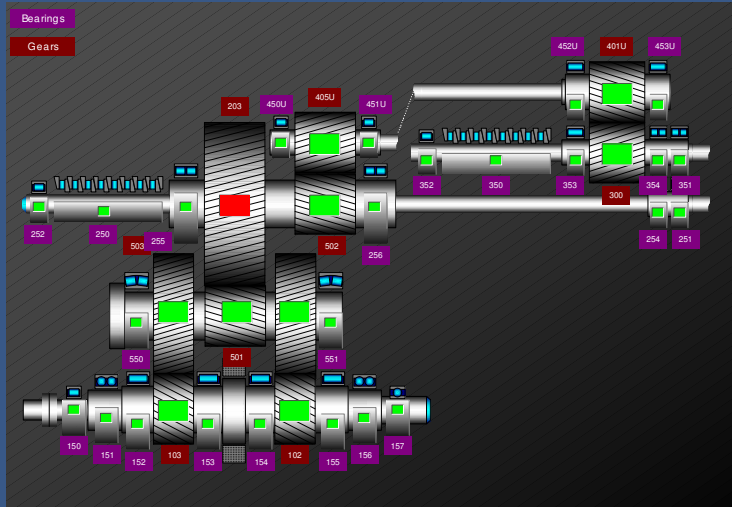
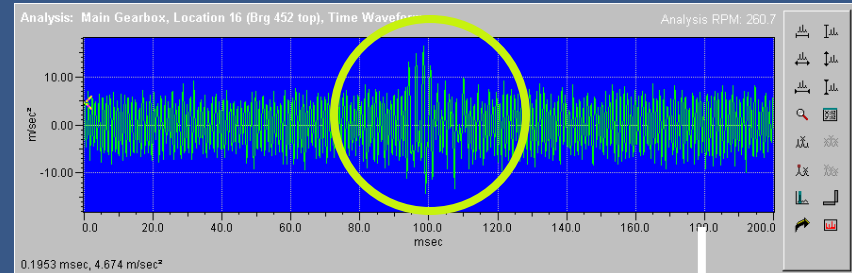


