

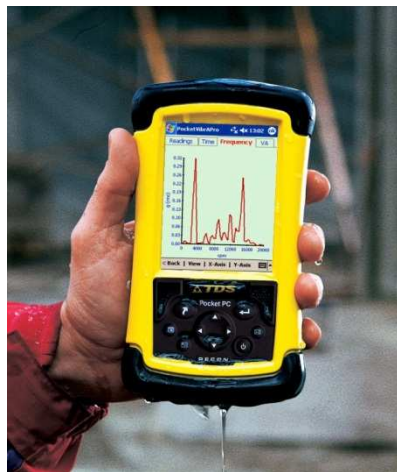
Predictive Maintenance

(or how to stop things breaking down!)

John Atkinson

C-Cubed Ltd

Engineering the maintenance revolution



C-Cubed

www.pocketvibra.com

Plant maintenance techniques:

1. **Breakdown Maintenance** (€22/kW/year*)
 - what the dinosaurs did!
2. **Routine Maintenance** (€15/kW/year*)
 - historically what most people have done
3. **Predictive Maintenance** (€11/kW/year*)
 - what the SMART people are doing

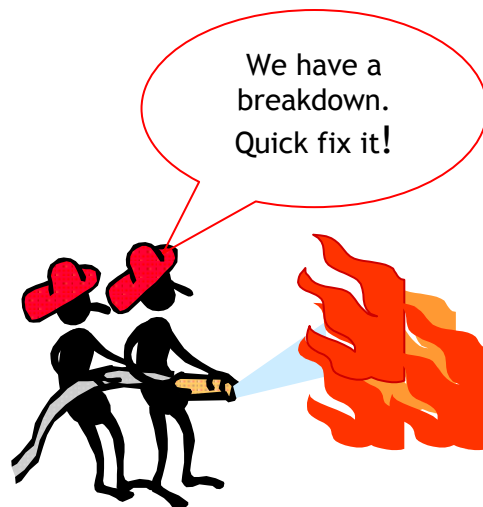
* Estimated figures based on a study carried out by Swedish vibration consultants VT AB.

Plant maintenance techniques:

Breakdown Maintenance

i.e. run it till it breaks down!

Some people still use this technique although it is becoming increasingly rare as they go out of business!



It can cost **10 times** more to repair equipment after a breakdown.

Plant maintenance techniques:

Routine (Scheduled) Maintenance

- historically what people have always done because there was nothing better!

Disadvantages:

- A lot of effort is needlessly wasted on machines that are perfectly OK - also dismantling machines can actually introduce errors!
- Also relies on luck - that machines don't randomly break down!
- Spares have to be ordered **after** machine is stripped down (or expensive redundant stock has to be carried)
- Can be **very** expensive if you get it wrong!

Plant maintenance techniques:

Predictive Maintenance (PdM)

- Condition Based Maintenance (CBM)
- The method used by people who intend to remain in business in future!

Advantages:

- No wasted effort, only repair machines that **need** fixing
- Allows you to spot faults **before** they cause break downs
- Work can be planned to coincide with shut downs
- Spares can be ordered **in advance**
- **Reduced down time!**

Plant maintenance techniques:

Predictive Maintenance

Disadvantages:

- Investment in maintenance tools (e.g. vibration analyser, thermal camera, trending software)
- Training of maintenance personnel in the use of these tools

These tools used to be expensive and difficult to use - but not any more!

Plant maintenance techniques:

Pro-active Maintenance (€6/kW/year*)

- *Closing the loop!*

- Identify the **cause** of the problem, which can then be **corrected** to prevent it occurring again
- Relies on recording and trending **ALL** relevant information
- **Any** process parameter can be trended (e.g. temperatures, pressures, oil condition, human observations etc)

* Estimated figures based on a study carried out by Swedish vibration consultants VT AB

