Competition

Background

- https://www.machinerylubrication.com/Read/839/acoustic-analysis-lubrication
- https://ims.evidentscientific.com/en/learn/white-papers/intro-ultrasonic-transducers-ndt-testing
- Marble — Grid Hardware Status

Transformer Fault Detection

Oktogrid

- Danish company to do almost exactly what we currently do.
  - magnetometer; 3-axis vibration analyzer; ultrasonic mic; transformer temperature
  - freq; harmonics; load profile; early fault detection of core, winding, and structure; transformer capacity (IEEE model based on temperature); load forecast; identifying asset lifespan (?)
- Raised €3M in December 2022 (latest round)
- 8 employees, $80k/yr salary
- 2023 annual audit by KPMG
  - $200k gross profit (revenue minus cost of goods)
  - $650k/yr operating costs
- Selling product as ABB Ability® (page with leaflets)
  - ABB Ability Asset Manager for Transformers
  - ABB product datasheet
  - ABB pitch deck
- Oktogrid customer references
- Outage report example
- Finland customer success story

Magnefy

- American version of Oktogrid
- previous cohort of LabStart
- raised $1.5M in a pre-seed round
  - don't think they have any customers yet, hence pre-seed
- supposedly utilizing a high-freq magnetometer, but it looks like their product barely relies on that
- Hardware is leased from Stanford
- Software is supposed to be leased from FSU professor Gian Carlo Montanari
  - AI model, opaque, Joseph Kao doesn't know how it works
  - Takes in the magentometer data from the Stanford hardware
- If they own neither the hardware nor the software, I worry about their ability to complete this

Acoustic Emissions Analysis

Vailen

German acoustic emissions company

> Waveform-based analysis, such as FFT, wavelet transform, enhanced feature extraction and pattern recognition provides additional information about, e.g. source mechanisms, damage evaluation or wave propagation.

Neuron Soundware

AI-driven acoustic monitoring with easy-to-deploy sensors. Strong in logging, cloud analysis, and real-time alerts for any asset type.

Nanoprecise

Wireless IoT solution, acoustic plus vibration plus environment sensing. Rapid installation (up in days), strong in hazardous industries, provides Remaining Useful Life predictions.

Mistras Group

While the founder was an acoustics guy, they don't really do acoustics anymore. They're focused on NDT and oil and gas contracts (80% of their revenue).

Ultrasonic Analysis

- Handheld bearing tool
- https://www.machinerylubrication.com/Read/31954/detecting-low-or-slow-speed-bearing-failure-ultrasonics
- https://www.bearing-news.com/diagnosing-bearing-failures-using-ultrasound-spectrum-analysis/

EA Technologies

- Explanation of PD detection
  - implies that they're doing broadband analysis
- small handheld device
  - likely cheap
- brochure
  - 40 kHz center frequency???
  - heterodyning???
  - very odd

UE Systems

- > \$15k/unit
- Limited analysis
- No data collection
- Manual usage

SDT-340

- $2,290/unit
- Limited analysis
- No data collection

Fluke

Fluke ii915 is an acoustic imager that is the size of a book. It uses an array of 64 MEMS microphones (based on information available for the ii900 but not available for the ii915). This is used for ultrasonic detection of partial discharge. It does not appear to have a parabolic dish.

Exacter, Inc.

RF emissions of PD and ultrasonic emissions of PD. They fly a helicopter around looking for PD on transmission poles. Offer it for transmission lines, distribution lines, and substations. It's a mix of their monitoring device being installed, and having workers travel and do inspections. Sounds incredibly expensive, and their last blog post is from DistribuTECH 2024.

Their CFO Chris Henneforth was involved in criminal wire fraud case, and he appealed. The verdict was sustained.

Vibration Analysis

Fluke

Fluke 810 is the preferred tool, and it costs ~$15k/unit. In addition, it requires trained, manual use on the machines, taking measurements that attach to the machine in multiple locations (after inputting into the Fluke 810 the design of the system). The Fluke 810 gives you a diagnosis assessment for different bearings, which is a good offering. It has 800 lines of FFT resolution, which means if you are sampling at 40 kHz, your resolution is 50 Hz.

Fluke 805 is a small meter that looks like a pen, but they emphatically declare that it is not. It is designed for go/no-go measurements. It has 100 Hz frequency resolution, which is not enough for detailed analysis, and does not provide any way to store the data for later analysis.

Tractian

Most likely vaporware

Educational material:

- Vibration analysis and AI
Trigger	Frequency	Amplitude	Comments
Unbalance	1 x RPM	Proportional to the imbalance, greater in the radial direction	Usually appears in the first harmonic
Misalignment/Bent shaft	1/2/3/4 x RPM	Large in the axial direction	Misalignment between bearings
Clearance in the bearings	1/2 x RPM	Large in the vertical direction	As the frequency is less than 1/2 amp, phase can be variable
Lack of mechanical firmness	2 x RPM	Unstable	Usually affects the alignment
Loose straps	1 x RPM	Unstable	-

Defective gears	High	"Blips"	Frequency between 15-40 kHz
Deteriorated bearings	High	"Blips"	Frequency between 15-40 kHz
Lubrication	High	-	The amplitude changes significantly due to the lubrication
Twisted shaft	1 x RPM	Large in the axial direction	The amplitude can be present in a pulsatile form

- Electric motor guide

Tractian does not appear to do the analysis for you — it looks like they give you the tools to do it yourself.

Fracttal

Triaxial vibration sensor samples at 3.2 kHz, which means it can only detect frequencies up to 1.6 kHz, which is low.

Ludeca

asdf

Mitchell Instrument Co

asdf

BETAVIB

- \$35k for total system (+ \$12k/machine)
- Only does bearing assessment
- Automated operation

VIE

After a conversation with Jim Hildenbrand, I learned that VIE has small hockey-puck vibration analyzers that send all of their data back to the cloud, where analysis is done through discriminant AI (discriminant meaning "not generative").

- The winding analysis was done in the early days where they would match vibrational readings with a manufacturer's assessment of whether or not something has winding issues. The implication was that this analysis was done in the early days and has not been updated.

    - There is clear room for improvement on this. I have heard that the vibration analysis isn't that good.
- Been around for 10 years and has ~30 employees
- Series A round of $15M in March 2025, led by Energy Impact Partners
    - Supposedly deadpooled? They started, folded, and then came back?
- They seem to be struggling to get a product that works
- Cost is ~$4k/unit

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