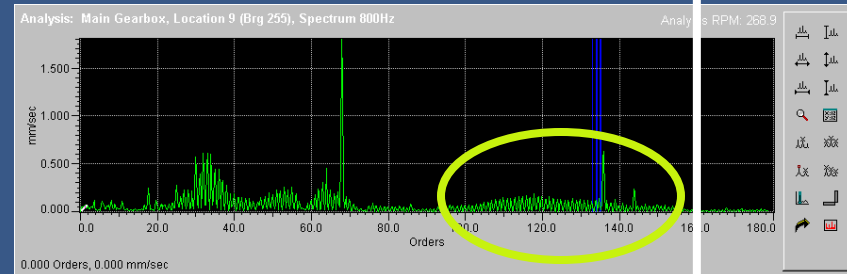
# Results - Gears



### Gearbox Bad

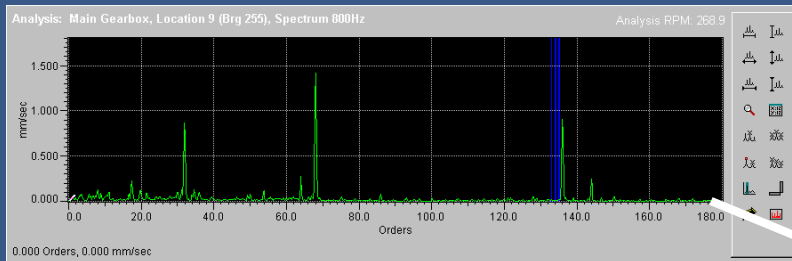


1 'tick' per revolution

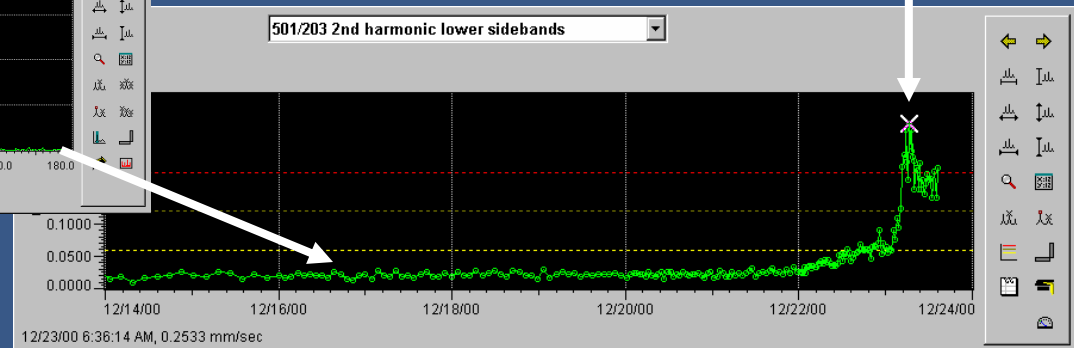


gear sidebands rising

### Gearbox Good



No indication of gear problem

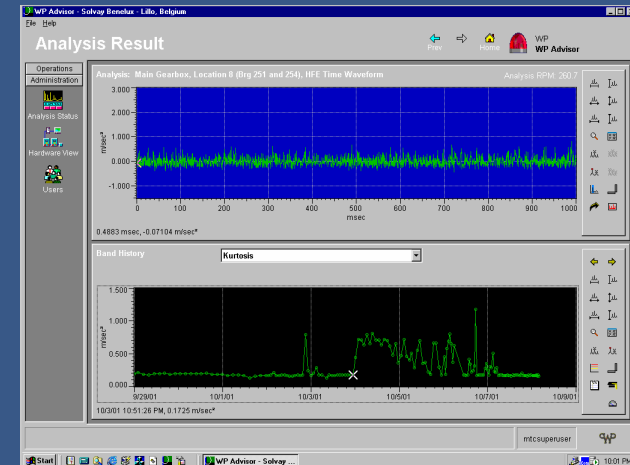


