

Quality maintenance: control conditions, not just inspect output

Link a product defect to a testable equipment-condition mechanism, maintain the approved condition and verify both the condition and affected output before claiming effectiveness.



A restored condition is only half the verification

Fictional assembly fixture F9 positions a component before a marking operation. Quality engineer Mei reviews repeated mark-location defects and a report that the locating face has residue. The team proposes cleaning the face and declaring the quality problem solved. Engineering controls the applicable fixture and product acceptance criteria.

Your role and the reference condition

Quality/process engineer with the qualified maintenance owner and trained operator.

Normal: The approved locating condition and product mark position are both defined, with checks appropriate to the process.

Gap: Residue and mark errors appear together, but the mechanism has not been demonstrated and other explanations remain.

Work within these conditions

1. This learning record does not supply technical tolerances or instructions for changing the fixture.
2. Correlation is a starting point; use authorized tests, suitable measurement and the actual engineering criteria.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

See how the method works

Finished-product inspection may find a defect after the process has already lost its required condition. Identify the mechanism that connects a relevant equipment or process condition to the quality characteristic. Define an approved way to check that condition, the response to drift and how restoration will be verified. Keep the evidence linking condition and outcome explicit; correlation alone is insufficient. Maintenance, quality and operations each contribute to the loop. Avoid inventing universal limits for pressure, temperature, wear or alignment. The teaching diagram explains the relationship and responsibilities, while technical criteria remain with the appropriate engineering authority.



Connected method map: Relevant condition, Failure mechanism, Check and respond, Verify condition + output. Every authored connection is shown with a numbered arrow and named legend.

Follow the evidence and decisions

Inspect the supplied case inputs

Evidence / proposal	Supplied fictional status
Product symptom	Mark-location error on identified jobs
Fixture observation	Residue reported on locating face
Hypothesis A	Residue prevents consistent seating
Alternative B	Component variation changes seating
Alternative C	Marking reference or measurement differs
Proposed action	Authorized condition restoration, followed by condition and output verification

01 / Define the quality characteristic and condition

Mei identifies the exact mark characteristic, affected jobs and approved acceptance reference. Maintenance identifies the locating-face condition reference and who may inspect or restore it.

Why: A vague good-quality or clean-machine statement cannot support a meaningful verification.

Evidence / check: The record links product criterion and equipment condition without inventing new limits.

02 / State how the condition could create the defect

The team describes the hypothesized sequence: residue changes seating, changed seating shifts the mark. It asks what observation would support or contradict each link.

Why: A mechanism makes the relationship testable instead of treating any dirty surface as the cause.

Evidence / check: Condition, seating and mark position are separately observed under the authorized test plan.

03 / Preserve alternatives during the test

The engineer considers component variation and the marking/measurement reference while planning comparable observations before and after authorized restoration. Relevant job and operating conditions are retained.

Why: Changing several uncontrolled conditions at once can hide which explanation fits.

Evidence / check: The comparison record lists what changed, what was held comparable and remaining limitations.

04 / Verify condition and output together

After technical acceptance of the restored locating condition, quality checks the relevant output under the approved plan. If defects remain, the team retains the unresolved quality issue and investigates alternatives.

Why: A restored machine condition does not by itself prove that product risk or the proposed mechanism has been resolved.

Evidence / check: Separate condition and product verification feed the maintenance/control routine only after reviewed learning.

Completed condition-to-quality investigation plan

Link / check	Planned evidence	Decision boundary
Residue > seating	Observe locating condition and seating	Hypothesis, not proven cause
Seating > mark	Link component/job to measured mark position	Use approved measurement/reference
Authorized restoration	Record actual technical action and condition acceptance	No improvised adjustment
Output verification	Check relevant product under approved plan	Condition pass alone is insufficient
Sustain	Maintain supported condition/check with owner	Review recurrence and alternatives

The condition passes but the defect remains

A fictional follow-up verifies that the locating condition meets its approved reference, yet another comparable job still has the mark-location defect.

