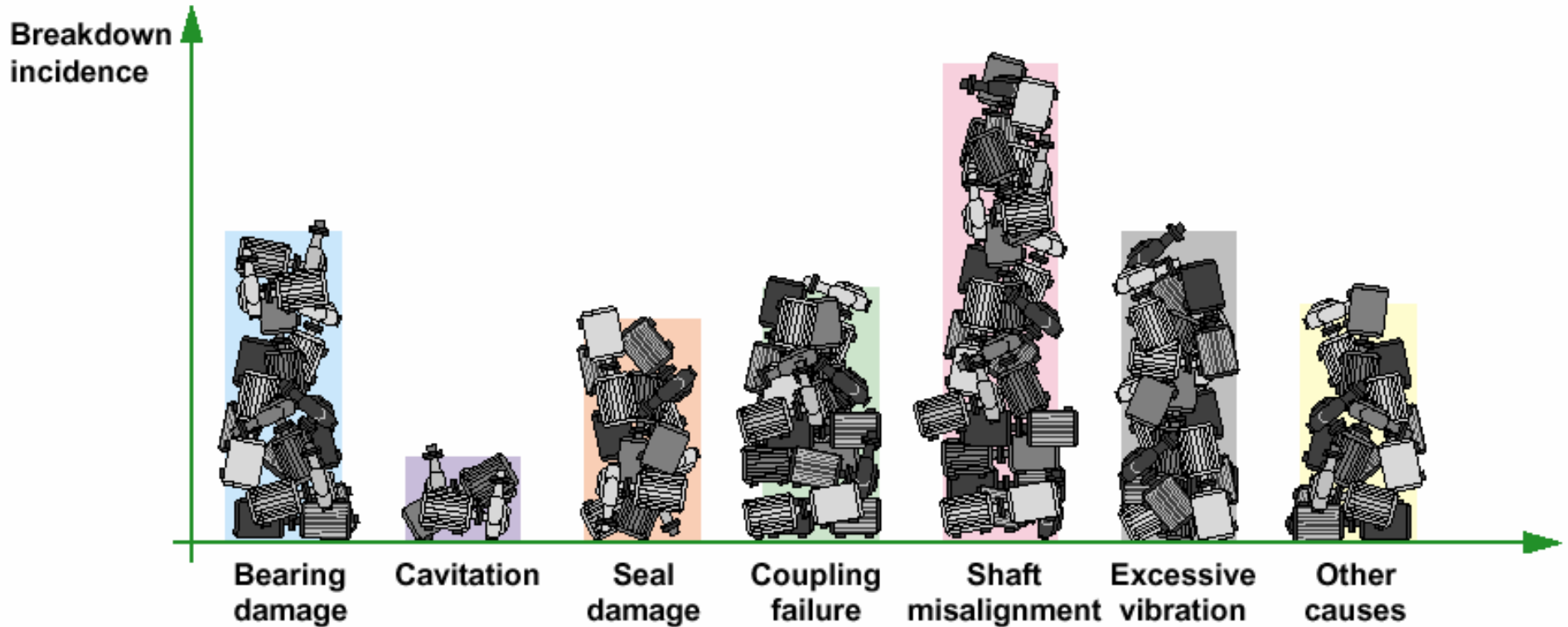

***CONDITION MONITORING EQUIPMENT
FOR
CONDITION-BASED (PREDICTIVE)
MAINTENANCE***

The Examples and Products

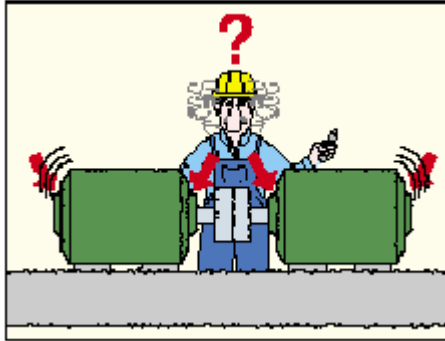
Original by RMS group

Causes of Machine Breakdown

80% of all machine breakdown are due to misalignment or balancing

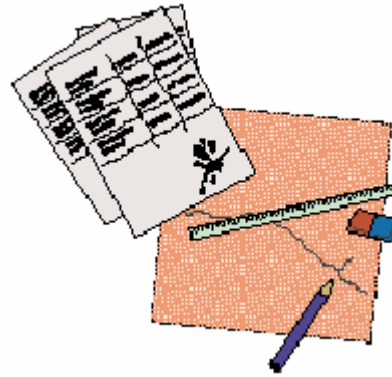


Collecting Data for Analysis



Without data collection

- Individual measurements yield little information
- When the machine 'howls,' it is usually already too late
- + No additional effort required
- Little chance of success
- High downtime incidence
- High repair costs



Data collection 'by hand'

- Time-consuming plotting of trend curves
- Paperwork-intensive
- + Plenty of advance warning
- + Good chance of success
- Major effort required