# Results – Screw Wear

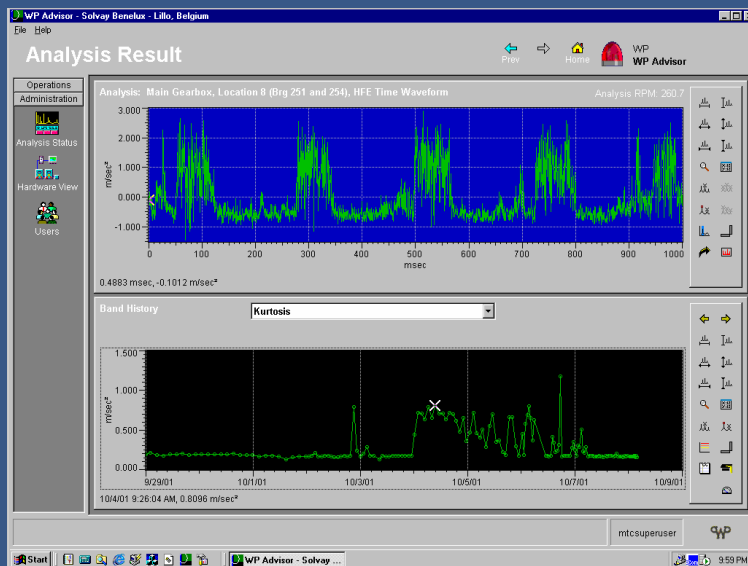
## SMART ADVISOR GEAR IMAGING

### Healthy Signature

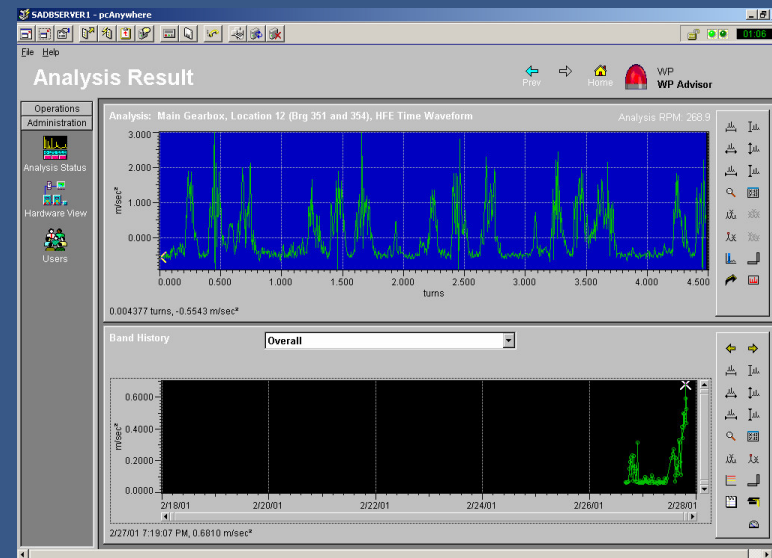
The HFE waveforms show a repetitive pattern at the output shaft period that is quite variable in the number of impulses per