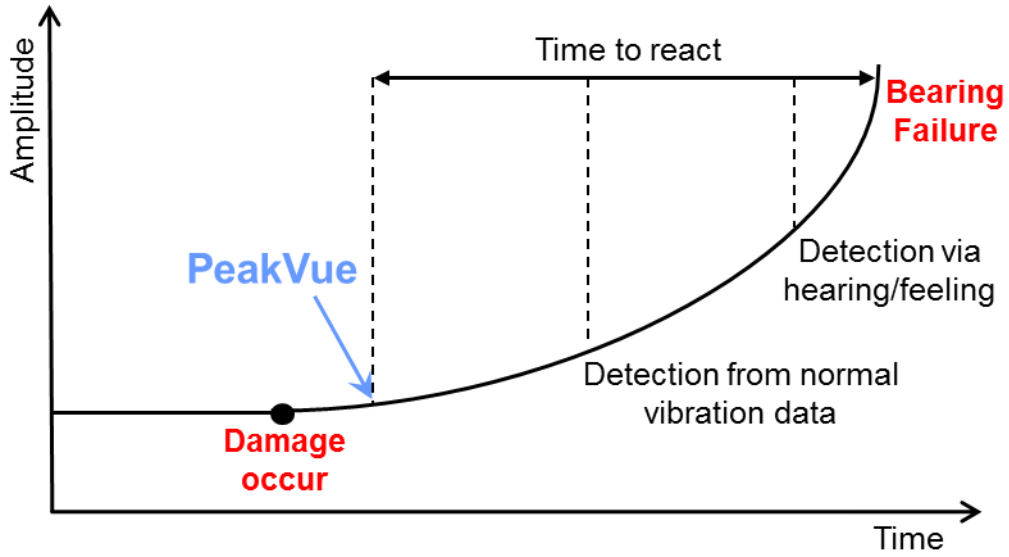
- Sensor Mounting effects frequency range
  - More rigid mounting = Higher frequency range
  - Mount the sensor on a paint free clean surface if possible
  - 100 mV/g accelerometer is typically used

- Mounting location of the sensor is important
  - The accelerometer is mounted near the origin of the stress wave
  - The accelerometer is mounted in the load zone if possible



# Earlier detection of integrity degradation





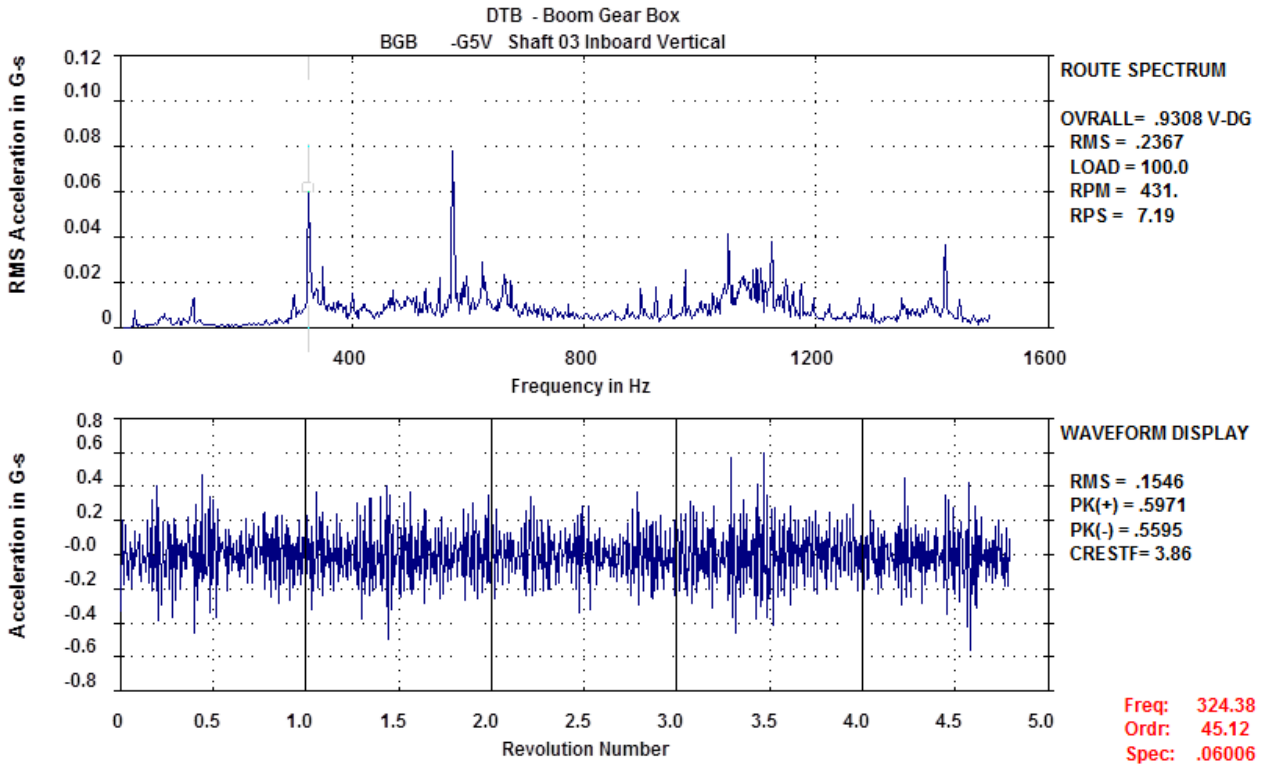

PeakVue differentiator area's:

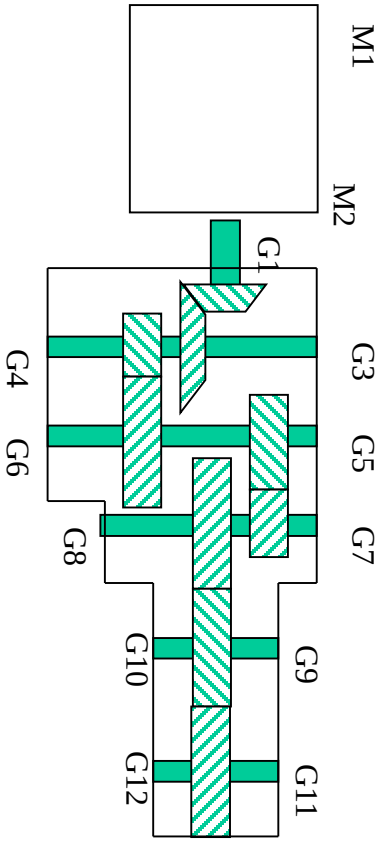
- At assets with **rolling element bearings** & **gearboxes**
- Detection of **metal to metal contact** due **lubrication issues**
- Very **heavy and / or slow rotating equipment**

# Any Questions?

**Dieter Charle**
BDM Portable Reliability Solutions
Dieter.charle@emerson.com
+32 493 229 991

# Case Study: Standard vibration data

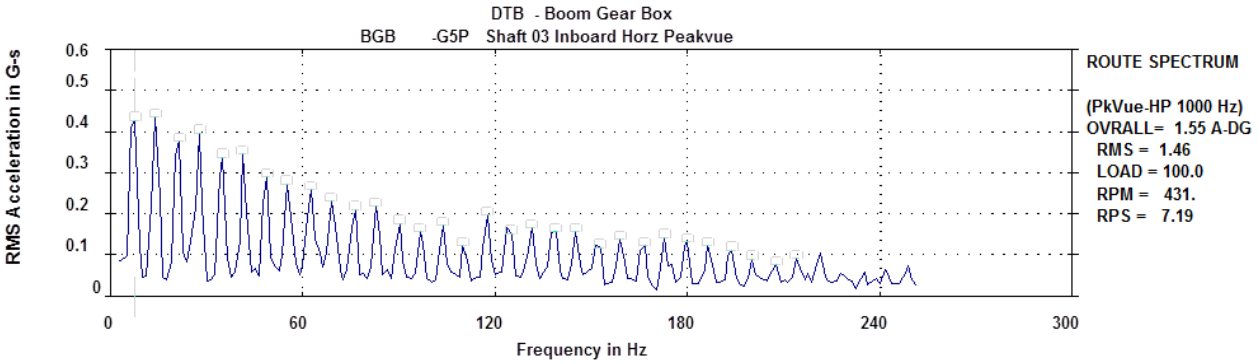


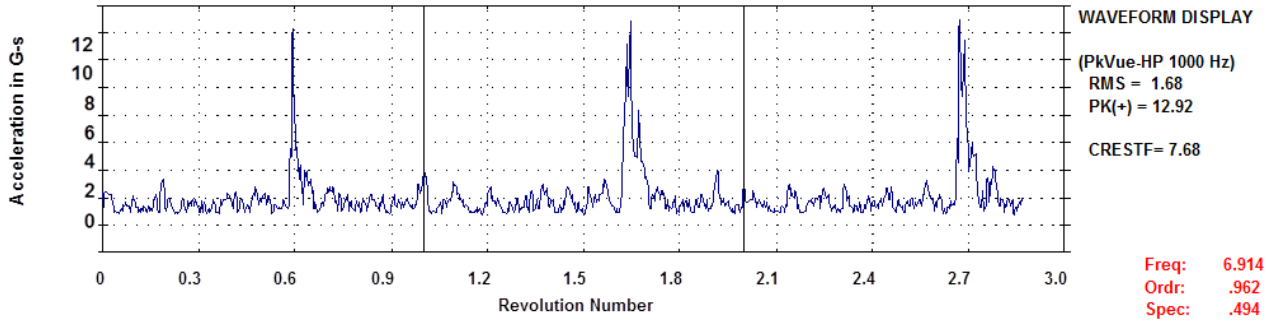

The standard spectrum was taken
Is there a problem?

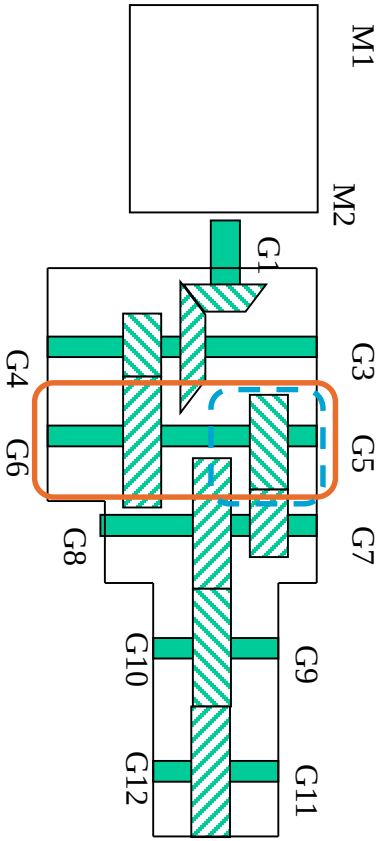
# Case Study: PeakVue data

- PeakVue spectrum:
  - Distinct peaks at 6,91 Hz and harmonics
  - Corresponds to the running speed of the third shaft




- PeakVue time waveform:
  - One big impact per revolution at G5
  - Amplitude level of approximately 13 g Peak-to-Peak



# Case Study: The fault

Examination suspected a gear fault at G5 caused by damaged tooth