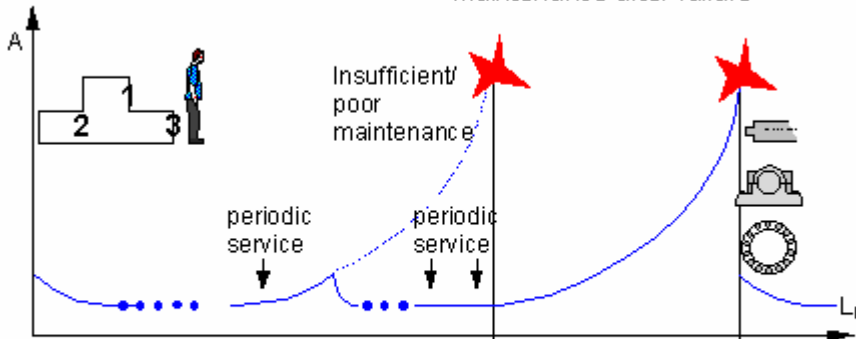
With data collector

- + Automated data collection
- + Automated trend plotting
- + Plenty of advance warning
- + Good chance of success
- + Reduced downtime
- + Reduced repair costs

Types of Maintenance Strategies

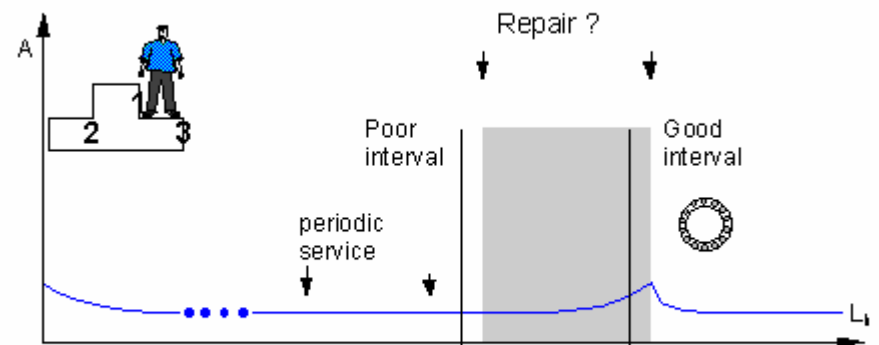
1. Break down maintenance

- Fire fighting 7 * 24 h / week
- maintenance after failure



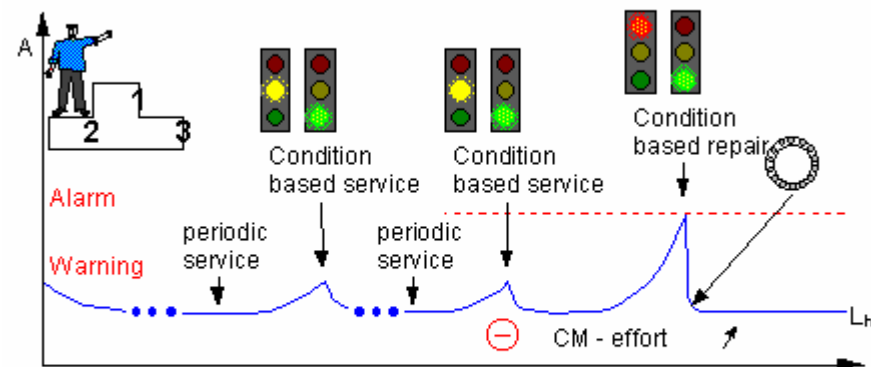
- ⊕ Takes full advantage of entire lifetime
- ⊖ Extensive resulting damage
- ⊖ Fire fighting 24 hours 7 days
- ⊖ Large supply of spare parts
- ⊖ Long, unplanned shutdowns

2. Preventive time based maintenance



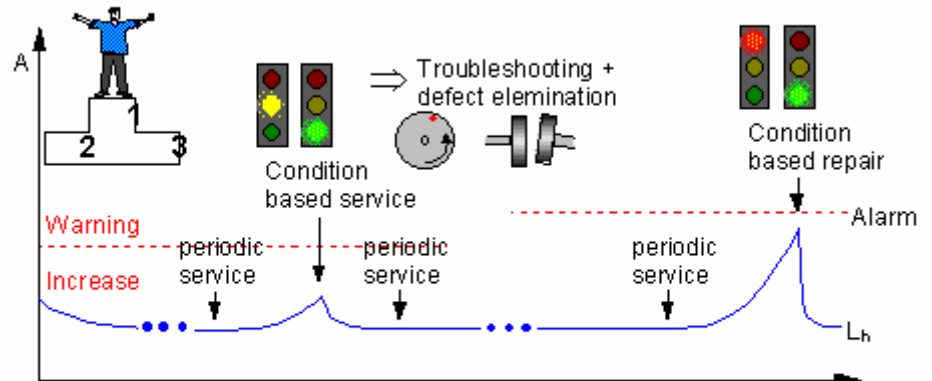
- ⊖ Lifetime not fully used
- ⊕ Planned shut downs
- ⊕ Minor resulting damage
- ⊖ Machine „repaired to death“

3. Condition based maintenance



- ⊕ Spare parts, repair according to condition
- ⊕ Takes advantage of entire lifetime
- ⊕ Service according to condition
- ⊕ No resulting damage
- ⊕ Planned shut downs
- ⊕ Production certainty