turn. At different times the number of impulses per turn can vary between 1 and 3, sometimes the shape can be more complicated, and sometimes the signature disappears altogether.



### Screw Wear Signature 1

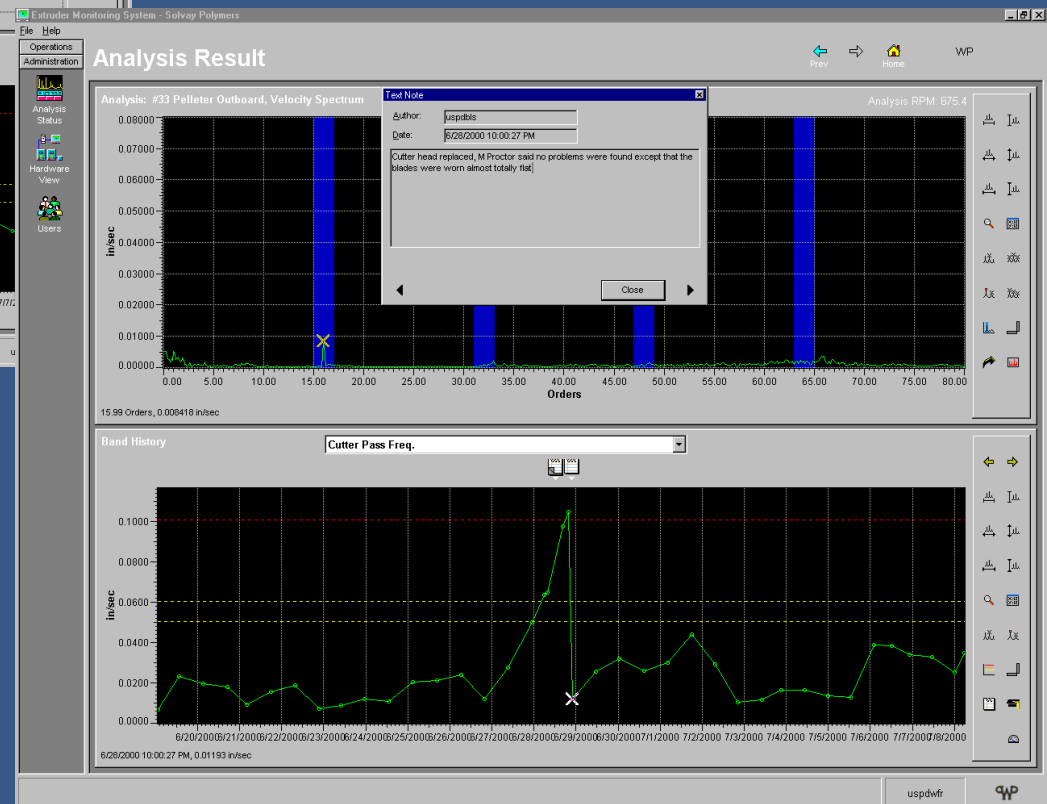
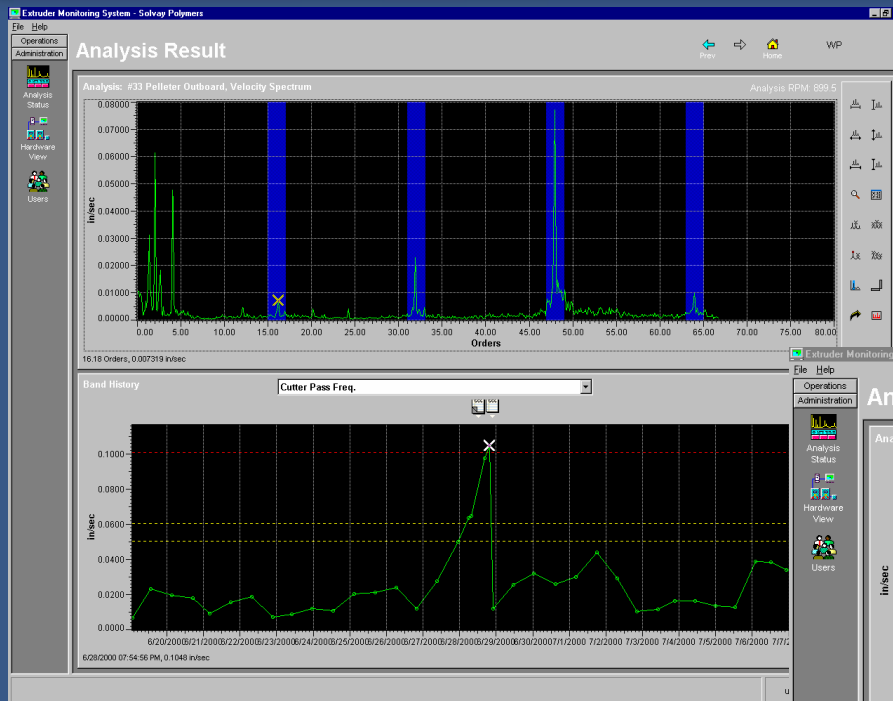


