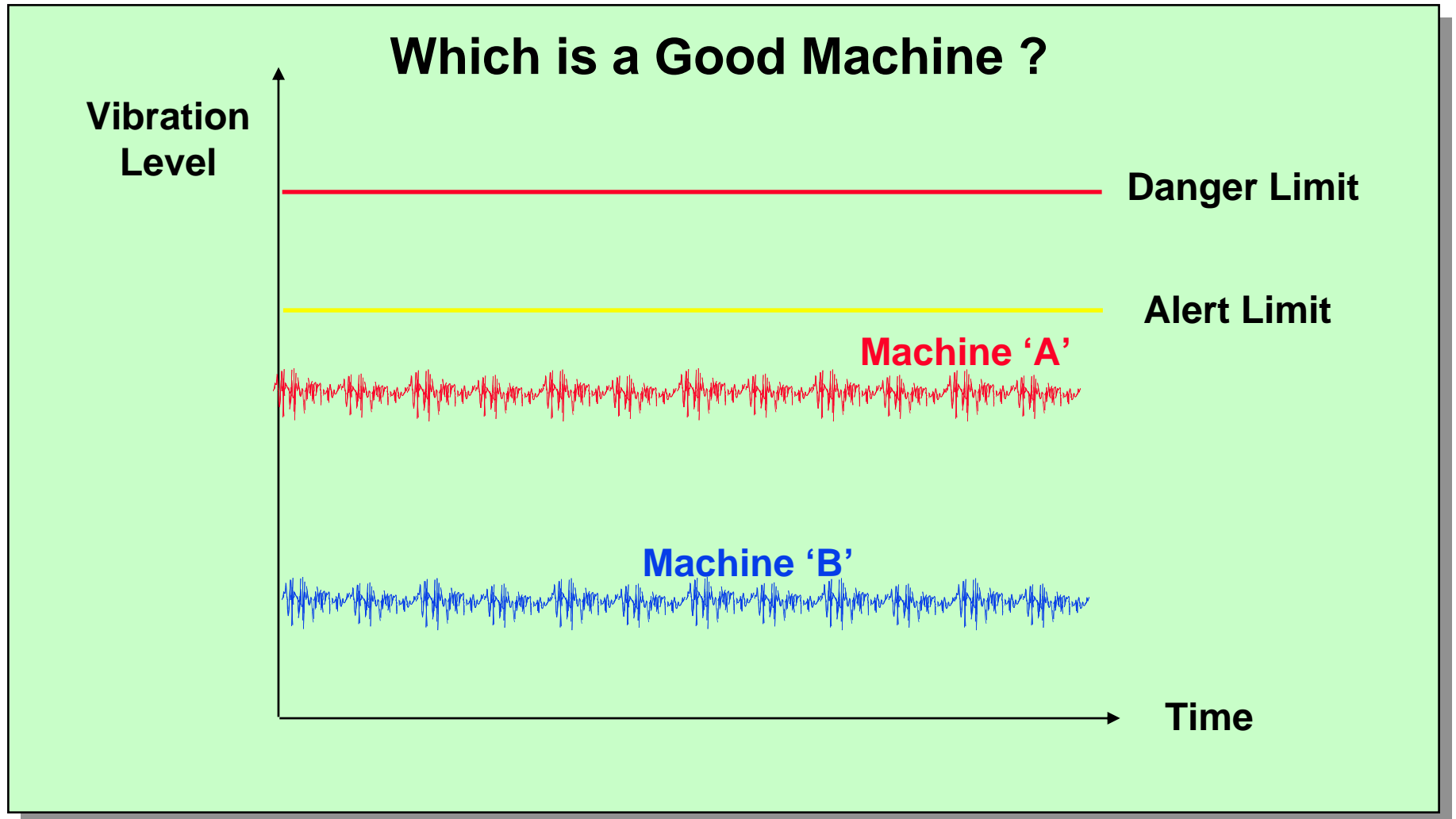
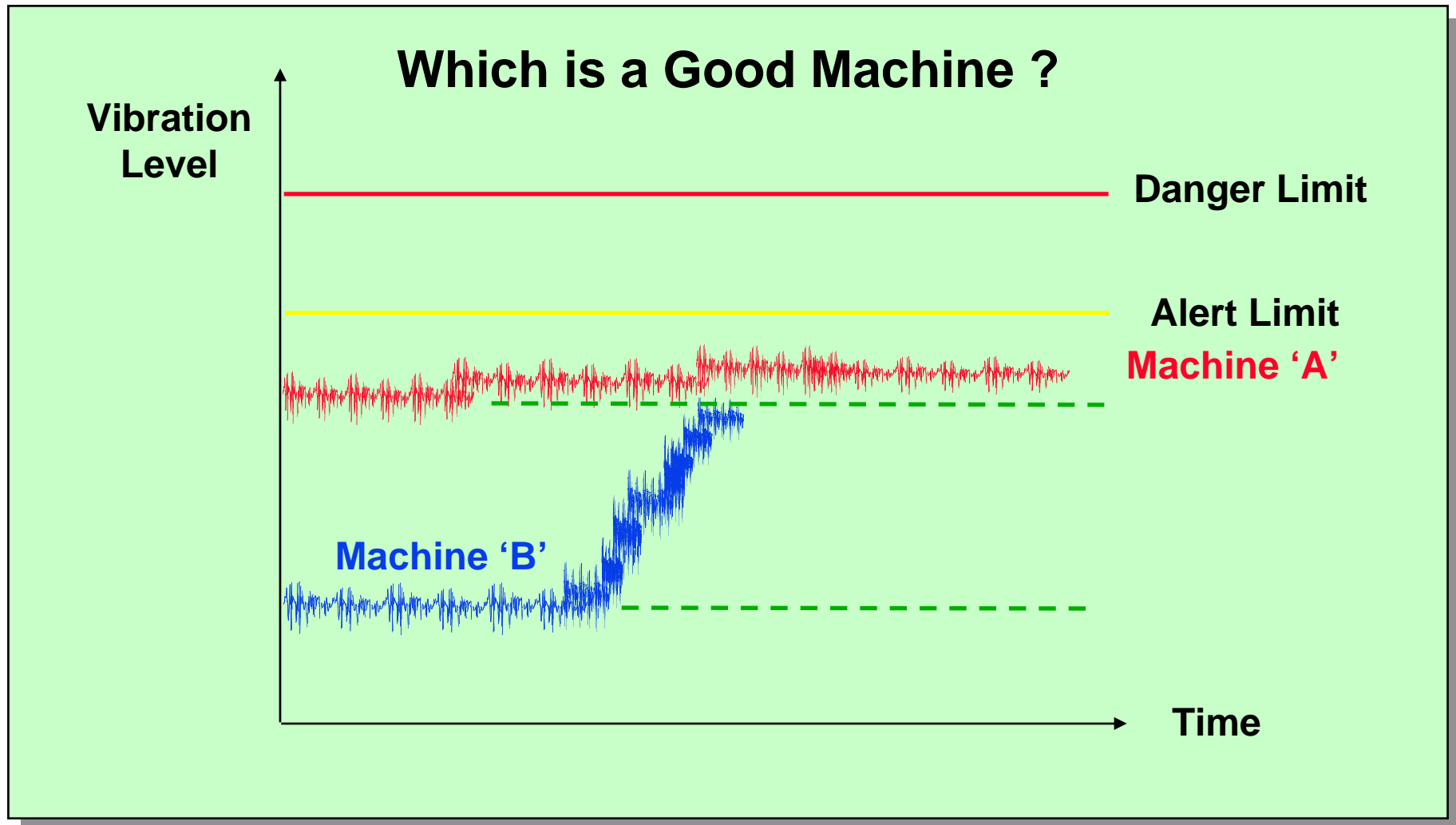