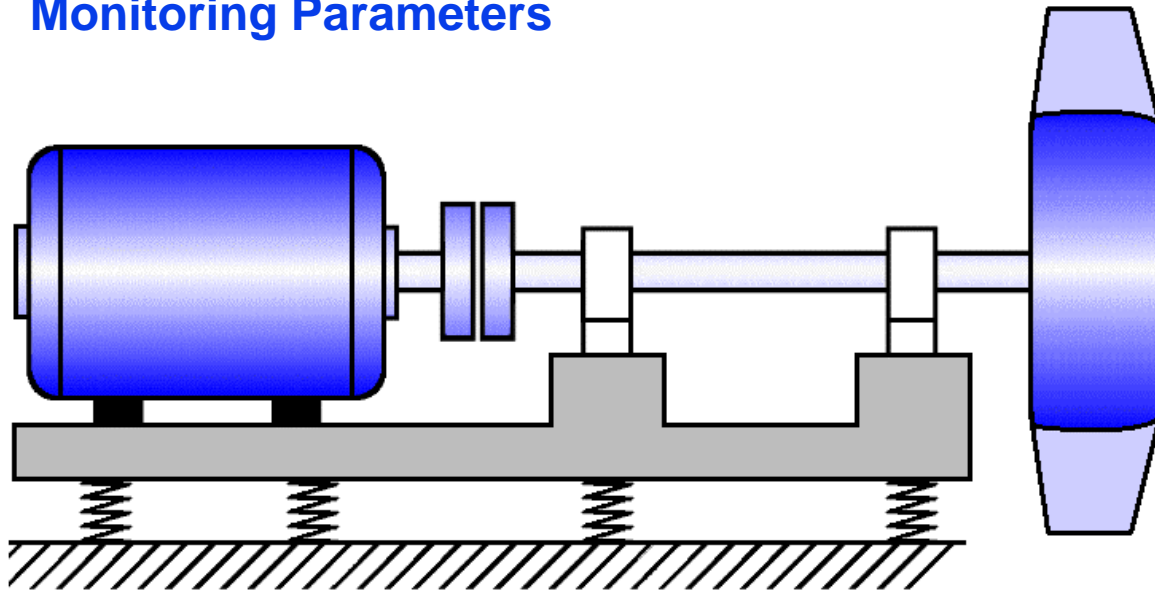
4. Preactive maintenance



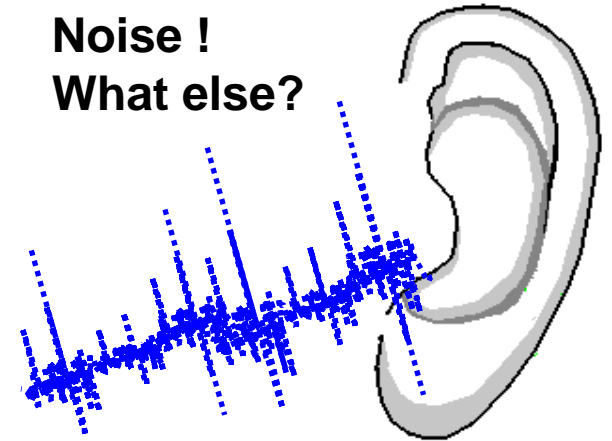
- ⊕ Lifetime prolongation by troubleshooting
- ⊕ Condition dependent periodic service
- ⊕ Comprehensive condition monitoring of process and operation
- ⊖ Effort CM Management ↗

What is Condition Monitoring ?

Monitoring Parameters



Noise !
What else?



Standard Machineries :

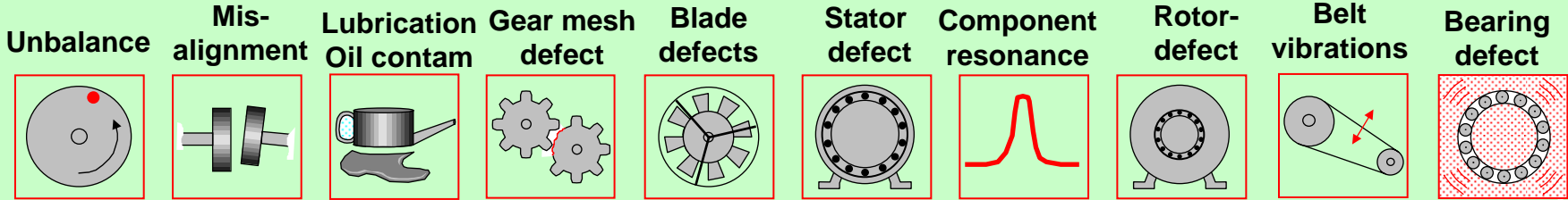
Temperature
Output
Phase
Motor Current
Pressure
Speed
Vibration
Oil Quality

Turbo-machineries :

Casing Expansion
Eccentricity
Valve position
Differential Expansion
Rotor position

Parameters for Condition Monitoring

Machines faults - Potential Failure Modes



Temperature

X X  X X X X X X 

Acoustic

X X X X X X  X X 

Oil Analysis

X X   X X X X X 

Vibration

      X   