### Screw Wear Signature 2



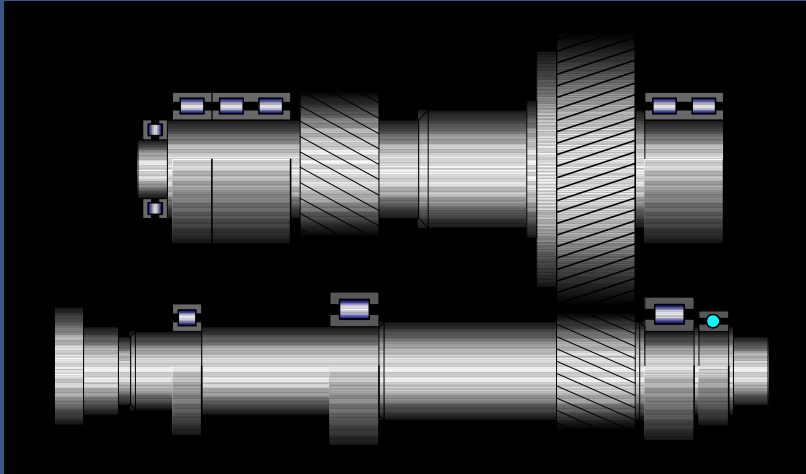
# Results – Pelletizer Knives

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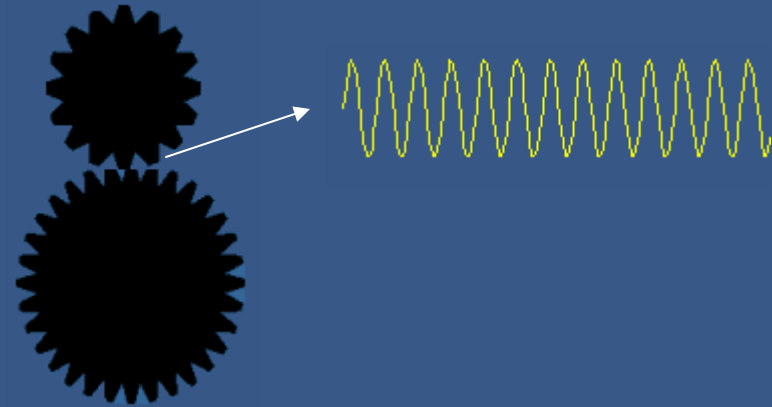
WP Advisor Customer uses the energy of the cutter pass frequency to verify the need for pelletizer knife change-out.

