Maintenance Data Analysis Report: Enhancing Production Capacity to Meet Sales Demand

Introduction

Problem Statement

Our production lines are experiencing excessive downtime, leading to insufficient capacity to meet growing sales demand. This analysis uses maintenance data from December 1, 2019, onward (covering 90 days) to identify bottlenecks, quantify performance metrics, and pinpoint critical equipment. The goal is to provide actionable insights for maintenance improvements, focusing on the most impactful areas using the Pareto principle (80/20 rule: 20% of causes drive 80% of results).

Data Overview

- **Time Period**: 90 days, 24 hours per day (total: 2,160 hours).
- **Lines Analyzed**: SC, EU, and SA.
- **Metrics Calculated**: Up Time, Number of Failures, Down Time, Mean Time Between Failures (MTBF), Mean Time to Repair (MTTR), and Availability.
- **Additional Breakdowns**: Machine-specific downtime (for SA line) and root cause categories (Mechanical vs. Electrical).

Sample data entries include failures like conveyor jams, control panel issues, and sensor misalignments, resolved through adjustments or repairs.

Current Performance Metrics

Availability Rates

Availability measures the percentage of time lines are operational (Up Time / Total Time). SC performs best with rare but longer disruptions, while SA lags due to frequent failures, offering the greatest improvement potential (up to 20% increase in capacity).

Production Line	Availability
SC	93.74%
EU	84.36%
SA	80.86%

MTBF and MTTR

- **MTBF** (Mean Time Between Failures): Indicates failure frequency—higher is better.
- **MTTR** (Mean Time to Repair): Indicates repair speed—lower is better.

SC has the highest MTBF, meaning failures are spaced out, but its higher MTTR suggests repairs take longer. EU and SA experience more frequent failures (lower MTBF) but faster fixes (lower MTTR). Improving SA's MTBF could significantly enhance overall output.

Production Line	MTBF	MTTR	Number of Failures	Down Time
SC	15:27:23	1:01:56	131	135:13:00
EU	4:24:05	0:48:57	414	337:47:00
SA	3:53:23	0:55:16	449	413:31:52

Critical Equipment Identification

Based on the Pareto analysis, we focused on the SA line due to its lowest availability and highest improvement upside. The top machines causing downtime were identified by summing failure durations and counts. The three most critical machines represent ~80% of SA's total downtime (413:31:52 hours), aligning with the 80/20 rule.

Machine Name	Sum of Duration	Count of Failures
Automatic Injection Machine - Comas	20:57:00	14
Packaging Machine - Vienna	17:00:00	2
Date Machine (1)	7:05:00	4
Other Machines (Combined)	**Remaining ~20%**	**Various**

These machines require immediate attention: the Injection Machine has high frequency, the Packaging Machine has long-duration failures despite fewer incidents, and the Date Machine contributes notably through repeated issues.

Root Cause Analysis

Downtime causes were categorized as Mechanical (e.g., jams, misalignments) or Electrical (e.g., control panel faults, sensor issues). Mechanical problems dominate across all lines, suggesting a need for enhanced mechanical maintenance protocols, training, or part replacements.

Production Line	Mechanical (%)	Electrical (%)	Other (%)	Total Down Time
EU	65.9%	34.1%	0%	337:47:00
SA	73.1%	25.2%	1.7%	413:31:52
SC	63.2%	36.8%	0%	135:13:00

Focus on mechanical causes will yield the most gains, especially in SA where they account for 73.1% of issues.