Proactive Maintenance Tool Kit

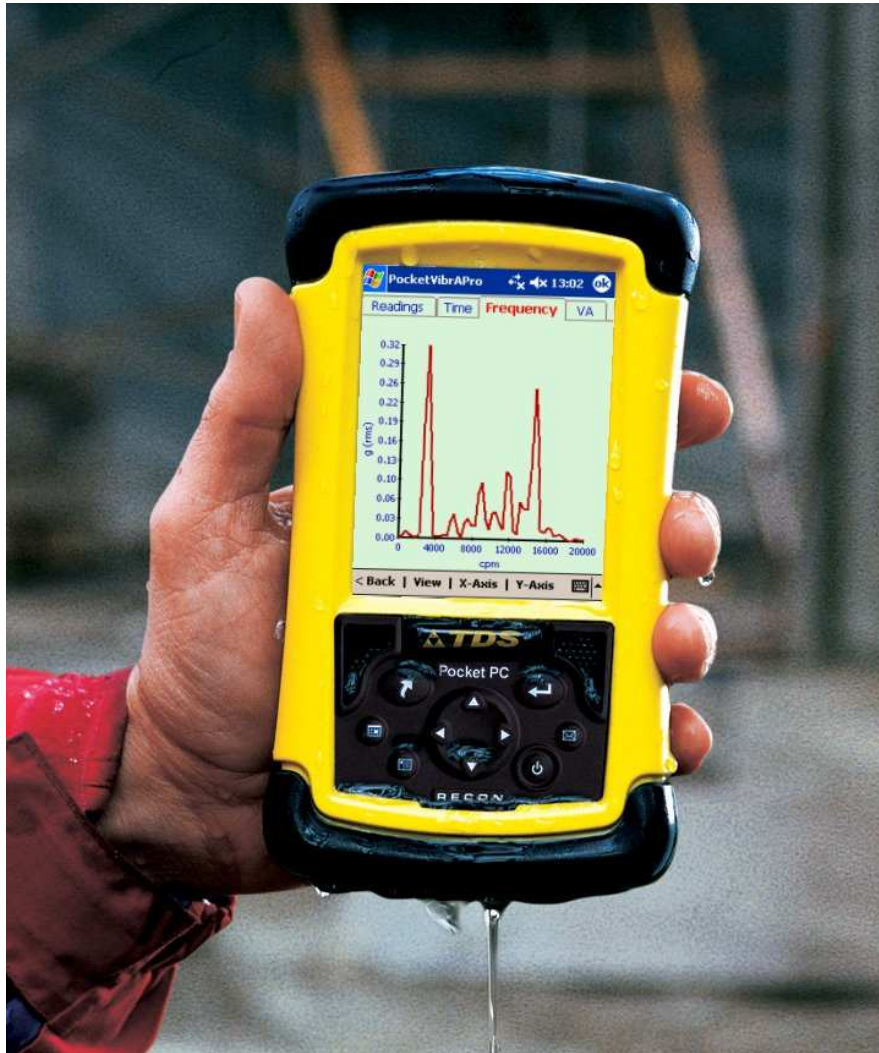
Vibration Analysis
Thermal Analysis
Lubrication Analysis
Inspection!
Laser Alignment
Field Balancing



Innovative Maintenance Products

- Very easy to use by **MAINTENANCE ENGINEERS**
- High level of **simple** and **intuitive** features
- User familiar **Windows** software – point and click
- Use very latest technology (e.g. **RFID**) to enhance user capability and efficiency
- Modular concept enables **easy upgrading**

Pocket VibrA - vibration analyser



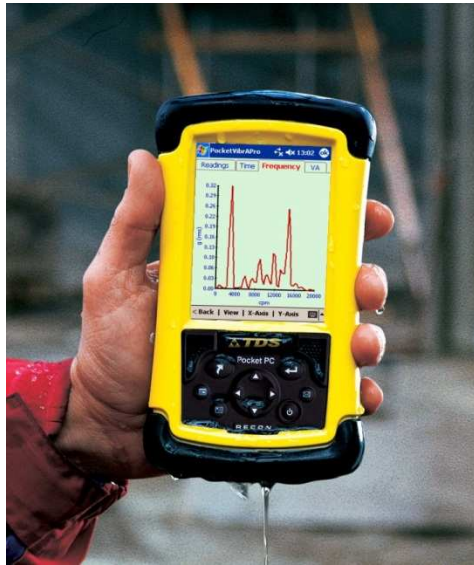
A portable rugged full function vibration analyser based on a rugged Pocket PC.

Collects and analyses vibration data to monitor asset condition.

Asset Wizard for motors, pumps, fans.

PocketVibrA will relate results to **ISO Standards**

Proactive Maintenance Tool Kit



PocketVibrA will tell you (on day 1):

If you have bearing damage.

If your plant is out of balance, loose, misaligned or unstable.

If you use the **C-Trend** software included and take regular measurements over time, PocketVibrA will also:

Allow you to see trends, predict when faults will exceed ISO standards, schedule maintenance, email a full report.. and thus offer a