# Gear Fault Phenomenon

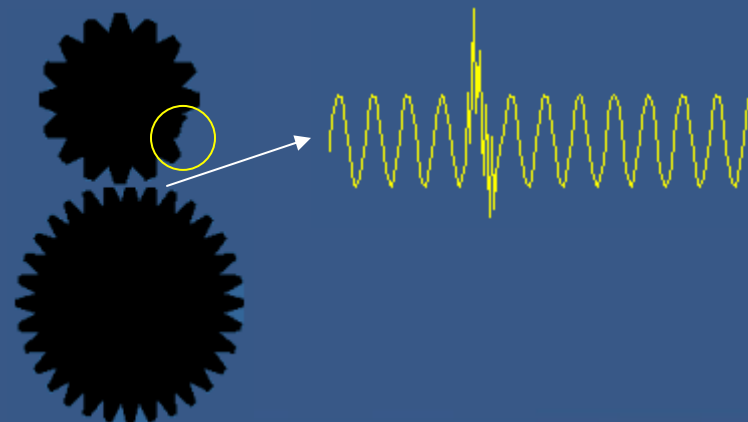


Damaged tooth produces a vibration impulse each time it goes through the mesh

Normal Gear Mesh

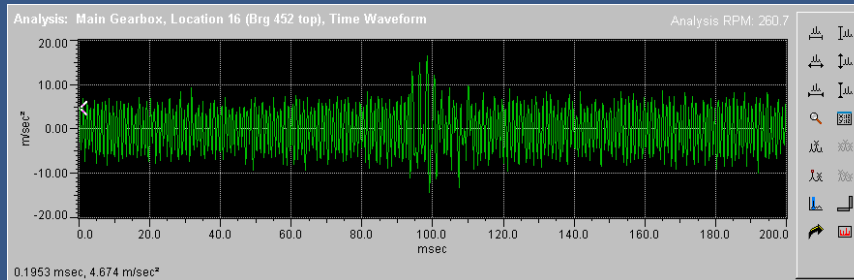


Gear Mesh with Damaged Tooth

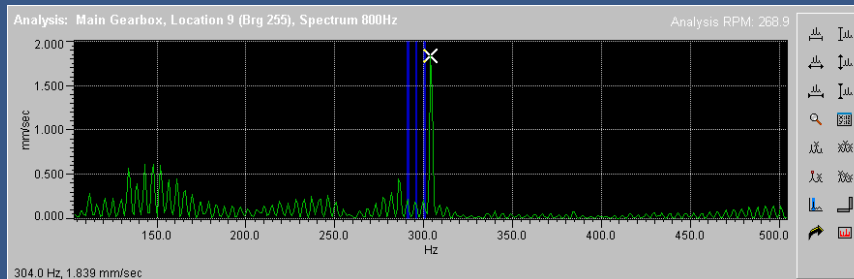


# Traditional Detection Techniques

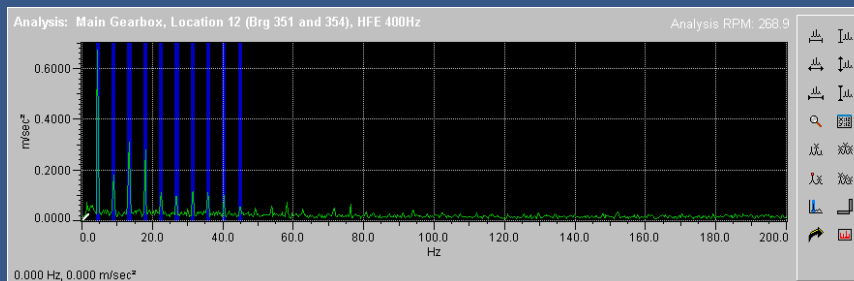
SMART ADVISOR GEAR IMAGING



Time waveform with vibration impulse



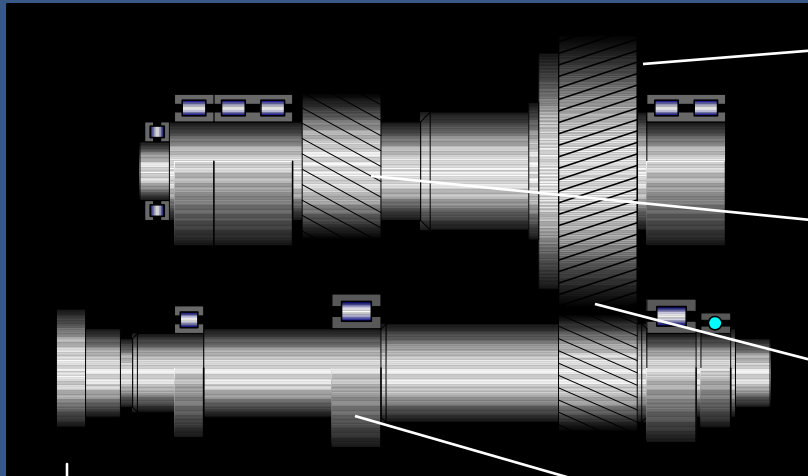
Standard vibration spectrum with shaft sidebands around the mesh



