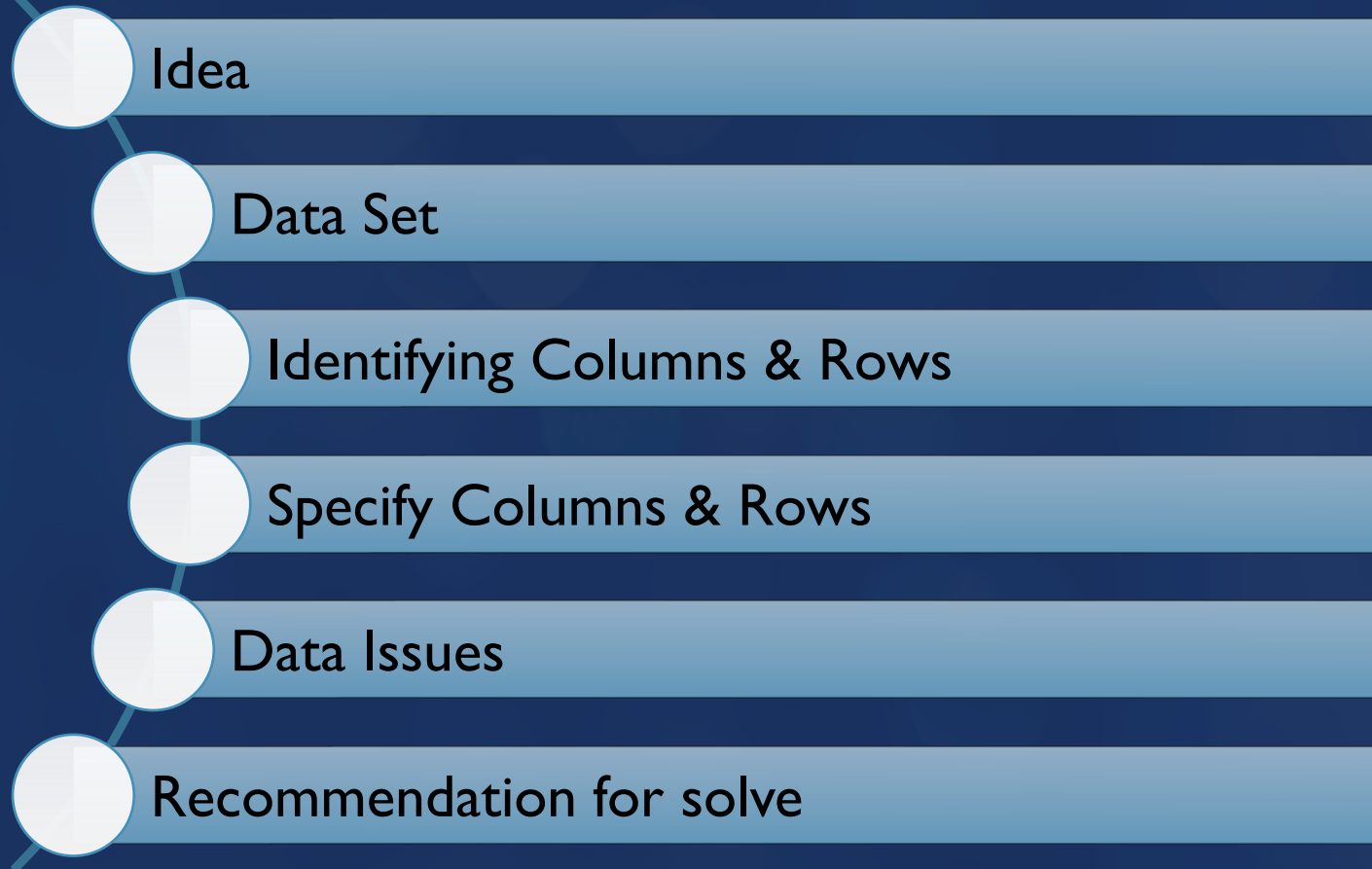




MANUFACTURING OPERATIONS IN A TEXTILE FACTORY

DATA EXPLORATION PART

PRESENTATION STEPS



IDEA

- The project's goal is to **improve operational performance and reduce costs** at a textile factory by analyzing machine data. We will apply a data analysis methodology to uncover patterns, identify hidden issues, and provide actionable recommendations.
- **Key Project Areas**
- **Production Efficiency Analysis:** We will examine the relationship between operating hours and daily output for each machine and production line. The objective is to identify the most efficient machines and understand the factors influencing their output.
- **Downtime Analysis and Reduction:** We will analyze downtime data to understand the most common causes, such as mechanical failures or power outages. This will allow us to develop a preventive maintenance plan and reduce production losses.
- **Resource Consumption Optimization:** We will analyze energy and water consumption and link it to production. This will help us identify opportunities to reduce consumption and lower operational costs.
- **Expected Outcome**
- By the end of this project, the factory will be able to make data-driven decisions to increase efficiency, cut costs, and improve overall operational performance.

DATA SET

- This dataset is a comprehensive record of daily operations at a textile factory, covering a long period from **January 1, 2023**, to **September 15, 2025**. It consists of **372,220 rows** and **15 columns**, providing deep insights into machine performance and production efficiency.

