Manufacturing Downtime Analysis

Agenda

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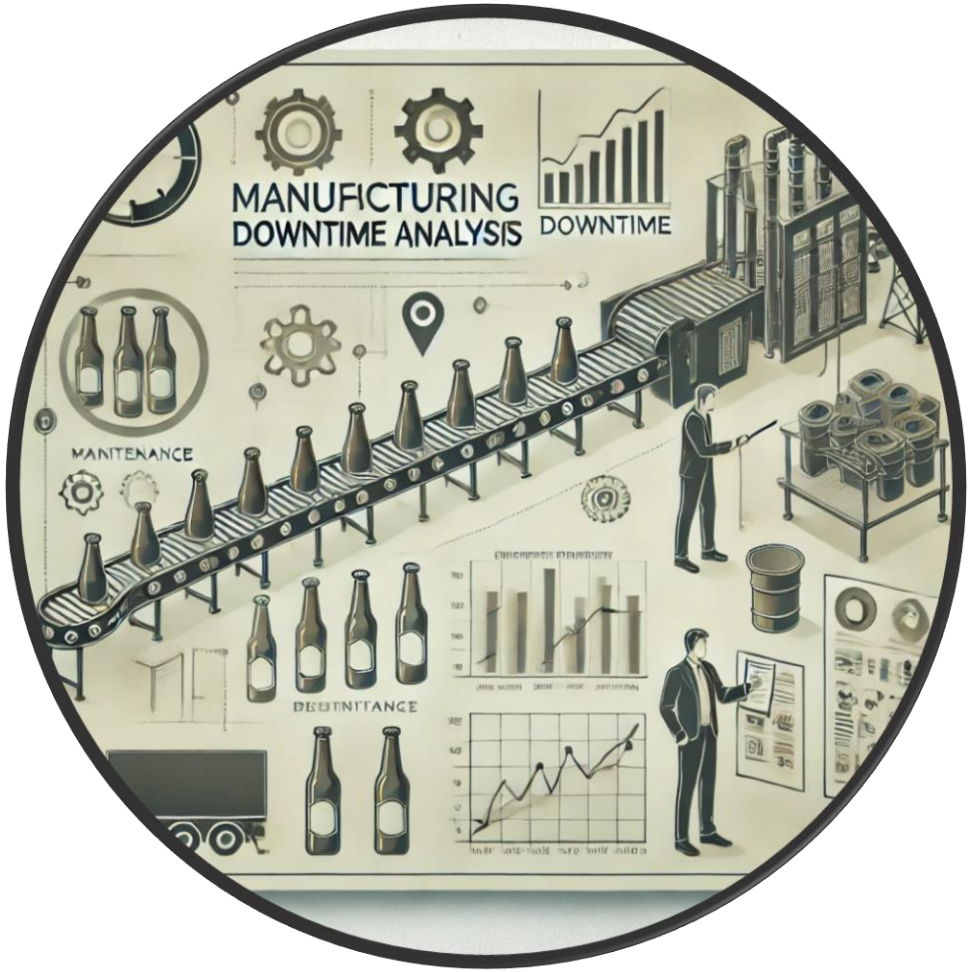
- Objectives
- Dataset Exploration
- Visual Analysis of Objectives
- Dashboard
- Insights
- Recommendations