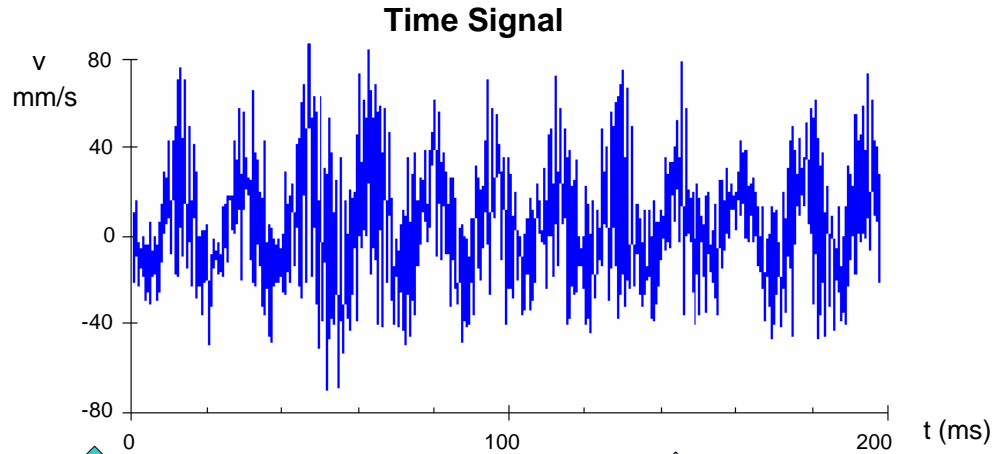
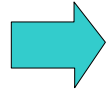
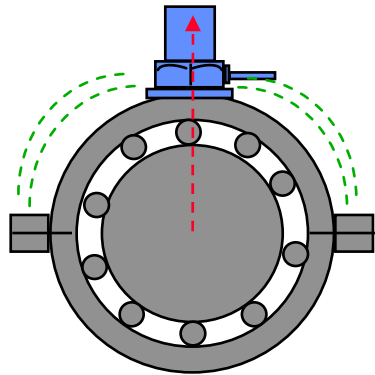
# Vibration Monitoring Example (B)



