Failure investigation report

TRAINING EXAMPLE — Pump P-101

Fictional facility
Revision: 00
Training – fictional data
Training team
Generated: 11/29/2026, 2:44:31 AM

1. Executive summary

Investigation status

Preliminary

Fictional example. Suction limitation hypothesis under investigation.

Documentation completeness

75% — completion indicator, not technical certainty.

Review points

Review: Hypotheses assessed
Review: Effectiveness verification

2. Identification and scope

Investigation title

TRAINING EXAMPLE — Pump P-101

Company / site

Fictional facility

Location / area

Pump room

Equipment category

Centrifugal pump

Equipment / system name

Centrifugal pump

Asset ID / tag

P-101

Event date and time

2026-11-20T10:00

Investigation owner

Training team

Revision

00

Confidentiality classification

Training – fictional data

Required function / expected performance

Deliver 60 m³/h at design conditions.

3. Event and impacts

Factual problem statement

Flow fell from 60 to 42 m³/h; noise and vibration followed a reservoir level decrease.

Normal condition / reference

60 m³/h

Observed condition / symptoms

42 m³/h

Operational, safety and environmental impacts

Partial loss of capacity. No personal injury reported.

Containment and immediate measures taken

Equipment removed from service with authorization; safe condition recorded.

Downtime (h)

3

Uncertainties / missing data

Fictional data and evidence; do not use as an actual report.

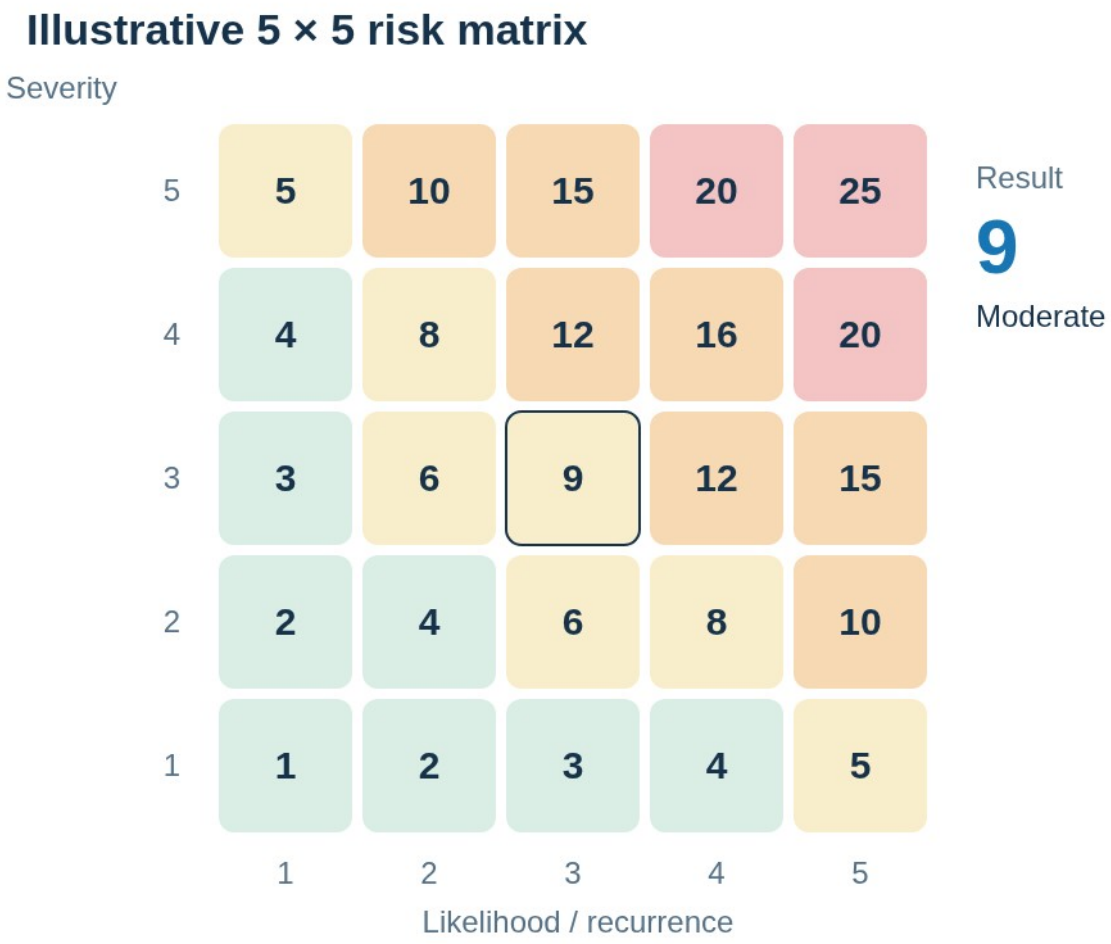
4. Initial risk assessment

Criteria and rationale

Illustrative classification example.