MachineID	ProductionLine	ProcessStage	MachineType	Date	Shift	OperatingHour	Downtime_Minute	Downtime_Reason	Daily_Output_KG	Workers_Count	Energy_Consumption_kWh	Water_Consumption_L	Depreciation_Percent	Waste_KG
SP-EU-001	Spinning	Cotton Receiving	Forklift	1/1/2023	Morning	6.05	17	Oil Low	313.61	1	11.14	0	0.005	-0.69
SP-EU-001	Spinning	Cotton Receiving	Forklift	1/1/2023	Afternoon	7.18	2	None	171.41	2	14.38	0	0.005	-0.11
SP-EU-001	Spinning	Cotton Receiving	Forklift	1/2/2023	Morning	7.43	44	None	674.96	1	15.13	0	0.005	-0.4
SP-EU-001	Spinning	Cotton Receiving	Forklift	1/2/2023	Afternoon	7.52	10	None	832.9	3	14	0	0.005	1.5
SP-EU-001	Spinning	Cotton Receiving	Forklift	1/3/2023	Morning	6.2	24	Power Outage	201.95	4	12.66	0	0.005	2.41
SP-EU-001	Spinning	Cotton Receiving	Forklift	1/3/2023	Afternoon	7.07	59	Power Outage	489.31	3	15.07	0	0.005	2.96
SP-EU-001	Spinning	Cotton Receiving	Forklift	1/4/2023	Morning	7.15	45	Thread Breakage	207.65	2	15.08	0	0.005	1.71
SP-EU-001	Spinning	Cotton Receiving	Forklift	1/4/2023	Afternoon	7.73	24	None	433.94	2	15.04	0	0.005	3.35
SP-EU-001	Spinning	Cotton Receiving	Forklift	1/5/2023	Morning	7.34	44	None	1040.56	2	15	0	0.005	8.28
SP-EU-001	Spinning	Cotton Receiving	Forklift	1/5/2023	Afternoon	6.33	24	None	348.74	3	13.14	0	0.005	4.71
SP-EU-001	Spinning	Cotton Receiving	Forklift	1/6/2023	Morning	7.69	49	Thread Breakage	209.72	1	16.32	0	0.005	2.4
SP-EU-001	Spinning	Cotton Receiving	Forklift	1/6/2023	Afternoon	6.42	60	None	601.77	4	12.1	0	0.005	5.63
SP-EU-001	Spinning	Cotton Receiving	Forklift	1/7/2023	Morning	6.29	8	None	327.47	4	11.98	0	0.005	2.04
SP-EU-001	Spinning	Cotton Receiving	Forklift	1/7/2023	Afternoon	6.72	8	Mechanical Failure	579.52	2	12.22	0	0.005	-1.84
SP-EU-001	Spinning	Cotton Receiving	Forklift	1/8/2023	Morning	7.58	27	Power Outage	739.3	3	15.45	0	0.005	1.99
SP-EU-001	Spinning	Cotton Receiving	Forklift	1/8/2023	Afternoon	7.94	55	Power Outage	1131.58	3	14.66	0	0.005	9.74
SP-EU-001	Spinning	Cotton Receiving	Forklift	1/9/2023	Morning	7.54	21	Mechanical Failure	260.14	3	14.94	0	0.005	0.96