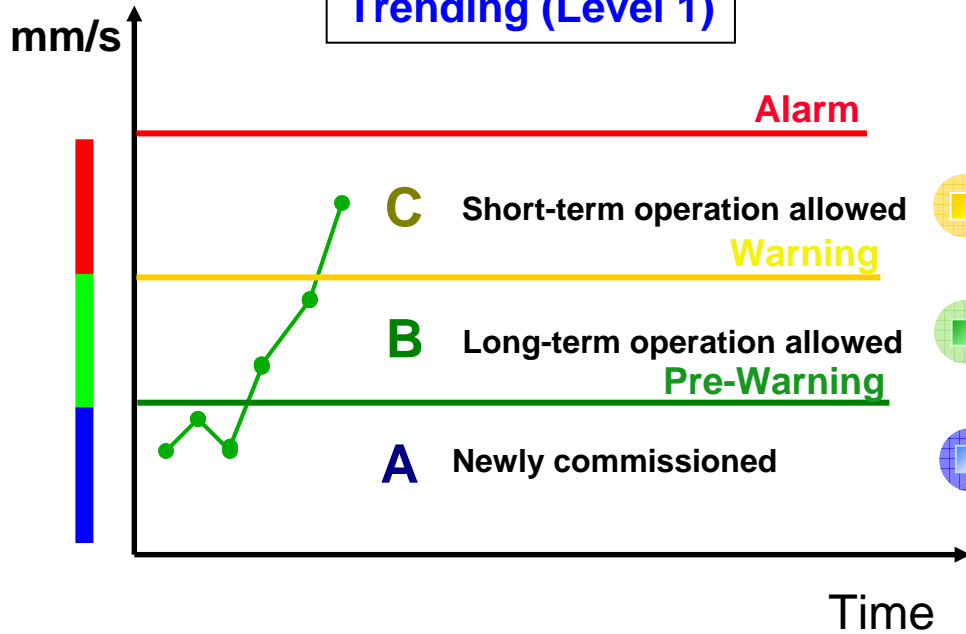
# Vibration Monitoring Example (C)