Severity × likelihood

3 × 3 = 9 (Moderate)



Illustrative matrix; user criteria

5. Evidence and records

E001 · Measurement · Flow measurement

Date/time: 2026-11-20T10:00
Source: Fictional instrument
Classification: Observed fact
60 -> 42 m³/h

E002 · Observation · Noise after level decrease

Date/time: 2026-11-20T09:55
Source: Simulated record
Classification: Observed fact
Noise and vibration reported.

6. Hypotheses and validation

Record 1

Mode / mechanism / hypothesis: M25 — Cavitation

Motivating observation: E001 / E002

Supporting evidence (IDs): E001, E002

Opposing evidence / gap: Absolute pressure not measured.

Required test: Compare available and required NPSH using actual data.

Status: Investigating

Rationale: Plausible but unconfirmed.

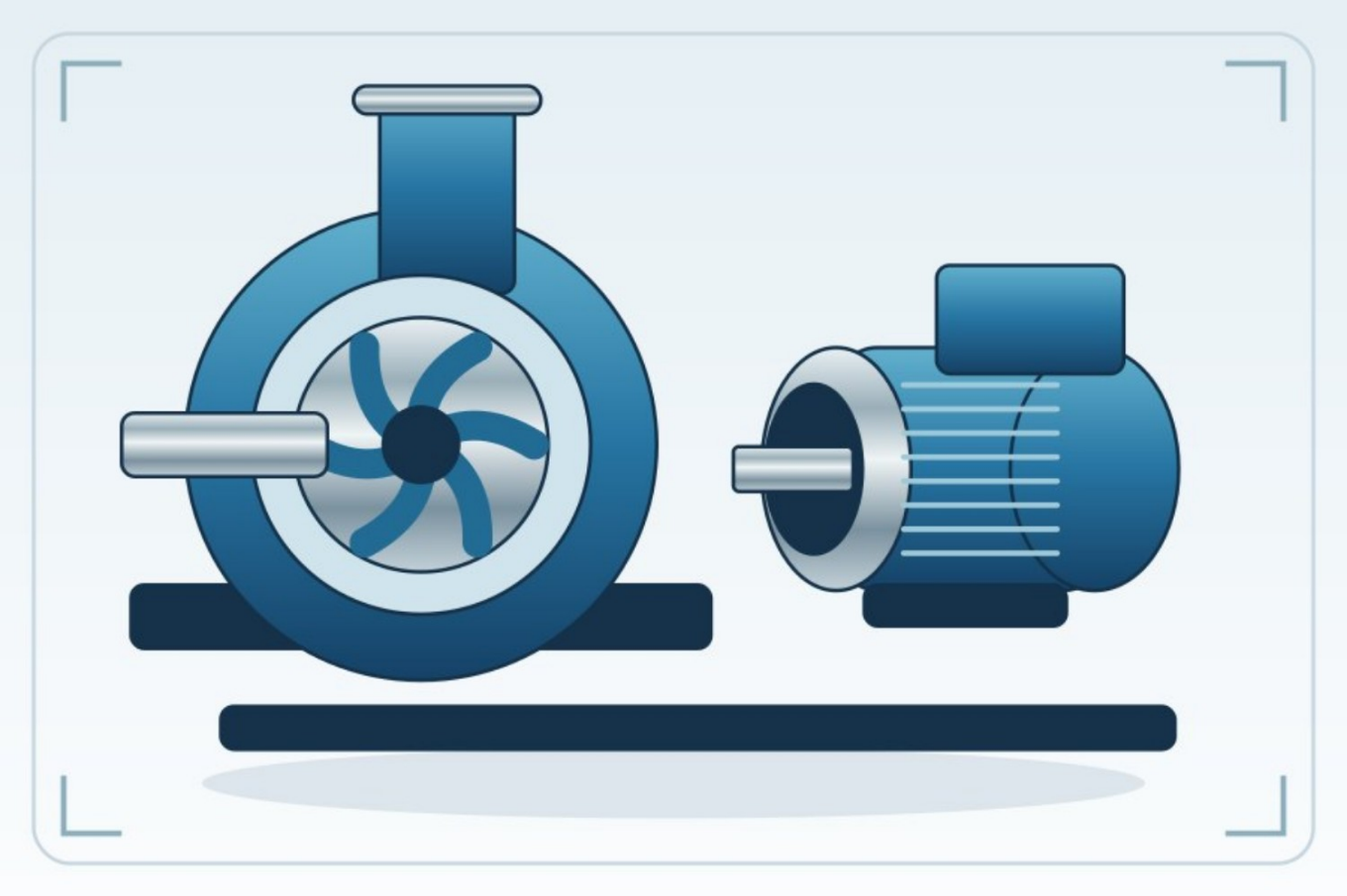


Hypothesis status

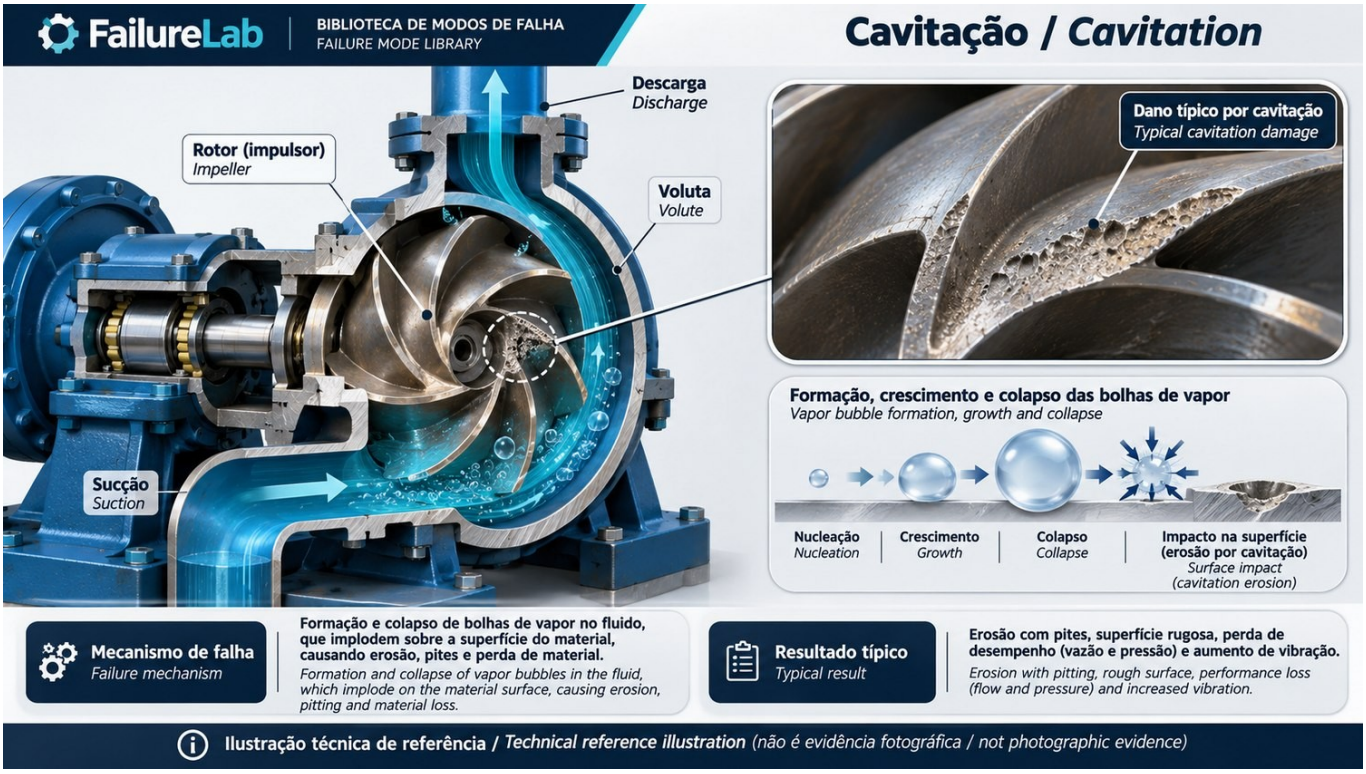
7. Technical reference illustrations — not evidence

Purpose of illustrations

These images are AI-generated educational references or original diagrams. They do not depict the actual asset, are not event evidence and do not establish root cause. Geometry, details and conditions shown are illustrative; validate using applicable documentation and tests.



