OpsPilot

Vibration Analysis — User Manual

ISO 20816 Severity & Fault Diagnosis · AI Engineering Co-Pilot

What this guide covers — what vibration analysis does, how the OpsPilot module guides it across four modes, what to have ready, and the report you receive.

1. What is vibration analysis?

Vibration analysis listens to rotating machinery and tells you what's wrong with it — imbalance, misalignment, bearing defects, looseness, resonance — from the pattern of vibration it produces, and how urgent it is from the severity of that vibration. It is the backbone of condition-based maintenance on pumps, motors, fans, compressors and gearboxes.

OpsPilot applies the recognised standards — *ISO 20816 for severity (the current series replacing ISO 10816/7919), ISO 13373 for diagnostic method, ISO 17359 for condition monitoring, ISO 18436-2 for analyst competence* — and enforces a strict discipline: quantitative answers, explicit confidence, and no corrective action on a low-confidence diagnosis without a confirmation test first.

2. What the OpsPilot module does

Role	Responsibility
🎯 **AI Vibration Analysis Coach (OpsPilot)**	Guides the full lifecycle and forces rigour: quantitative readings (“9.2 mm/s RMS at the non-drive-end horizontal”, not “high vibration”), a diagnosis stated with explicit confidence (High / Medium / Low) and a differential, and the Severity-Action Rule — no corrective action at medium or low confidence until confirmation tests are done.
👷 **Condition Monitoring / Maintenance Engineer (you)**	Provide the machine, the readings (or the symptoms), the operating context and the history — and carry out the confirmation tests the coach calls for.

3. The four entry modes

Mode	When to use it
Symptom	You have a problem and no data yet — the coach helps you get the right measurements.
Data	You have readings — the coach assesses severity and diagnoses the fault.

Mode	When to use it
Verification	You've done a repair — the coach confirms whether it worked.
FIV / AIV	Flow-induced or acoustic-induced vibration in piping — assessed per the Energy Institute guidelines.

4. What you will be asked — have this ready

- The machine, its running speed, bearing arrangement and operating context.
- Quantitative readings where you have them — overall level in mm/s RMS, the measurement location and direction, and a spectrum if available.
- The history — is this new, worsening, or steady?
- Willingness to run a confirmation test before acting on a medium- or low-confidence diagnosis.

5. What you receive — the output

A vibration analysis report (Word): the severity assessment against ISO 20816, the fault diagnosis stated with explicit confidence and a differential (the alternatives considered), and a confidence-driven action plan that won't send you to the workshop on a guess.

6. Worked example (illustrative)

A pump reads 9.2 mm/s RMS at the non-drive-end horizontal, with the spectrum dominated by a peak at 1× running speed. Severity against ISO 20816 puts it in the action zone. The diagnosis: imbalance, stated at High confidence, with misalignment held as the differential. Because confidence is high, the action is to balance. Had the spectrum been ambiguous and confidence only Medium, the rule kicks in — confirm with a phase measurement before anyone touches the coupling, rather than balancing a machine that's actually misaligned.

7. Getting the best result

- **Give numbers, not adjectives.** “9.2 mm/s at NDE-H” is diagnosable; “high vibration” is not.
- **Demand a confidence and a differential.** A diagnosis without confidence is a guess.
- **Respect the Severity-Action Rule.** Don't carry out a corrective action on medium/low confidence until a confirmation test backs it.
- **Use Verification mode.** Prove the repair worked — don't assume the vibration went with it.