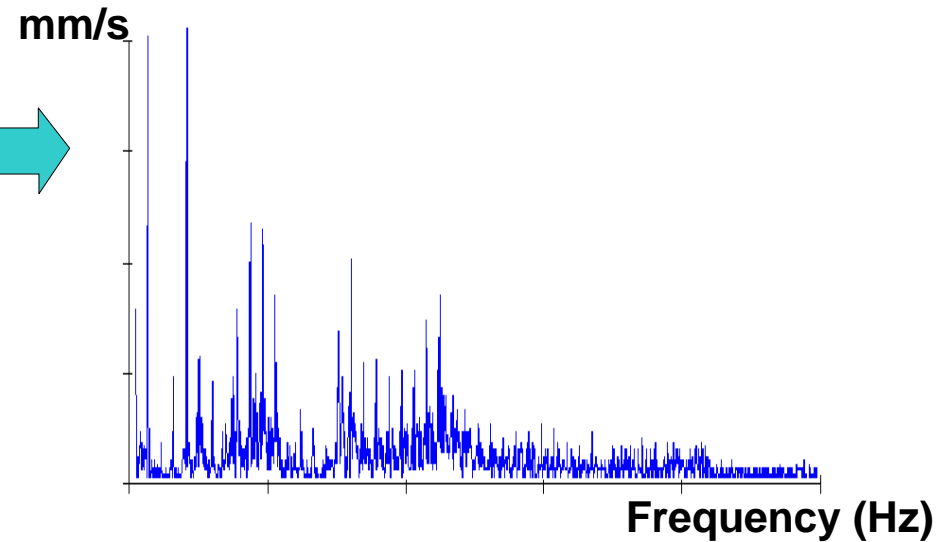
# Level 1 and 2 Philosophy



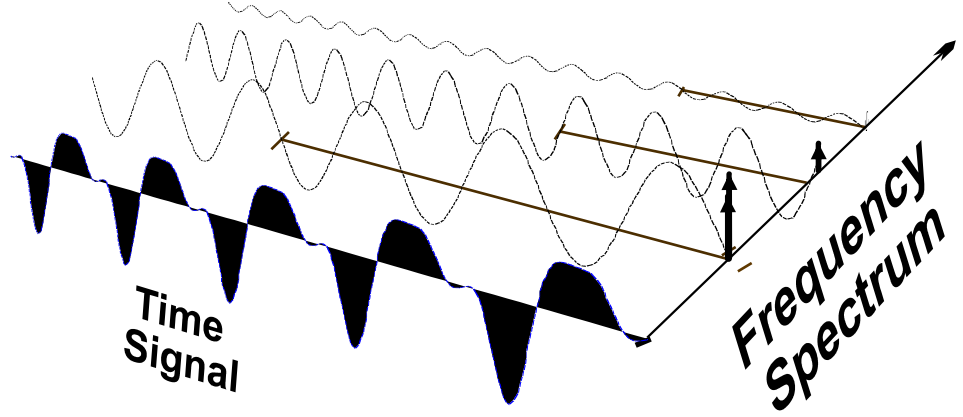
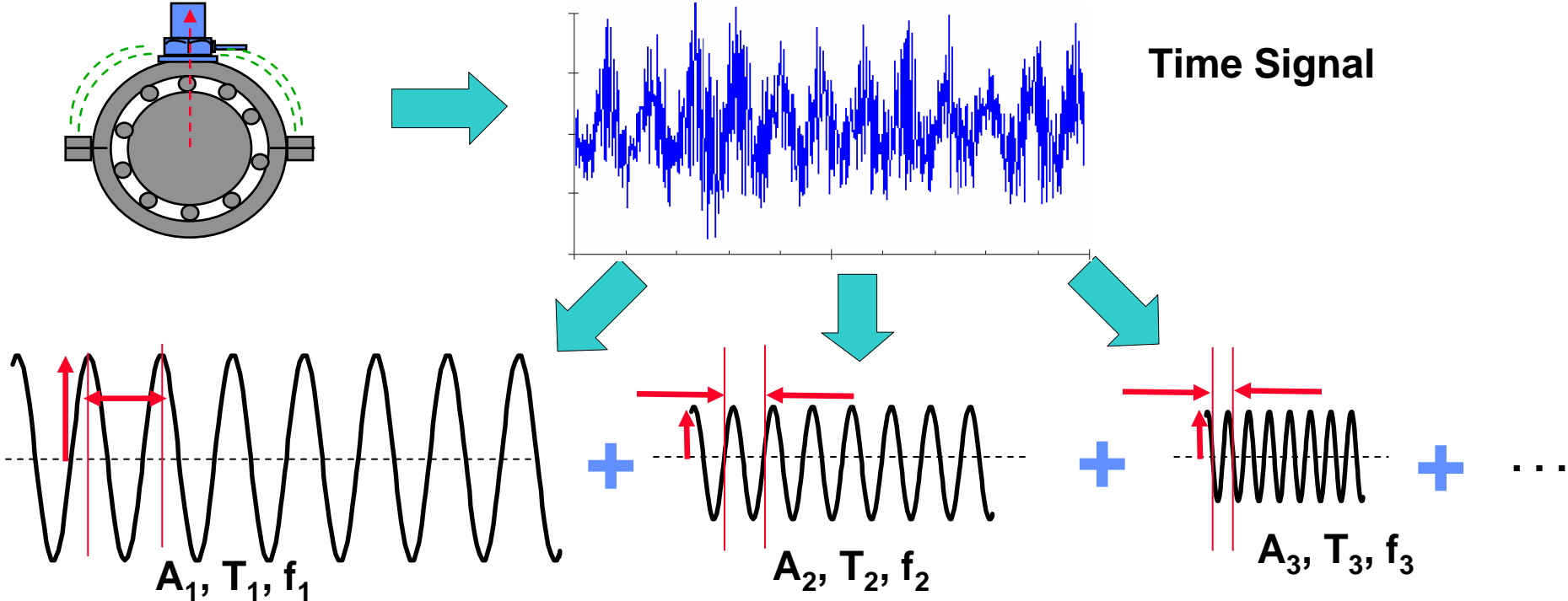
**Trending (Level 1)**



