

PREDICTIVE MAINTENANCE DASHBOARD USING JMP FOR AN INDUSTRIAL EQUIPMENT SUPPLIER

Client Objective

A leading supplier of industrial-grade compressors and hydraulic systems wanted to implement predictive maintenance strategies to reduce unexpected equipment failures at client sites. They collected operational data from IoT sensors installed in machines across various plants but had no interactive tool to explore failure trends or predict breakdown risks.

Their goal was to develop a JMP-based visual analysis platform that could summarize machine health status, flag failure risks, and guide timely maintenance schedules based on historical performance and operating conditions.

My Role and Responsibilities

As the lead statistical consultant, I was responsible for designing a JMP-driven analytics system that could be easily used by both technical maintenance teams and operations managers. The project scope included data cleaning, modeling, interface design, and report generation.

Key responsibilities:

- Transform raw sensor data into structured analytical datasets
- Model failure likelihood using logistic regression and decision trees
- Build dashboards and interactive JMP reports to monitor equipment performance
- Train the internal team on using the tool for real-time insights

Data Overview

- **Source:** Sensor data from 68 machines across 7 factories (24 months of data)
- **Size:** Over 120,000 time-stamped machine readings
- **Variables Included:**
 - Sensor metrics: vibration amplitude, motor temperature, oil pressure, run-time hours
 - Maintenance logs: date of last service, replaced parts, emergency shutdowns
 - Failure flag: 1 (failure reported) or 0 (normal functioning)

Techniques Used in JMP

- **Data Preparation:**
 - Time-window aggregation (daily, weekly means and max values)
 - Feature engineering: moving averages, lagged values, and failure counts by machine
- **Exploratory Analysis:**
 - Control charts to assess sensor stability over time
 - Bubble plots to compare machine behavior across locations
- **Predictive Modeling:**
 - Logistic regression to model failure probability
 - JMP's Decision Tree (Partition) for model interpretability
 - ROC Curve to evaluate prediction accuracy
- **Interactive Dashboard Development:**
 - JMP Data Filters for machine ID, plant, and sensor thresholds
 - Embedded visualizations: time series plots, failure heatmaps
 - Drop-down selectors for filtering by maintenance type or factory

Key Insights

- A rise in **motor temperature above 78°C** over two consecutive weeks increased failure probability by 35%
- Compressors with >2,000 run-time hours since last maintenance were at 3x greater risk of failure
- Decision tree identified **oil pressure variability** as the top predictor of motor failure (split value = 11.2 PSI)
- Two plants had significantly higher sensor drift and abnormal patterns compared to others

Deliverables

- A fully functional JMP Journal file with embedded interactive graphs, models, and filters

- PDF maintenance strategy report for each plant summarizing historical issues and predictive risks
- Training manual and recorded walkthrough videos for internal team adoption
- Summary presentation highlighting ROI potential from predictive maintenance adoption

Impact & Outcome

- The dashboard was deployed at 4 regional maintenance offices
- Predictive alerts helped prevent 9 critical shutdowns in the first quarter post-deployment
- Maintenance costs reduced by 18% due to smarter resource allocation
- Downtime reduced by 22% across machines monitored with the new dashboard