Introduction

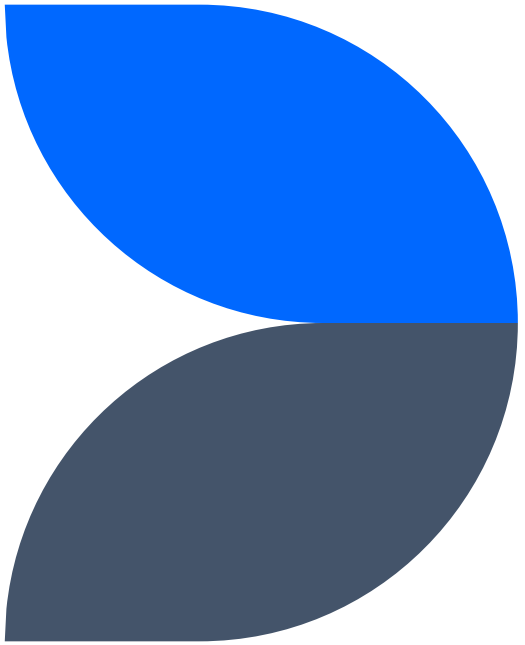
- *Wolf Cola,* a soft drink company in Philadelphia, initiated a productivity improvement project to enhance bottling line efficiency which generated a dataset detailing production activities

- The task is to analyze this data to assess productivity, identify bottlenecks, and provide insights for improving efficiency

Objectives

- Calculating line efficiency
- Identifying the primary factors causing downtime
- Analyzing downtime by operator and factor

Data Exploration



Data Overview

Date	Product	Batch	Operator	Start Time	End Time	Batch Time	Min Batch Time
2024-08-29	OR-600	422111	Mac	11:50:00	14:05:00	135	60
2024-08-29	LE-600	422112	Mac	14:05:00	15:45:00	100	60
2024-08-29	LE-600	422113	Mac	15:45:00	17:35:00	110	60
2024-08-29	LE-600	422114	Mac	17:35:00	19:15:00	100	60
2024-08-29	LE-600	422115	Charlie	19:15:00	20:39:00	84	60
2024-08-29	LE-600	422116	Charlie	20:39:00	21:39:00	60	60
2024-08-29	LE-600	422117	Charlie	21:39:00	22:54:00	75	60
2024-08-30	CO-600	422118	Dee	4:05:00	6:05:00	120	60
2024-08-30	CO-600	422119	Dee	6:05:00	7:30:00	85	60
2024-08-30	CO-600	422120	Dee	7:30:00	9:22:00	112	60

Line Productivity

		Downtime factor											
Batch	Operator	1	2	3	4	5	6	7	8	9	10	11	12
422111	Mac		60					15					
422112	Mac		20						20				
422113	Mac		50										
422114	Mac				25		15						
422115	Charlie										24		
422116	Charlie												

Line Downtime

Product	Flavor	Size	Min batch time
OR-600	Orange	600 ml	60
LE-600	Lemon lime	600 ml	60
CO-600	Cola	600 ml	60
DC-600	Diet Cola	600 ml	60
RB-600	Root Beer	600 ml	60
CO-2L	Cola	2 L	98

Products

Factor	Description	Operator Error	Downtime	Pareto
6	Machine adjustment	Yes	332	24%
7	Machine failure	No	254	42%
4	Inventory shortage	No	225	58%
2	Batch change	Yes	160	70%
8	Batch coding error	Yes	145	80%
12	Other	No	74	86%
5	Product spill	Yes	57	90%

Downtime Factors

Data Dictionary

❑ **Line Productivity Table**:

•*Date*: Production date for each batch

•*Product*: Product ID of the batch produced

•*Batch*: Unique ID for each batch

•*Operator*: Name of the operator overseeing production

•*Start Time / End Time*: Batch production start and end times

❑ **Products Table**:

•*Product*: Unique product ID

•*Flavor*: Flavor of the soda

•*Size*: Volume/size of the product

•*Min Batch Time*: Minimum time to complete a batch without downtime

Data Dictionary

❑ **Downtime Factors Table**:

•*Factor*: Unique ID for each downtime factor.

•*Description*: Brief description of the factor.

•*Operator Error*: Indicates if the factor was caused by operator error (Yes/No)

❑ **Line Downtime Table**:

•*Batch*: Unique batch ID.