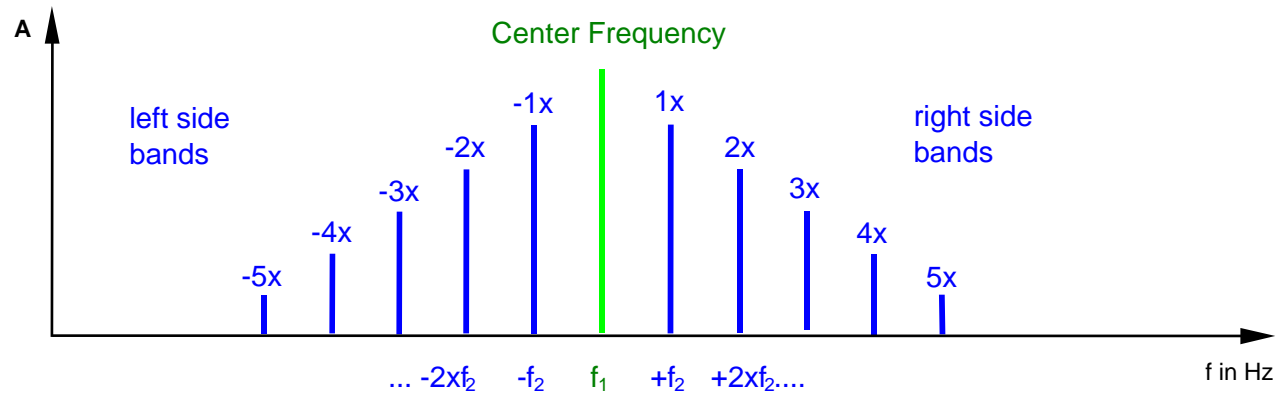
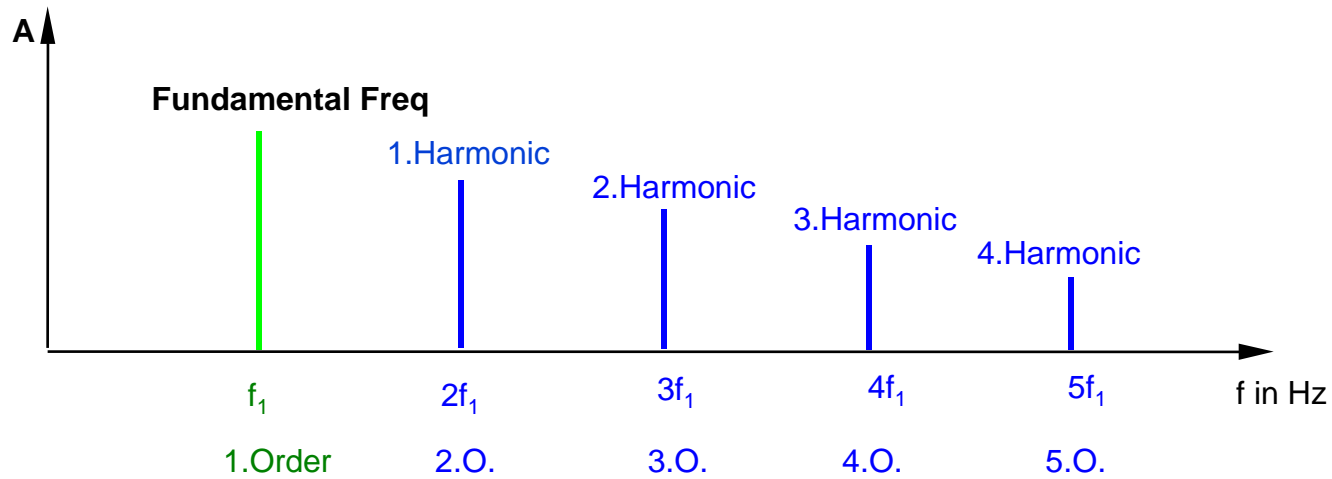
**Fast Fourier Transform (Level 2)**



