

# Enterprise Predictive Maintenance Knowledge Base

## Decision-Indexed, Retrieval-Only Maintenance Reference

### 1. Purpose of This Knowledge Base

This document provides standardized maintenance guidance for industrial equipment based on pre-determined system decisions.

It is designed to be used by a retrieval-only maintenance agent that:

- does not reason
- does not infer new conclusions
- does not override system decisions
- only retrieves documented procedures

All diagnostics and decisions are assumed to be finalized upstream by a decision-making system.

### 2. Scope and Applicability

#### 2.1 Equipment Covered

- Rotating machinery
- Rolling and journal bearings
- Electric motors
- Reciprocating compressors
- Sensor-instrumented industrial equipment

#### 2.2 Out of Scope

- Catastrophic failures
- Design defects
- Operator safety incidents
- Emergency response procedures

### 3. Action Philosophy and Urgency Levels

All maintenance actions are categorized by urgency:

- Low – Observe and monitor
- Medium – Inspect and plan maintenance
- High – Schedule corrective maintenance
- Critical – Immediate shutdown required

Unless explicitly stated, early-stage conditions do not require immediate shutdown.

### 4. Decision: EARLY\_BEARING\_DEGRADATION

#### Description

Indicates the early wear phase of a bearing where mechanical integrity is intact and preventive action remains possible.

#### Recommended Maintenance Actions

- Inspect bearing housing for visible wear
- Check lubrication quality and quantity
- Verify shaft alignment and balance
- Schedule preventive maintenance within 5–10 operating days

#### Urgency

Medium – Continued operation allowed with monitoring

#### Notes / Do Not Escalate Conditions

- Single, non-persistent signal spike
- Recent lubrication replacement
- Newly commissioned equipment
- Recent ambient temperature change

## 5. Decision: VIBRATION\_ONLY

### Description

Sustained vibration without temperature rise may indicate imbalance, loose mounting, or early misalignment.

### Recommended Maintenance Actions

- Inspect mounting bolts and base
- Verify shaft alignment
- Monitor vibration trends over subsequent cycles

### Urgency

Low – Observation recommended

### Notes / Do Not Escalate Conditions

- Loose sensor mounting
- External vibration sources
- Nearby machinery operation

## 6. Decision: TEMPERATURE\_ONLY

### Description

Temperature increase without vibration rise may indicate lubrication degradation, cooling inefficiency, or ambient influence.

### Recommended Maintenance Actions

- Inspect lubrication pathways
- Verify cooling airflow
- Check temperature sensor calibration

### Urgency

Medium – Inspection recommended before escalation

## 7. Decision: VIBRATION\_AND\_TEMPERATURE

### Description

Combined vibration and temperature increase indicates confirmed mechanical degradation.

### Recommended Maintenance Actions

- Schedule maintenance during planned downtime
- Prepare spare components if available
- Continue monitoring until maintenance is performed

### Urgency

Medium to High – Depends on degradation rate

## 8. Decision: RECIPROCATING\_COMPRESSOR\_EARLY

### Description

Early degradation in reciprocating compressors involving piston wear, bearing wear, or lubrication flow issues.

### Recommended Maintenance Actions

- Inspect piston and bearing assemblies

- Verify lubrication flow
- Inspect valve clearances
- Schedule partial maintenance

Urgency

Medium

## 9. Decision: SENSOR\_INCONSISTENCY

Description

Indicates unreliable or conflicting sensor readings rather than mechanical failure.

Recommended Maintenance Actions

- Validate sensor readings
- Cross-check with secondary sensors
- Re-calibrate or remount sensor
- Avoid premature maintenance escalation

Urgency

Low

## 10. Decision: CONFIRMED\_PROGRESSION

Description

Indicates continued degradation despite monitoring or prior maintenance actions.

Recommended Maintenance Actions

- Schedule component replacement
- Prepare replacement parts
- Reduce operating load if possible

Urgency

High – Immediate planning required

## 11. Safety and Compliance Guidelines

- Isolate power supply
- Follow lock-out / tag-out procedures
- Wear appropriate PPE
- Do not bypass safety interlocks

## 12. Human and Operational Factors

### 12.1 Common Human-Induced Issues

- Over-lubrication
- Incorrect assembly
- Ignored early warnings
- Incomplete maintenance procedures

### 12.2 Recommended Actions

- Review maintenance logs
- Reinforce SOPs
- Provide operator training if required

## 13. Limitations and Disclaimers

- Advisory guidance only
- Final decisions rest with qualified engineers

- Site-specific conditions may require deviation
- Does not replace engineering judgment

## 14. Closing Statement

This knowledge base ensures consistent maintenance actions, reduced ambiguity, and transparent documented guidance. It supports execution, not decision-making.