Decision

Keep the quality issue open and investigate the remaining mechanism links and alternatives. Preserve the valid condition-restoration record without claiming that it solved the defect.

Reasoning

Contrary output evidence challenges the proposed sufficient cause or the completeness of the response.

What would change the decision?

Link the passing condition check, job identity and failing product measurement; reassess component and marking references.

Practise with a changed case

Seal appearance and a dirty guide

New fictional packaging case: a guide surface has visible residue and some seals fail the approved appearance criterion. After authorized restoration, the guide passes its condition check, but one representative test package still fails. No evidence about incoming material variation has been reviewed.

Record	Supplied fact
Guide condition before	Residue observed
Product before	Appearance defects on identified packages
Guide after	Approved condition verified
Product after	One representative test fails
Alternative	Incoming material variation not reviewed

Your task

1. Write the hypothesized condition-to-defect mechanism without declaring it proven.
2. Record separate condition and output decisions after restoration.
3. Choose the next evidence needed and explain what must remain open.

Use the next page to record your reasoning before reading the answer.

Your practice worksheet

Seal appearance and a dirty guide

Product characteristic / approved reference

Equipment condition / approved reference

Mechanism and alternative

Condition versus output verification

Next owner / recurrence and control review

Complete your reasoning before turning to the answer. Use the separate learner workbook for group practice.

Check your reasoning and transfer it

1. The hypothesis must explain how the guide condition could influence the seal; visible residue alone does not prove that link.
2. Condition restoration can be accepted on its own evidence while the quality issue remains unresolved because output still fails. Apply actual product response controls.
3. Review job/material identity, process conditions and suitable product measurements to test alternatives, including material variation. Do not restore the dirty condition merely to reproduce a defect outside an authorized test.

Suggested completed record

Decision	Evidence / next step
Condition	Guide passes approved reference
Product	Test package fails; quality issue open
Mechanism	Incomplete or insufficient explanation
Next evidence	Material/process/measurement comparison under approved plan

Plausible wrong turns

1. A clean asset is not proof of conforming output.
2. Two conditions appearing together do not establish a causal mechanism.

Evidence of a sound answer

1. Link a specific product characteristic to a testable mechanism.
2. Separate technical condition acceptance from quality closure.
3. Retain an alternative and define the next controlled observation.

Take the learning back to work

Commitment	Agreed follow-through
Owner	Quality/process engineer with maintenance and operations
Record	Condition-quality mechanism record, approved checks and dual verification
Review	After authorized response and across relevant operating conditions
Verification evidence	Supported mechanism, controlled condition, acceptable output and recurrence history
If unresolved	Maintain applicable product/operating controls and investigate alternatives; revise the maintained condition only through technical review.

Help someone else apply the method

Prepare

1. Fixture/quality relationship illustration
2. Blank mechanism and dual-verification record
3. Condition-pass/product-fail exception card

Minutes	Activity and coaching prompt
5	Define both references What exactly must the fixture and product satisfy?
7	Trace the mechanism What could contradict residue causing the mark error?
9	Practice seal case Which decision is supported and which stays open?
5	Debrief maintenance linkage What evidence justifies adding a maintained condition?

Debrief

1. Ask for the physical/process link when the answer says dirty caused defects.
2. Do not discard a valid restoration record simply because the broader quality hypothesis failed.

Individual or remote practice

Draw the condition, mechanism and product as separate boxes; annotate evidence and alternatives before reading the answer.

Connect the method and check its boundaries

Before application

1. Engineering acceptance criteria
2. Credible mechanism evidence

Outside this lesson

1. Correlation does not establish mechanism
2. Generic thresholds cannot replace equipment standards

JIPM: 2024 TPM Awards Outline

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Quality-maintenance conditions, deterioration and recurring-breakdown prevention; historical assessment source

Historical 2024 assessment-method reference only, not current award rules or engineering acceptance criteria. All OPEX cases and records are fictional.

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