•*Downtime Factor*: Duration of downtime for each factor per batch

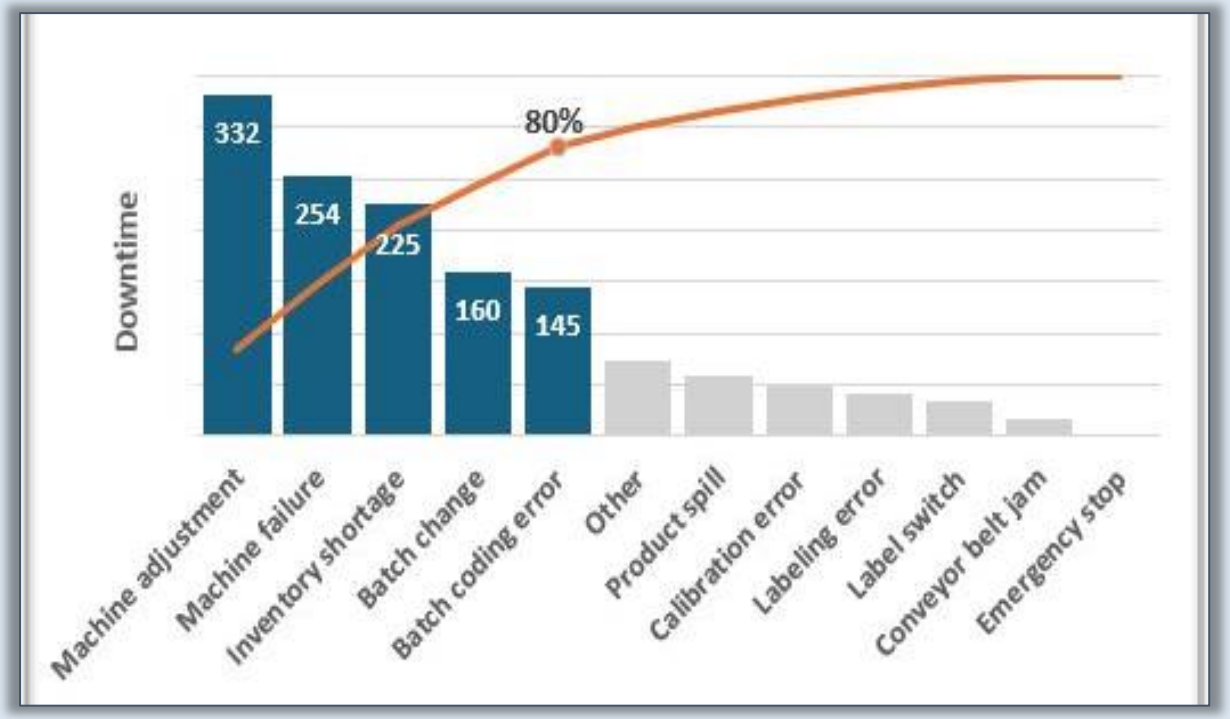
Visual Analysis of Objectives

➢ Line Efficiency

- Overall Efficiency: 64%
- The operator *Mac* performs a few percentage points below the average

