OXmaint Factory AI

ABB PLC → OPC → Shift Logbook

Predictive Maintenance Development Specification & Operational Logic

Version: 1.4

Audience: Automation, Reliability, CMMS/MES Development Teams

Purpose: Convert high-frequency PLC data into clear, shift-level maintenance decisions

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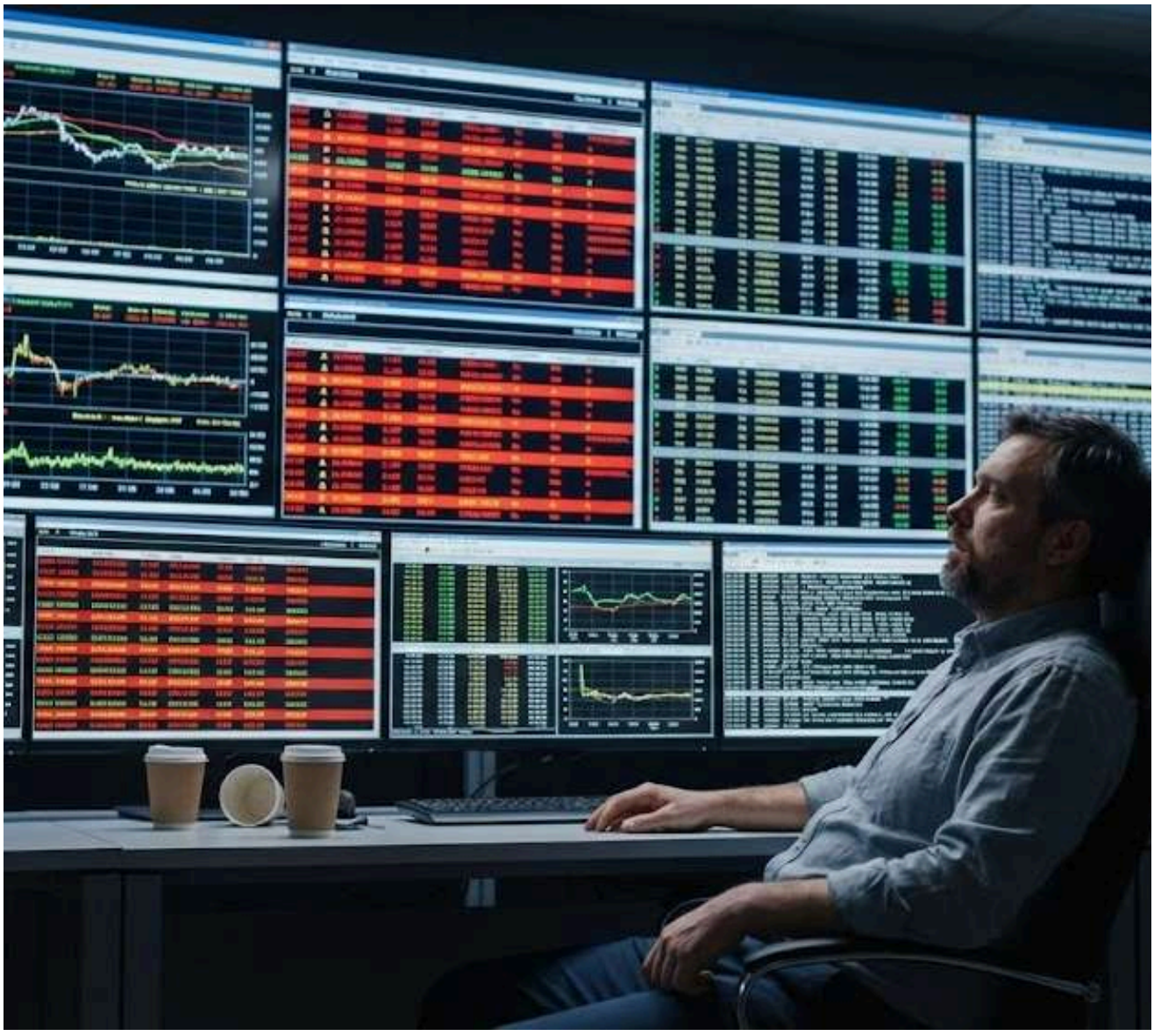
1. Business & Operational Overview

Modern steel plants generate millions of PLC samples per shift. Presenting raw alarms or raw trends creates noise and operator fatigue. This framework converts second-by-second signals into structured, explainable summaries that help shift engineers answer only what matters: **what needs attention now, how urgent it is, and since when the issue exists.**

THE CHALLENGE

- Millions of PLC samples generated per shift create information overload
- Raw alarms and trends cause operator fatigue and missed critical issues
- Shift engineers struggle to identify what truly needs attention
- Legacy systems lack intelligent filtering and prioritization