Centrifugal pump — Original technical diagram · Reference, not case evidence · Generic equipment



M25 · Cavitation — AI-generated illustration · Reference, not case evidence · Investigating

8. Applied methods

1. 5 Whys — Flow loss

Build a chain of questions from an observed fact without forcing exactly five levels.

5 Whys

Record 1

Question / why?: Why did flow decrease?

Answer / hypothesis: Possible suction limitation.

Evidence IDs / test: E001, E002

Record 2

Question / why?: Why might suction be limited?

Answer / hypothesis: Low level or head loss.

Evidence IDs / test: Pending test



Flow loss

2. Pareto analysis — Fictional event history

Rank categories by frequency, cost or duration and calculate cumulative share.

Pareto analysis

Record 1

Category: Seal

Value (same unit): 14

Record 2

Category: Bearing

Value (same unit): 9

Record 3

Category: Suction

Value (same unit): 6

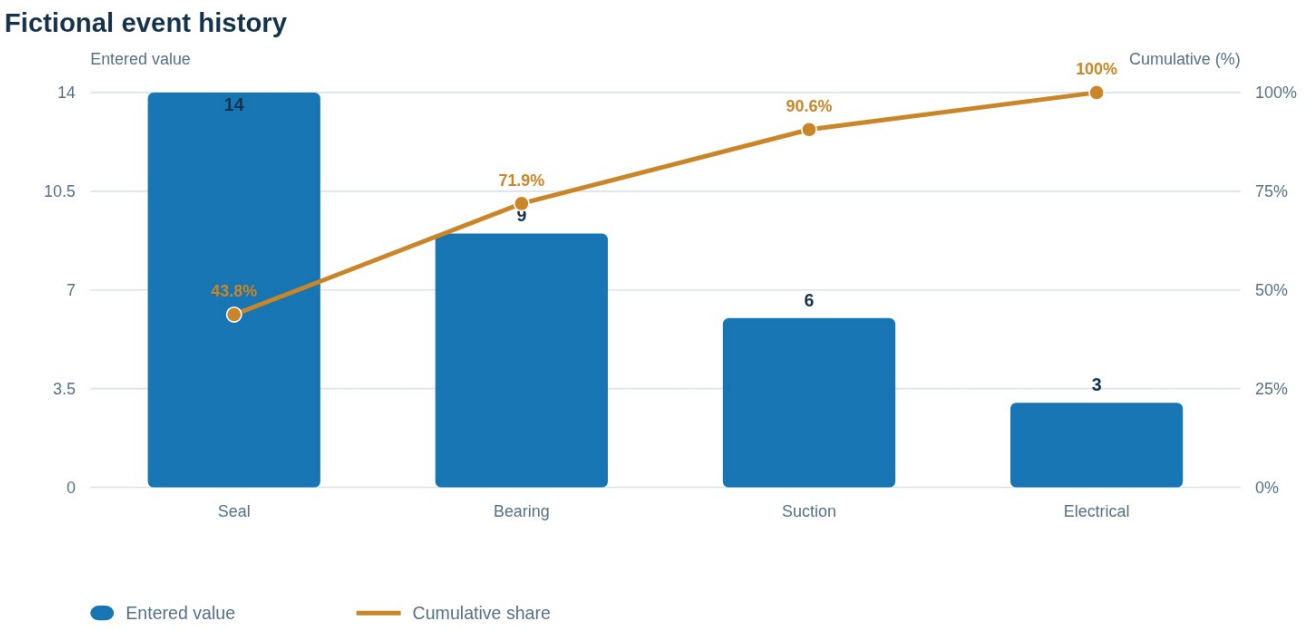
Record 4

Category: Electrical

Value (same unit): 3

Results and limitations

Total: 32; categories: 4.



Fictional event history

3. Trend / time series — Simulated flow (m³/h)

Visualize progression of a variable and optional reference limit.