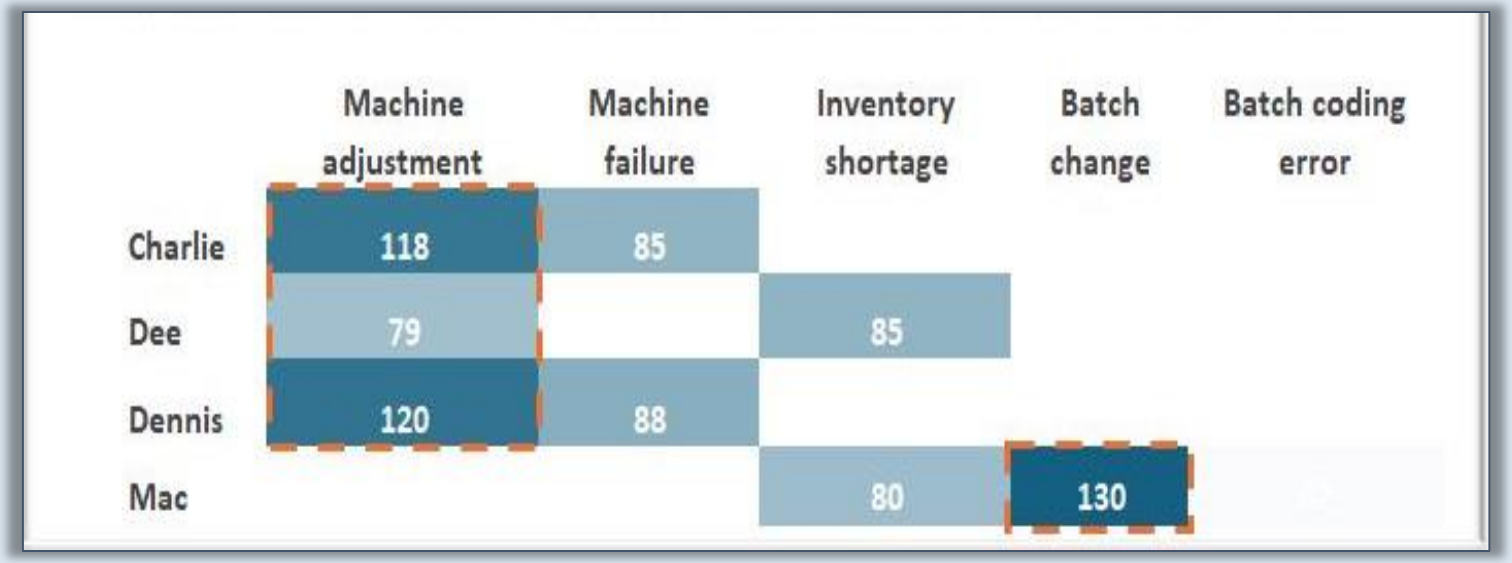
➢ Main Downtime Factors

- The top 5 downtime factors contribute to 80% of total downtime

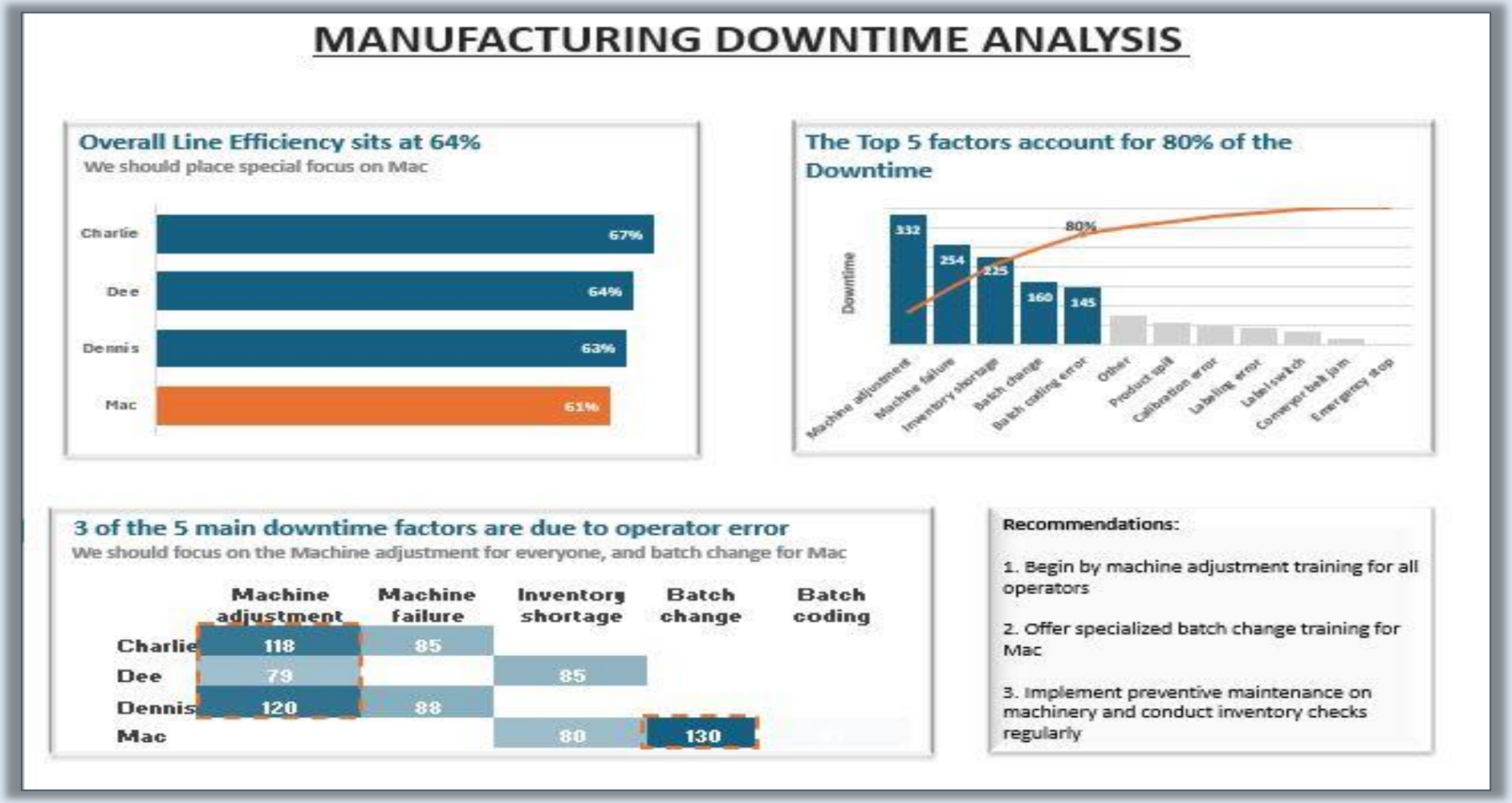


➢ Downtime by Operator and Factor

- **Machine Adjustment**: Charlie and Dennis experienced the most downtime
- **Inventory Shortage**: Dee had the highest downtime
- **Batch Change**: Mac faced the greatest downtime



Dashboard


MANUFACTURING DOWNTIME ANALYSIS
Overall Line Efficiency sits at 64%
We should place special focus on Mac
Charlie
67%
Dee
64%
Dennis
63%
Mac
61%
The Top 5 factors account for 80% of the Downtime
Downtime
332
254
225
160
145
80%
Machine adjustment
Machine failure
Inventory shortage
Batch change
Batch coding error
Other
Product spill
Calibration error
Labeling error
Label switch
Conveyor belt jam
Emergency stop
3 of the 5 main downtime factors are due to operator error
We should focus on the Machine adjustment for everyone, and batch change for Mac
Machine adjustment
Machine failure
Inventory shortage
Batch change
Batch coding
Charlie
118
85
Dee
79
85
Dennis
120
88
Mac
80
130
Recommendations:
1. Begin by machine adjustment training for all operators
2. Offer specialized batch change training for Mac
3. Implement preventive maintenance on machinery and conduct inventory checks regularly

Key Insights

- **Overall Efficiency**: 64%, with Operator Charlie achieving the highest efficiency at 67%
- **Total Downtime**: 1,388 minutes recorded across all batches
- **Top Downtime Factors**: Machine Adjustment, Machine Failure, Inventory Shortage, Batch Change, and Batch Coding Error, collectively accounting for 80% of total downtime
- **Operator Impact**: 3 out of the 5 main downtime factors are attributed to operator error

Recommendations

- **Training Programs**: Implement targeted training for all operators on machine adjustments to minimize downtime
- **Batch Change Training for Mac**: Offer specific training to Operator Mac to help improve his handling of batch changes
- **Preventive Maintenance**: Set up a regular maintenance schedule and check machines frequently to prevent failures.

Thank you