Total Diagnostic Solution

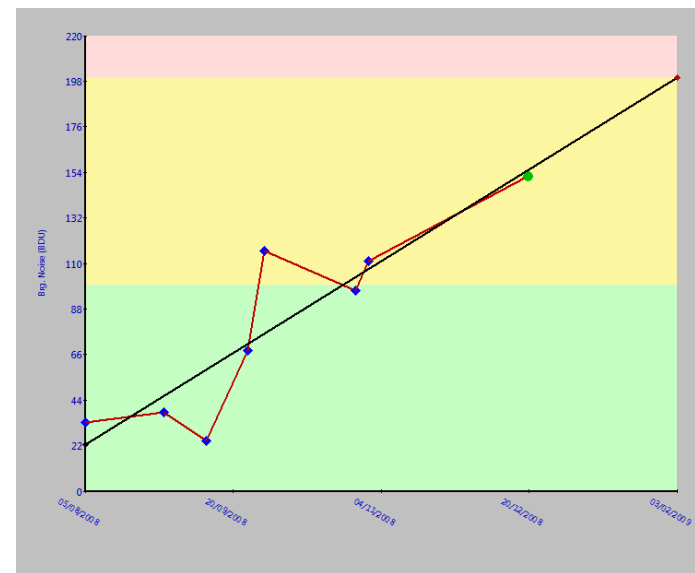
Vibration Analysis – C-Trend

C-Trend powerful trending and asset management software supplied with Pocket VibrA

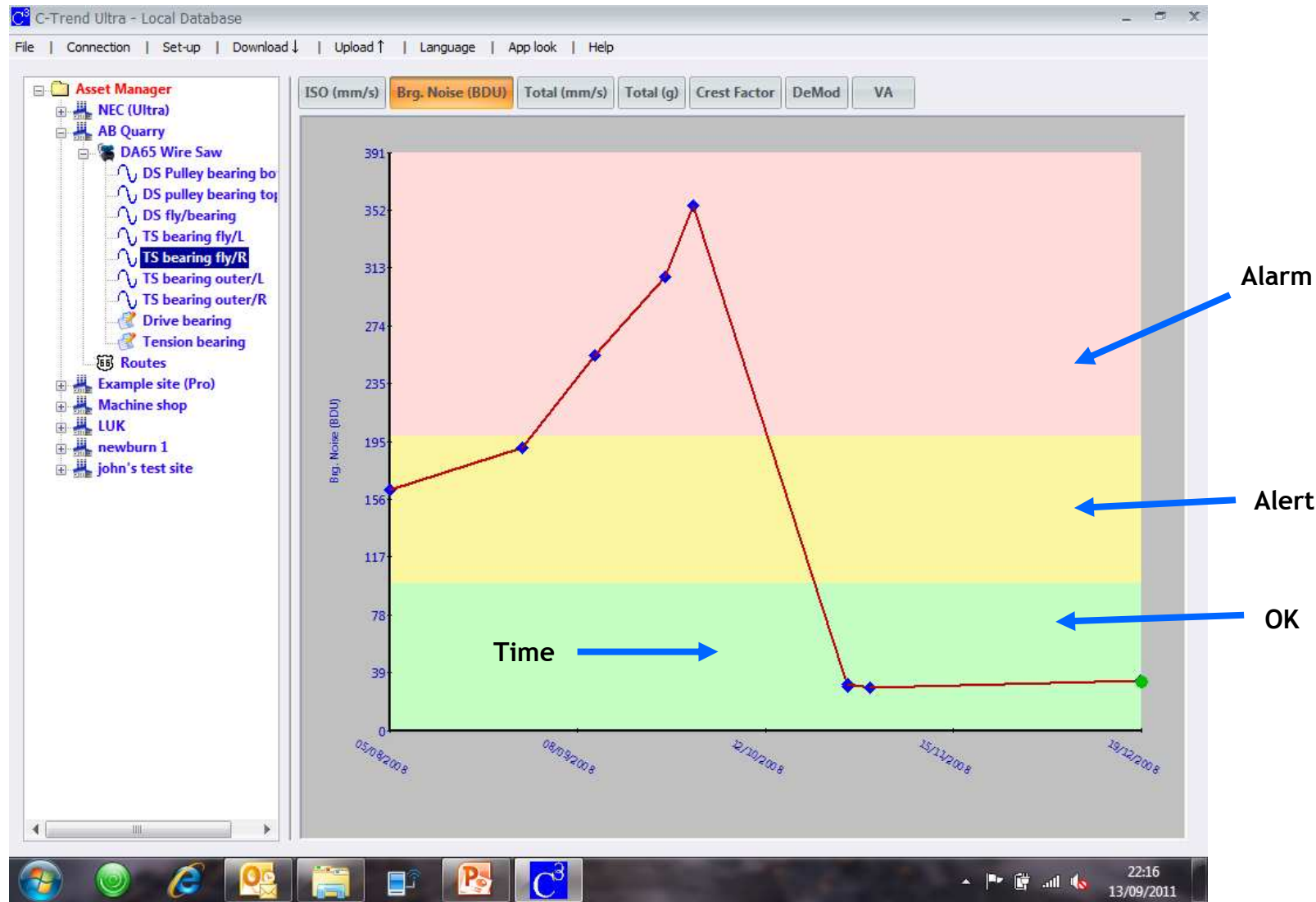
Use C-Trend to **View, Analyze & Report** on all your assets and **PREDICT** machine breakdown, saving downtime and money.