Trend / time series

Record 1

Date, time or order: T1

Measurement: 60

Optional limit: 50

Record 2

Date, time or order: T2

Measurement: 58

Optional limit: 50

Record 3

Date, time or order: T3

Measurement: 59

Optional limit: 50

Record 4

Date, time or order: T4

Measurement: 54

Optional limit: 50

Record 5

Date, time or order: T5

Measurement: 48

Optional limit: 50

Record 6

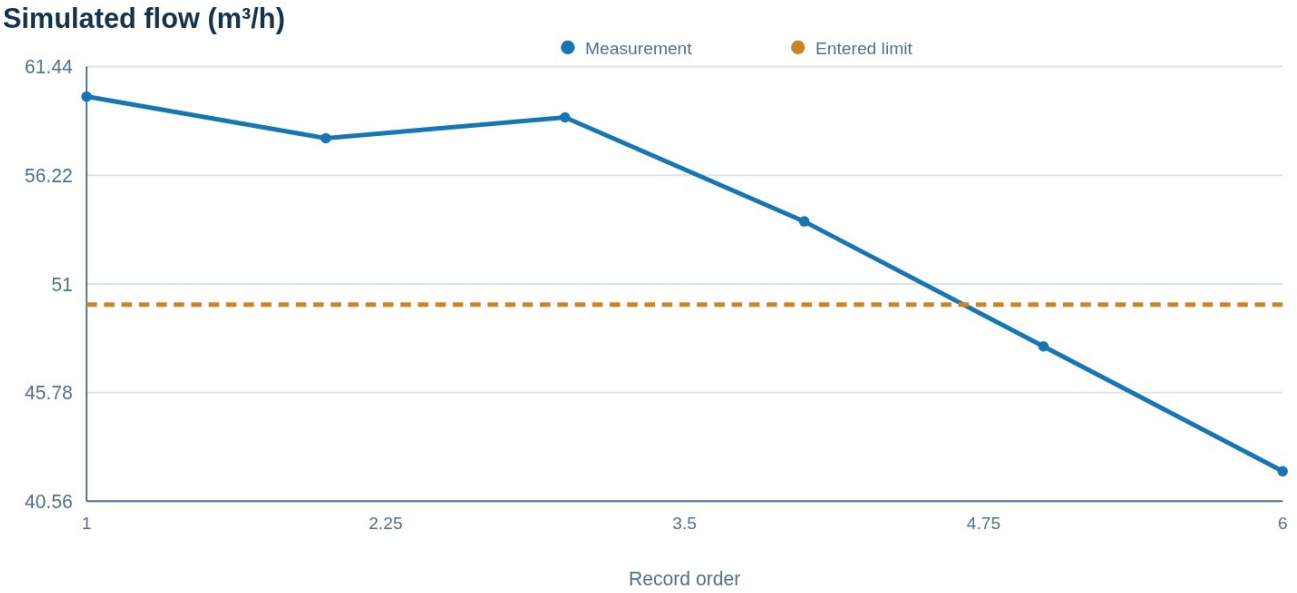
Date, time or order: T6

Measurement: 42

Optional limit: 50

Results and limitations

n=6; min 42; max 60; mean 53.5.



Simulated flow (m³/h)

9. Action plan and effectiveness

Record 1

Type: Verification

Action / what: Check suction conditions and OEM curve

Cause / why: Cavitation hypothesis

Owner: Engineering

Due date: 2026-12-05

Status: Planned

Effectiveness metric, target and deadline: Flow and pressure within validated range.



Action status

10. Conclusion, lessons and approval

Open items / limits of conclusion

Confirm suction conditions and exclude alternative hypotheses.

11. Supporting references

Methodological references; this report is not a certification of standards compliance. Educational content and assessment are the responsibility of qualified professionals.

IEC 62740:2015

Root cause analysis (RCA)
https://webstore.iec.ch/en/publication/21810

IEC 60812:2018

Failure modes and effects analysis
https://webstore.iec.ch/en/publication/26359

IEC 61025:2006

Fault tree analysis
https://webstore.iec.ch/en/publication/4311

IEC 31010:2019

Risk assessment techniques
https://webstore.iec.ch/en/publication/59809

ISO 14224:2016

Reliability and maintenance data (oil, gas and petrochemical scope)
https://www.iso.org/standard/64076.html

ISO 17359:2018

Condition monitoring and diagnostics of machines
https://www.iso.org/standard/71194.html

ISO 15243:2017

Rolling bearings: damage and failures
https://www.iso.org/standard/59619.html

SKF Evolution

Bearing damage analysis
https://evolution.skf.com/us/bearing-damage-analysis-iso-15243-is-here-to-help-you/

KSB Centrifugal Pump Lexicon

Cavitation
https://www.ksb.com/en-global/centrifugal-pump-lexicon/article/cavitation-1117364

NIST/SEMATECH

Engineering Statistics Handbook
https://www.nist.gov/programs-projects/nistsematech-engineering-statistics-handbook

NASA SSRI Knowledge Base

Mechanical Fault Tree Analysis
https://s3vi.ndc.nasa.gov/ssri-kb/topics/16/