OpsPilot

Asset Integrity Analysis (RBI) — User Manual

Risk-Based Inspection · API 580 / 581 · AI Engineering Co-Pilot

What this guide covers — what risk-based inspection is, how the OpsPilot module structures the analysis, what to have ready, and the report you receive.

> **Professional accountability.** OpsPilot structures the analysis; the integrity/inspection engineer bears the professional engineering accountability for the inspection programme. The output is a structured analysis for competent review, not a substitute for that judgement.

1. What is Risk-Based Inspection?

Risk-Based Inspection (RBI) decides where to spend inspection effort by ranking equipment on risk — and risk is Probability of Failure × Consequence of Failure. Rather than inspecting everything on the same calendar, RBI inspects the high-risk items more, the low-risk items less, and frees resources accordingly. The discipline starts with identifying the credible damage mechanisms — thinning, stress-corrosion cracking, hydrogen damage, high-temperature hydrogen attack, creep, fatigue, brittle fracture, corrosion under insulation — and there are around seventy named mechanisms to screen against.

OpsPilot follows *API RP 580 (the framework), API RP 581 (the calculation methodology), AS/NZS 3788, DNVGL-RP-G101 and ASME PCC-3*, supporting qualitative, semi-quantitative and quantitative approaches.

2. What the OpsPilot module does

Role	Responsibility
🎯 **AI Coach — Integrity Engineer (OpsPilot)**	Structures damage-mechanism identification, Probability-of-Failure assessment, Consequence-of-Failure assessment (area / financial / safety / environmental), risk ranking, inspection planning, and risk mitigation beyond inspection.
👷 **Integrity / Inspection Engineer (you)**	Provide the equipment inventory, service profile, inspection history and damage findings — and you bear the professional engineering accountability for the resulting programme.

3. How it works — the process

#	Stage
1	Equipment inventory and service profile
2	Damage mechanism identification (~70 mechanisms screened)
3	Probability of Failure (PoF) assessment
4	Consequence of Failure (CoF) — area, financial, safety, environmental
5	Risk ranking — Risk = PoF × CoF
6	Inspection planning — effort proportional to risk
7	Risk mitigation beyond inspection

4. What you will be asked — have this ready

- The equipment inventory and each item's service profile (fluid, temperature, pressure, materials).
- The inspection history and any damage findings to date.
- The consequence context — what a failure would mean for safety, environment, production and cost.

5. What you receive — the output

A complete Asset Integrity Analysis / RBI report (Word): the damage-mechanism screening, the PoF and CoF assessments, the PoF × CoF risk ranking, the risk-based inspection plan (technique and interval per item) and mitigation options where inspection alone won't bring the risk down.

6. Worked example (illustrative)

A pressure vessel in wet hydrogen-sulphide service. Damage-mechanism screening flags hydrogen-induced cracking and sulphide stress cracking as credible. PoF is assessed medium-to-high given the service and the inspection history; CoF is high because a loss of containment would be a toxic release. PoF × CoF lands it in the high-risk band — so it gets a focused inspection plan (internal inspection plus targeted ultrasonics at an interval proportional to that risk), and because the consequence is so high, the analysis also considers mitigation beyond inspection, such as a materials upgrade. A low-risk utility-water drum on the same site, by contrast, earns a much lighter inspection — which is the whole point of RBI.

7. Getting the best result

- **Screen all credible mechanisms.** The damage mechanism you don't consider is the one that isn't inspected for.
- **Risk = PoF × CoF.** A low-probability, high-consequence item can still be high risk.
- **Inspect proportional to risk.** That's the efficiency RBI exists to deliver.

- **Look beyond inspection.** Where risk is too high, mitigation or redesign may be the answer, not more inspection.