Simple Windows based software makes predictive maintenance possible for everyone.

Trend *any* data to give total understanding and control of your assets.



C-Trend – Easy, effective monitoring of asset condition!



Lubrication Analysis – Pocket Lube

Pocket Lube – gives the engineer complete control by measuring the bearing noise **BEFORE, DURING** and **AFTER** lubrication.

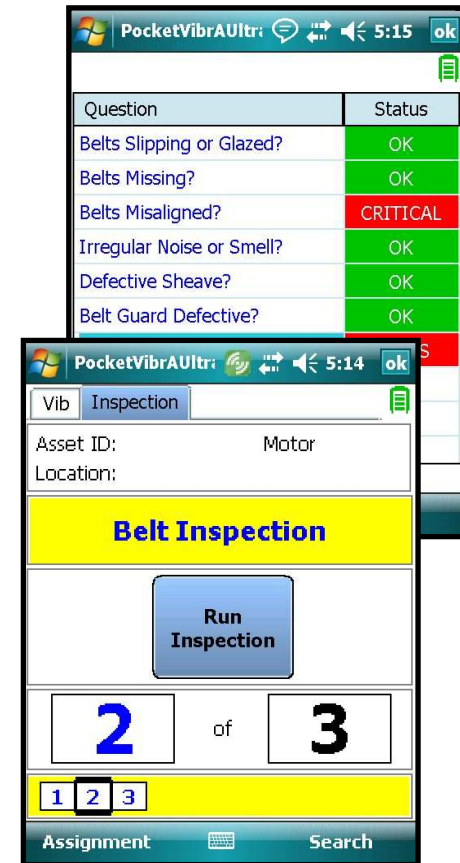
Both **Under** and **Over** lubrication can cause bearing damage. Pocket Lube helps you get it right.

Control lubrication costs by only lubeing when necessary and using the **correct** amount of lubricant.



Inspections – Pocket Inspection

- **Pocket Inspection** guides the user through pre-defined inspections for guaranteed and repeatable results.
- **Define** your own inspections for complete control with different degrees of criticality
- **Email** critical inspection results instantly and automatically
- **RFID** tags can be used to guarantee inspection confirmation – you can see it's been done!



Laser Alignment

- **Misalignment** is a major source of premature machine failure
- Simple to use **Laser Technology** enables instantaneous precision alignment of machinery

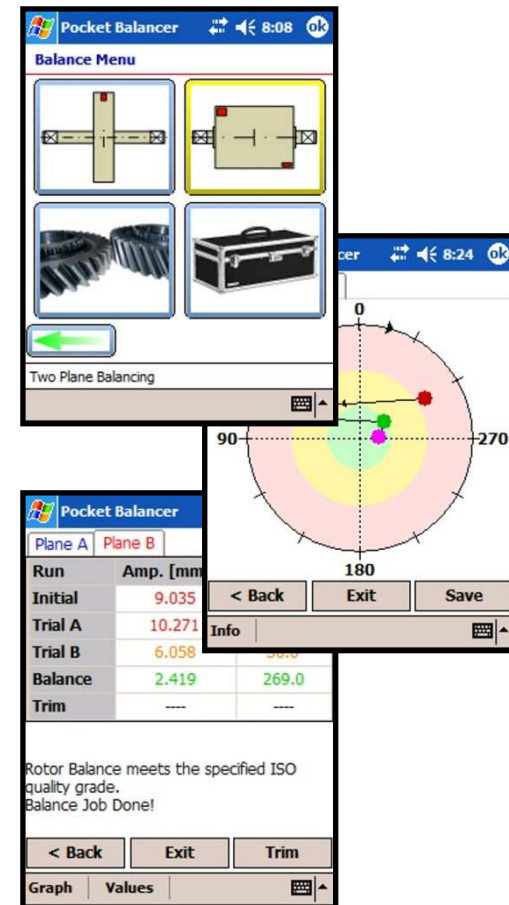


It is essential to align:

- Machine Trains (pumps, fans, compressors etc)
- Rollers
- Pulleys

Pocket Balancer (Field Balancing)

- Out of balance is the number one cause of premature bearing failure. **Pocket Balancer** makes a difficult job easy!
- **Simple** to use step-by-step screens lead even a novice user effortlessly and effectively through single or two plane balancing jobs.
- **Innovative Technology** allows precise balancing in fewer runs, saving time and money.



Plant maintenance techniques:

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2. Routine Maintenance (€15/kW/year*)
3. Predictive Maintenance (€11/kW/year*)
4. Pro-active Maintenance (€6/kW/year*)

Now - there's simply no excuse!