

Questionnaire for Data Analysis of Manufacturing

Downtime and Performance Metrics

1. Introduction

In manufacturing, optimizing efficiency, minimizing downtime, and improving batch cycle times are critical for maintaining high production rates and reducing operational costs. To achieve this, a structured approach using data visualization and key performance indicators (KPIs) is essential.

This document outlines key analytical questions, the proposed charts or KPIs for visualization, and the purpose of each question. The goal is to develop dashboards that provide actionable insights into:

- **Downtime Factors** – Identifying root causes and trends
- **Production Efficiency** – Evaluating performance across operators, shifts, and products
- **Batch Cycle Analysis** – Understanding processing time variations
- **Shift & Operator Performance** – Comparing efficiencies and identifying improvement areas
- **Product Analysis** – Assessing efficiency and downtime distribution

By leveraging interactive dashboards, decision-makers can track trends, identify problem areas, and implement data-driven improvements in real-time.

2. Key Analytical Questions, Proposed Charts & Purpose

➤ Downtime Analysis

No.	Question	Purpose
1	What are the most common downtime factors?	Identify the major causes contributing to downtime for targeted action.
2	How does downtime impact overall efficiency?	Examine the correlation between downtime and operational efficiency.
3	Which shift experiences the most downtime?	Understand which shifts require better maintenance or operational strategies.
4	How does downtime vary by operator?	Identify operators facing frequent downtime issues for further training.
5	What is the total downtime per product?	Compare downtime across different products to improve process stability.

6	What is the average downtime per shift?	Determine which shifts are most affected by downtime.
7	Which operator has the highest total downtime?	Pinpoint underperforming operators for further investigation.
8	Is there a relationship between downtime and batch duration?	Assess whether downtime significantly prolongs batch processing.

➤ **Efficiency Analysis**

No.	Question	Purpose
9	What is the average efficiency across all batches?	Get a quick snapshot of production efficiency.
10	Which product has the highest and lowest efficiency rates?	Identify products with performance gaps.
11	How does efficiency vary by shift (Morning, Afternoon, Evening)?	Determine which shifts require process optimization.
12	How does operator performance vary? Who are the most and least efficient operators?	Recognize top-performing operators and those needing improvement.
13	Is efficiency improving or declining over time?	Track efficiency trends and implement corrective measures.
14	What is the average efficiency per product?	Compare efficiency performance across product lines.
15	Which operator has the highest average efficiency?	Identify the best operators and analyze their practices.

➤ **Batch Processing & Cycle Time Analysis**

No.	Question	Purpose
16	What is the average duration for each product type?	Identify product-related batch time variations.

17	How frequently does batch change occur, and how does it affect downtime?	Examine whether frequent batch changes impact production stability.
18	Are there any operators or shifts that complete batches faster than others?	Pinpoint which teams are more efficient.
19	Are batch times improving over time?	Assess whether processing times are decreasing with optimizations.
20	How many batches are produced per day?	Track daily batch production volume.
21	What is the distribution of batch durations?	Understand variations in processing times.
22	Do batch processing times vary between experienced and new operators?	Evaluate the impact of experience on efficiency.

➤ **Shift Analysis**

No.	Question	Purpose
23	How does downtime vary by shift?	Determine if specific shifts experience higher downtime issues.
24	What is the average efficiency per shift?	Compare shift-wise efficiency to optimize scheduling.
25	Which shift has the highest number of batches produced?	Identify the most productive shift.

➤ **Product Performance Analysis**

No.	Question	Purpose
26	Which product has the highest total downtime?	Understand which products face the most production interruptions.
27	Which product has the highest average efficiency?	Identify top-performing products to replicate best practices.
28	How does downtime vary by product size?	Assess if product size influences production stability.

3. Conclusion & Summary of Insights

By implementing the above KPIs and data visualizations, we can:

- **Identify Top Downtime Causes** – Reduce inefficiencies by addressing key bottlenecks.
- **Improve Operator Performance** – Recognize high-performing operators and train those struggling.
- **Optimize Batch Processing** – Reduce cycle times and improve output consistency.
- **Enhance Shift Efficiency** – Ensure optimal workforce allocation.
- **Increase Product Stability** – Identify problematic products and refine their processes.

Recommended Next Steps:

- Implement a **Downtime Reduction Plan** – Target the most frequent downtime causes.
- Optimize **Shift Schedules** – Adjust based on efficiency trends.
- Train **Operators for Higher Productivity** – Improve performance through targeted training.
- Monitor **Real-Time Dashboards** – Enable data-driven decision-making.

By leveraging these insights, manufacturing teams can drive higher efficiency, reduced downtime, and increased productivity, ensuring a more streamlined and cost-effective operation.