

OpsPilot

RCM Module — User Manual

Reliability Centred Maintenance · AI Engineering Co-Pilot



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What this guide covers — what RCM is, how the OpsPilot RCM module applies the SAE JA1011 framework, the questions it asks, and the maintenance task list you receive. An illustrative example runs through the document.

1. What is Reliability Centred Maintenance?

Reliability Centred Maintenance (RCM) decides the RIGHT maintenance for each way a piece of equipment can fail — based on the consequence of that failure, not on habit or the calendar. The guiding principle is that more maintenance is not always better: an unnecessary task wastes money and can introduce its own failures, while a missing task leaves a real risk unmanaged.

OpsPilot applies the *SAE JA1011 seven-question RCM framework*, the recognised standard, and challenges unnecessary tasks as hard as it challenges missing ones.

2. What the OpsPilot RCM module does

Role	Responsibility
 AI Coach (OpsPilot)	Works each failure mode through the seven RCM questions, identifies functional failures and consequences, and recommends a specific task with type, interval and justification — challenging tasks that don't earn their place.
 Plant Expert (you)	Provides the real operating context — the process, the failure history, the operational consequences — and validates the analysis against ground truth.

3. The seven RCM questions

For every failure mode, the analysis answers these in order (SAE JA1011):

#	Question
1	What are the functions and performance standards of the asset?
2	In what ways can it fail to fulfil its functions (functional failures)?
3	What causes each functional failure (failure modes)?
4	What happens when each failure occurs (failure effects)?
5	In what way does each failure matter (failure consequences)?

#	Question
6	What can be done to predict or prevent each failure (proactive tasks)?
7	What should be done if no suitable proactive task can be found (default actions)?

4. What you will be asked — have this ready

- The equipment and what it does in your plant — its function and performance standard.
- The ways it can fail to deliver that function, and the causes behind each.
- What actually happens when it fails — locally and to the wider process.
- The operational, safety and environmental consequences — your failure history is gold here.
- Existing tasks and intervals, so OpsPilot can confirm, challenge or replace them.

5. How the right task is chosen

RCM selects a task by consequence and technical feasibility, not by default. OpsPilot recommends one of:

Task type	When it is selected
Predictive (condition-based)	A measurable condition gives warning before failure (vibration, oil analysis, thermography) — usually the most cost-effective when feasible.
Preventive (time/usage-based)	The item has a clear wear-out age and restoration or replacement at a set interval is justified.
Failure-finding	For hidden failures (protective devices) — a periodic test confirms the function is still there.
Run-to-failure	The consequence is low and proactive tasks aren't justified — a deliberate decision, not neglect.
Redesign / one-off change	No proactive task manages the risk acceptably — the design or operation must change.

6. What you receive — the output

A complete maintenance task list. For each failure mode it gives:

- The function, functional failure and failure mode.
- The failure effect and its consequence category (safety / environmental / operational / non-operational, and hidden vs evident).
- The recommended task, its type, interval and the trade to perform it.
- The RCM justification — why this task, this interval, traceable to the seven questions.

7. Worked example (illustrative)

Take a duty/standby cooling-water pump. One failure mode is impeller wear reducing flow. Working the questions: the function is to deliver rated cooling-water flow; the functional failure is flow below the minimum; the mode is impeller erosion; the effect is gradual loss of cooling with the standby

available; the consequence is operational, not safety, because of redundancy. A measurable warning exists (flow and vibration trend), so the recommended task is condition monitoring on a set interval rather than a fixed teardown — the cheaper, lower-risk choice the redundancy and the warning together justify.

Contrast a hidden failure: the standby pump's auto-start. There is no day-to-day evidence it still works, so RCM selects a failure-finding task — a periodic auto-start test — because the failure is hidden and only matters when the duty pump trips.

8. Getting the best result

- **Lead with consequence.** The consequence of a failure, not its likelihood alone, drives the task choice.
- **Let OpsPilot challenge existing PMs.** Some calendar tasks won't survive the seven questions — that is the saving.
- **Don't forget hidden failures.** Protective devices need failure-finding tests, or they fail silently until you need them.
- **Feed it real history.** Actual failure patterns sharpen both the modes identified and the intervals chosen.

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