HFE Spectrum with a set of shaft harmonics

# Real Life Vibration Signature

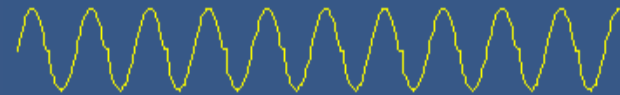
SMART ADVISOR GEAR IMAGING



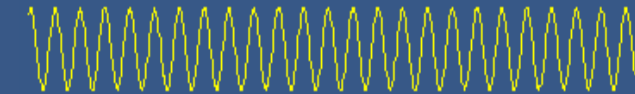
Bad Gear



Gearmesh



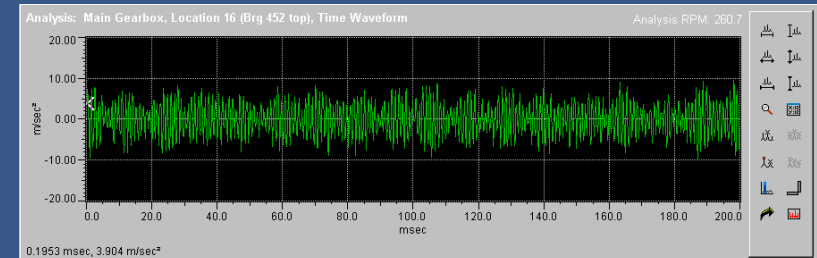
Gearmesh



Bad Bearing



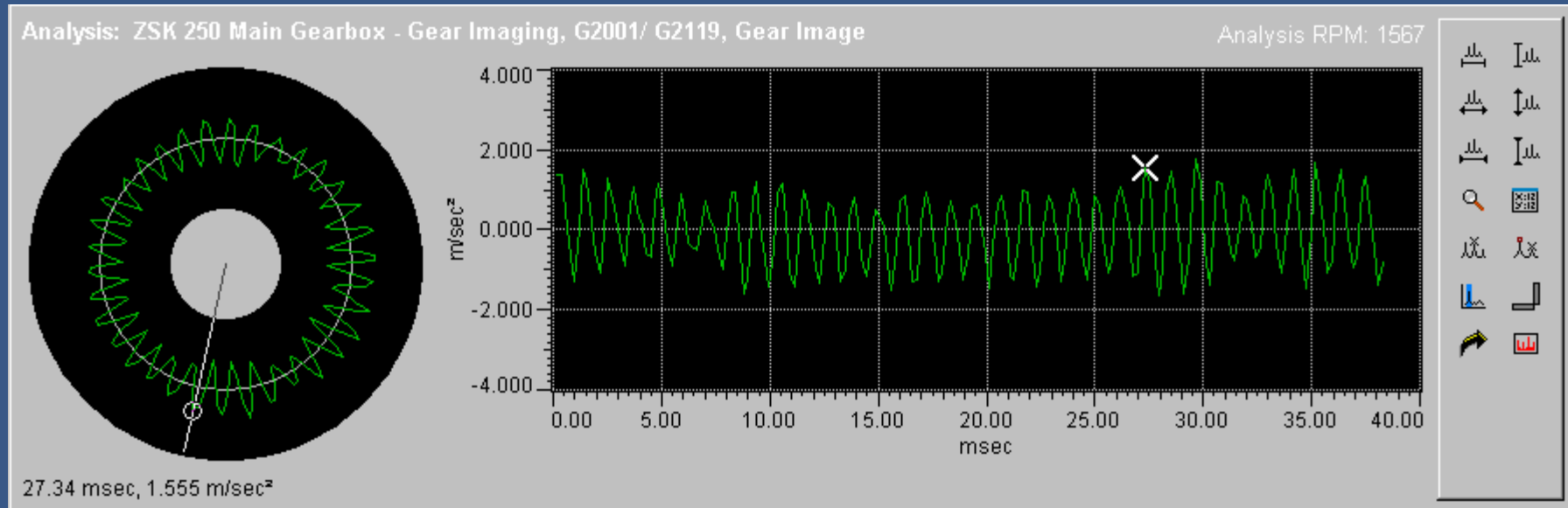
Overall Vibration



Traditional techniques work only if fault is big enough to overcome noisy background

# Gear Vibration Imaging

SMART ADVISOR GEAR IMAGING

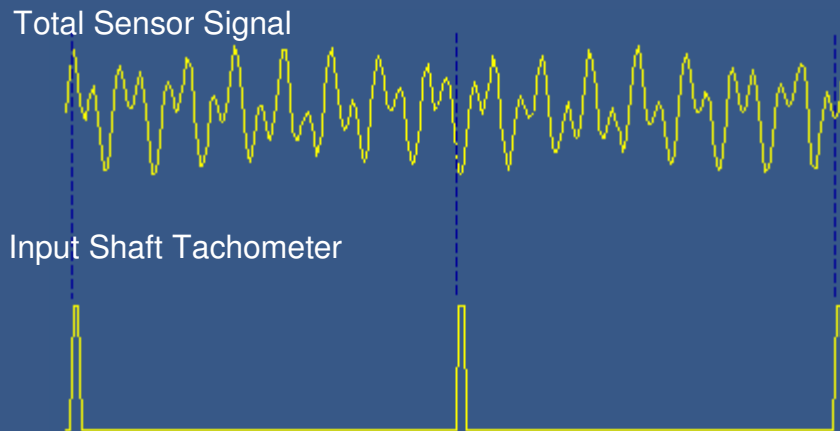


Time synchronous averaging isolates high frequency impacts produced by faulty gears, while rejecting noise and vibrations from other mechanical components.

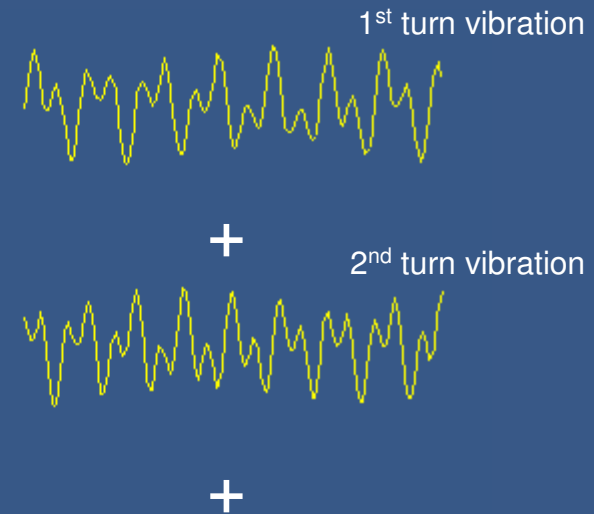
Gear Vibration Imaging detects incipient gear faults such as pitting, spalling, and gear cracks.