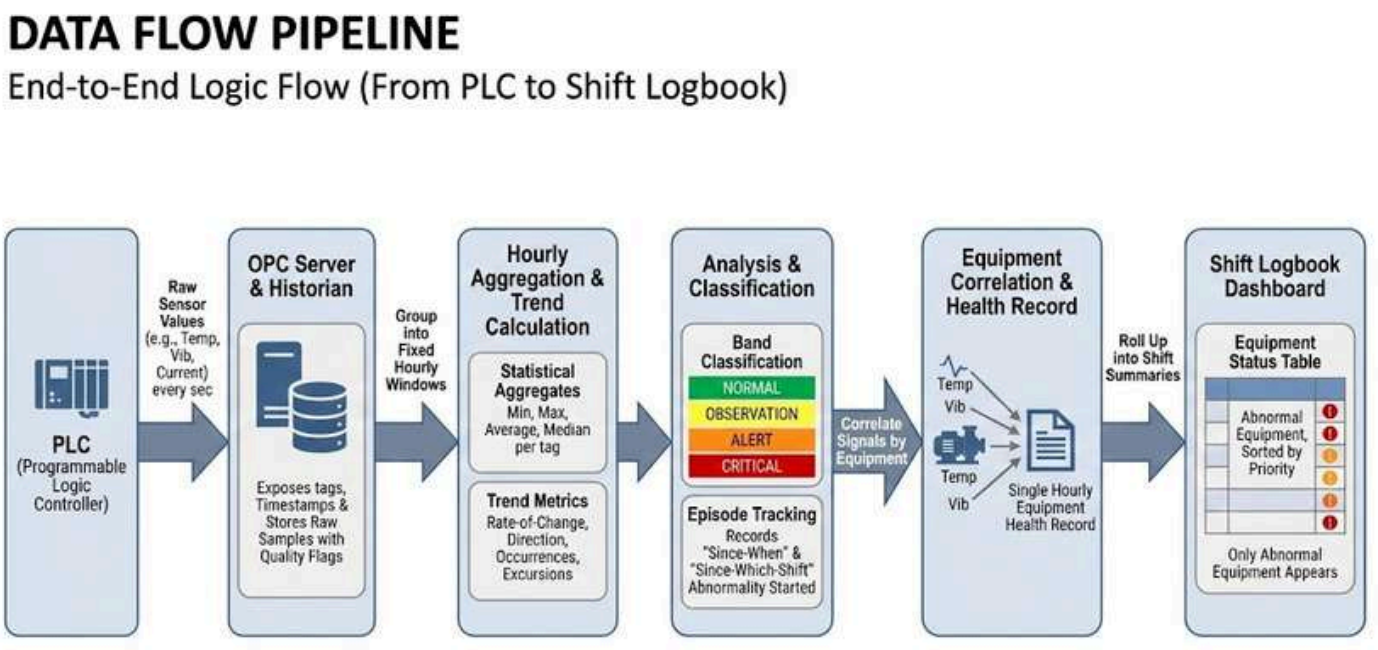


2. End-to-End Logic Flow (From PLC to Shift Logbook)

The following process transforms raw sensor data into actionable maintenance intelligence:

DATA FLOW PIPELINE

- PLC publishes raw sensor values every second (temperature, vibration, current, etc.)
- OPC server exposes tags; collector timestamps and stores raw samples with quality flags
- Raw samples are grouped into fixed hourly windows per tag
- For each hour and tag, statistical aggregates are computed: min, max, average, median
- Additional trend metrics are calculated: rate-of-change, trend direction, occurrences, excursions
- Each tag is classified into NORMAL / OBSERVATION / ALERT / CRITICAL bands
- Episode tracking records since-when and since-which-shift abnormality started
- All signals belonging to the same equipment are correlated into a single hourly equipment health record
- Hourly records are rolled up into shift summaries
- **Only abnormal equipment appears in the Equipment Status table, sorted by priority**