# Machine Vibration Signal and FFT

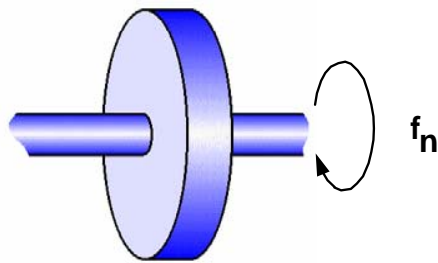


# Harmonics and Side Bands

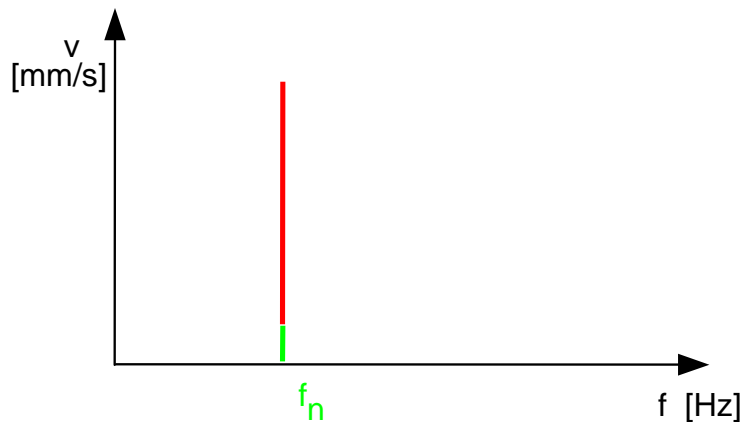


# Machine Vibration Example 1

## Unbalance



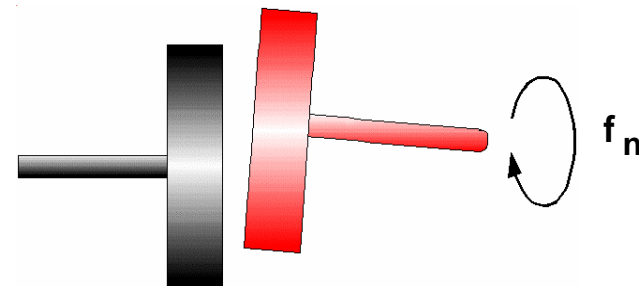
### Machine spectrum:



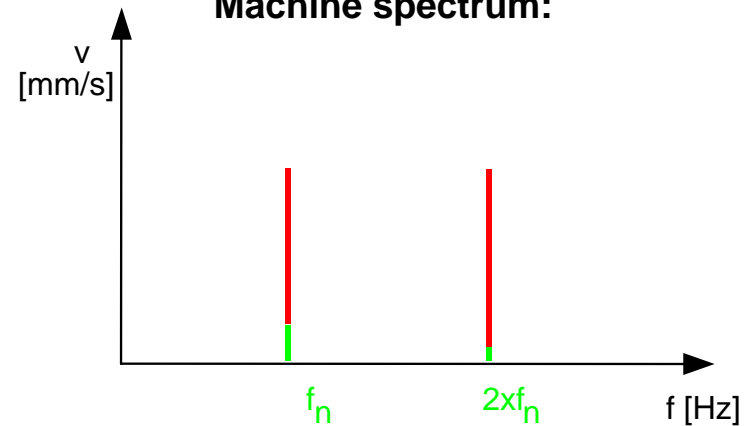
Symptom : High Amplitude at  $f_n$

- Fundamental Freq.  $F_n = \frac{\text{RPM} [\text{Rev/min}]}{60}$
- Evaluation criteria: ISO 10816-3