# Time Synchronous Averaging

SMART ADVISOR GEAR IMAGING

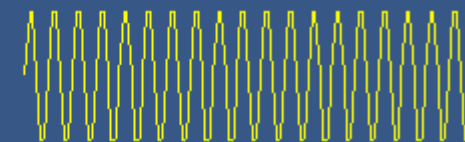


Tachometer signal marks the begin and end of each turn of the input shaft



up to thousands averages

perfect noise-free image

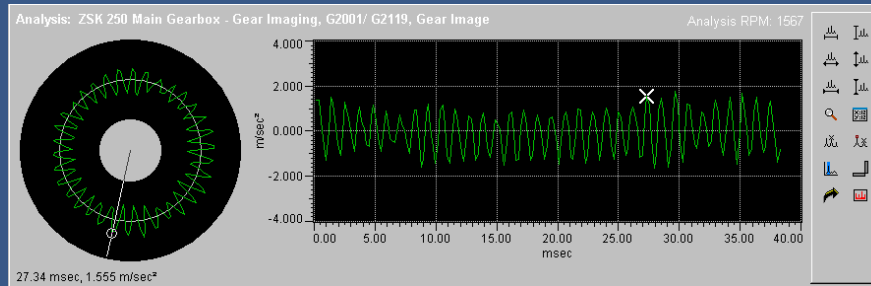


Averaging many turns of the gear isolates the vibration from that gear and eliminates the vibration from other sources.

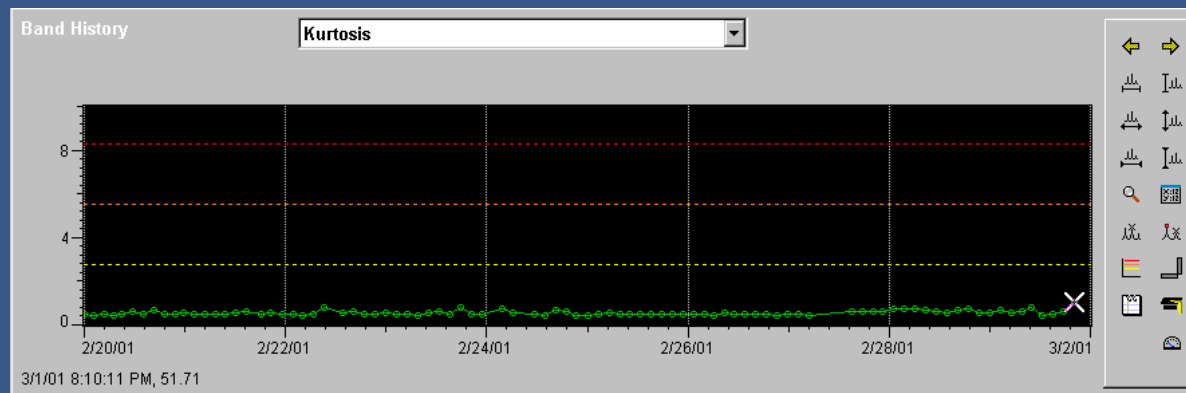
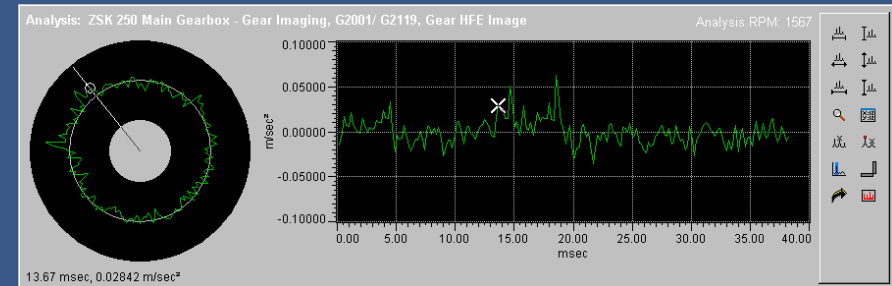
# Gear Images

## SMART ADVISOR GEAR IMAGING

### Vibration Image



### HFE Image



Kurtosis & Peak Ratio trends are extremely stable for fault-free condition.

Kurtosis and Peak Ratio change dramatically with slight changes of gear condition