3. Hourly Aggregation Logic (Per Signal)

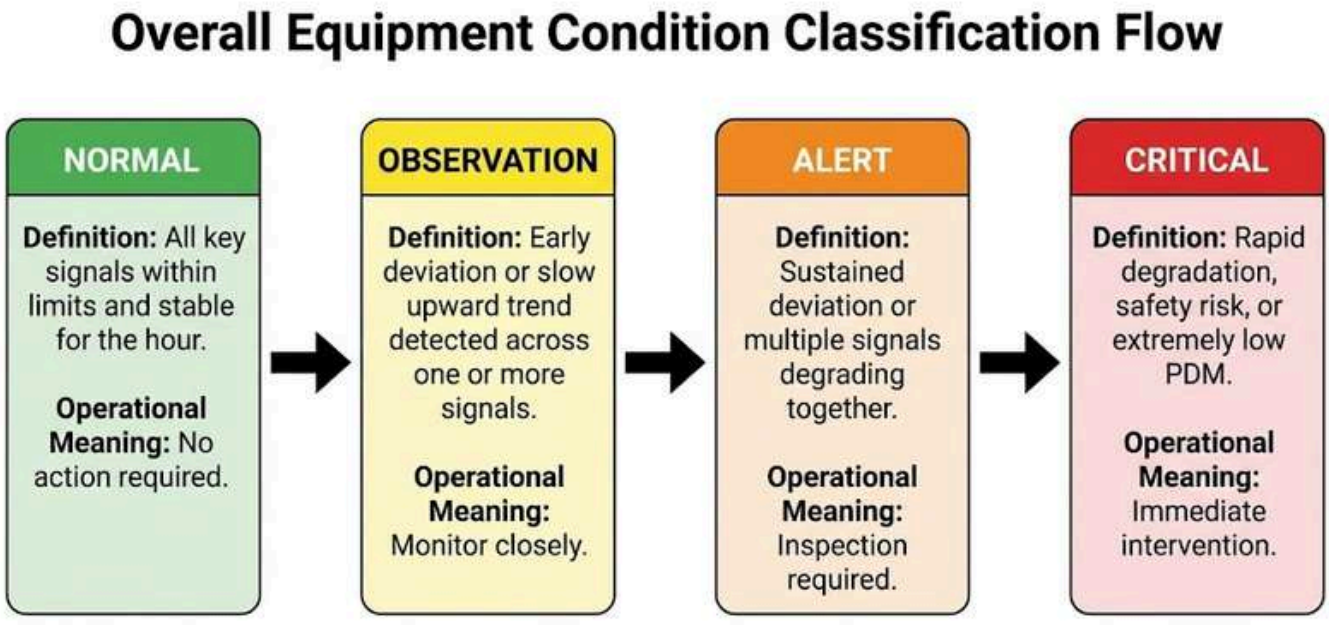
Hourly aggregation is the foundation of noise-free predictive maintenance. Each hour may contain up to **3,600 samples per signal** (1 sample/second). Aggregates are computed only from valid samples.

Metric	How It Is Calculated	Why It Matters
Minimum	Lowest value observed in the hour	Detects under-range conditions
Maximum	Highest value observed in the hour	Detects spikes and overloads
Average	Arithmetic mean of all samples	Represents general operating level
Median	Middle value after sorting samples	Robust against spikes
Rate of Change	Current hour median minus previous hour median	Detects acceleration
Trend Direction	UP / DOWN / NEUTRAL based on rate-of-change threshold	Shows worsening vs stabilizing
Occurrences	Count of samples outside defined limits	Measures persistence

4. Overall Equipment Condition Classification

Equipment condition is classified into four distinct levels based on signal analysis and trend behavior:

Condition	Definition	Operational Meaning
NORMAL	All key signals within limits and stable for the hour	No action required
OBSERVATION	Early deviation or slow upward trend detected across one or more signals	Monitor closely
ALERT	Sustained deviation or multiple signals degrading together	Inspection required
CRITICAL	Rapid degradation, safety risk, or extremely low PDM	Immediate intervention

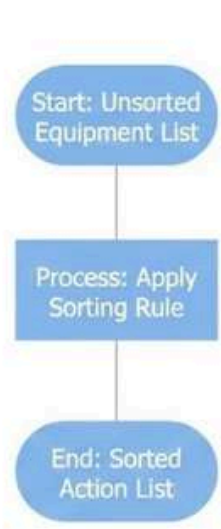


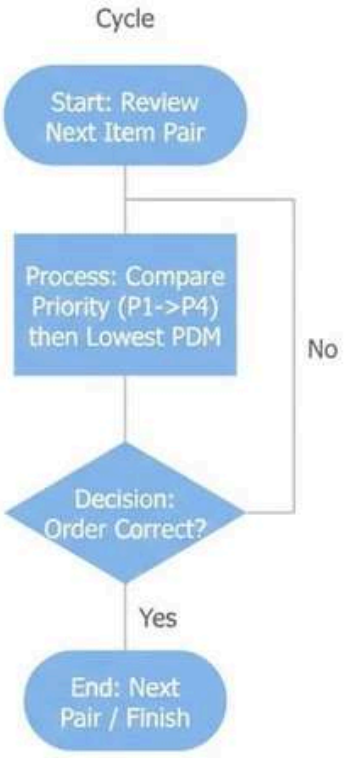
5. Shift Logbook – Equipment Status (Action List)

This table is the final operational output. It lists **only equipment requiring attention**. Issues may originate in the current shift or be carried forward from previous shifts.

Priority	Equipment	PDM	Since (Shift)	Trend	Occur.	Key Metric	Overall
P1	Motor XYZ (MTR-1123)	6 hrs	Today Shift A	Fast Upward	37	Temp 82°C	CRITICAL
P2	Gearbox Fan (FAN-044)	2 days	Yesterday Shift C	Upward	15	Temp 74°C	ALERT
P3	Pump P-07	3 shifts	Today Shift B	Stable	9	Temp 68°C	OBSERVE

Sorting Rule: Order by Priority (P1 → P4). Within the same priority, sort by lowest PDM first.





OXmaint Factory AI

Transforming Industrial Maintenance with Artificial Intelligence

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