## Misalignment



### Machine spectrum:

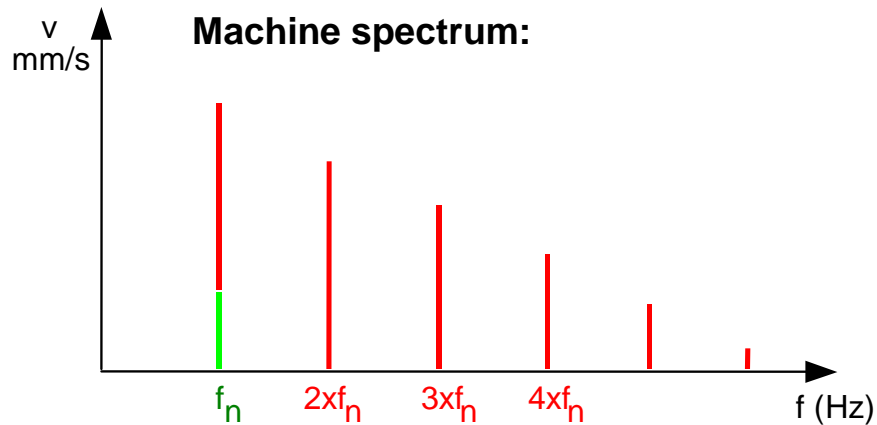
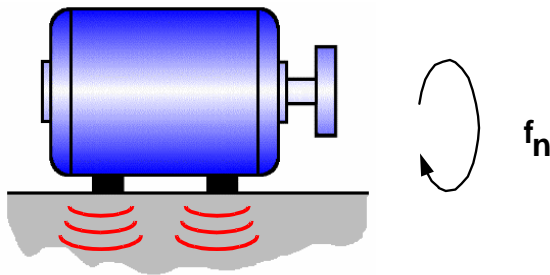


Symptom : Increased amplitude visible at  $f_n$  and/ or  $2xf_n$

- First and Second order of rotor frequency
- Radial : parallel misalignment  
axial : angular misalignment

## Machine Vibration Example 3

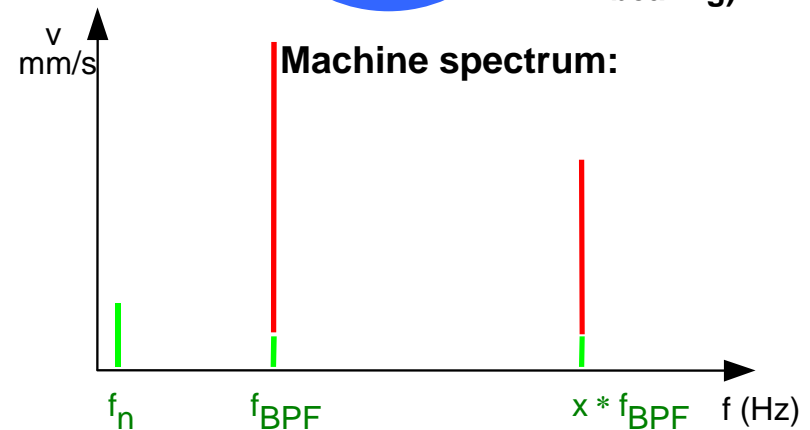
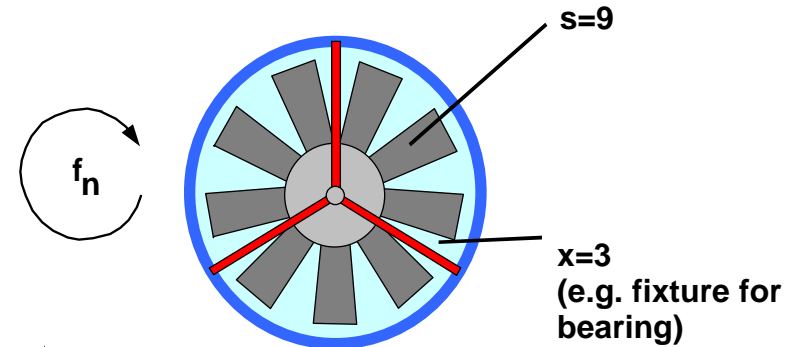
### Bad foundation



Symptom : Harmonics of  $f_n$  are visible

- fundamental freq.  $f_n = \frac{\text{RPM [Rev/min]}}{60}$
- Root Cause: Resonance or Instability

### Turbulences



Symptom : Blade pass frequency  $f_{BPF}$

- Blade pass frequency  $f_{BPF} = f_n \cdot s$
- Higher orders  $x \cdot f_{BPF} = f_n \cdot s \cdot x$
- $s$ : number of blades
- $x$ : number of disturbance locations