SP-EU-001	Spinning	Cotton Receiving	Forklift	1/9/2023	Afternoon	7.94	48	None	343.2	2	17.06	0	0.005	4.55
SP-EU-001	Spinning	Cotton Receiving	Forklift	1/10/2023	Morning	6.31	48	Oil Low	258.72	3	13.69	0	0.005	3.64
SP-EU-001	Spinning	Cotton Receiving	Forklift	1/10/2023	Afternoon	6.98	7	Mechanical Failure	982.66	1	14.89	0	0.005	12.36
SP-EU-001	Spinning	Cotton Receiving	Forklift	1/11/2023	Morning	6.48	36	None	927.31	2	12.92	0	0.005	-3.05
SP-EU-001	Spinning	Cotton Receiving	Forklift	1/11/2023	Afternoon	6.26	30	Thread Breakage	895.75	2	12.59	0	0.005	-1.52
SP-EU-001	Spinning	Cotton Receiving	Forklift	1/12/2023	Morning	7.86	48	Mechanical Failure	903.04	3	15.13	0	0.005	-0.88
SP-EU-001	Spinning	Cotton Receiving	Forklift	1/12/2023	Afternoon	6.88	33	Oil Low	541.41	2	12.56	0	0.005	-0.02
SP-EU-001	Spinning	Cotton Receiving	Forklift	1/13/2023	Morning	7.18	0	None	209.86	3	13.58	0	0.005	1.6
SP-EU-001	Spinning	Cotton Receiving	Forklift	1/13/2023	Afternoon	6.14	15	Overload	345.08	4	12.38	0	0.005	1.62
SP-EU-001	Spinning	Cotton Receiving	Forklift	1/14/2023	Morning	6.49	30	None	811.09	4	11.93	0	0.005	-0.97
SP-EU-001	Spinning	Cotton Receiving	Forklift	1/14/2023	Afternoon	6.82	55	Power Outage	782.8	4	14.96	0	0.005	6.63
SP-EU-001	Spinning	Cotton Receiving	Forklift	1/15/2023	Morning	7.46	51	None	984.85	4	14	0	0.005	-0.03
SP-EU-001	Spinning	Cotton Receiving	Forklift	1/15/2023	Afternoon	6.37	29	None	334.26	1	12.6	0	0.005	4.5
SP-EU-001	Spinning	Cotton Receiving	Forklift	1/16/2023	Morning	6.1	34	Thread Breakage	784.97	2	13.24	0	0.005	11.29
SP-EU-001	Spinning	Cotton Receiving	Forklift	1/16/2023	Afternoon	6.81	30	None	325.43	4	12.42	0	0.005	0.98
SP-EU-001	Spinning	Cotton Receiving	Forklift	1/17/2023	Morning	6.53	50	Power Outage	797.1	4	13.57	0	0.005	0.56

IDENTIFYING COLUMNS & ROWS

Column Name	Description
MachineID	Unique identifier for each machine
ProductionLine	The production line on which the machine operates
ProcessStage	Processing stage in the production line
MachineType	Machine type
Date	Date of data recording
Shift	Work shift (Morning,Afternoon, Night)
OperatingHours	Machine operating hours
Downtime_Minutes	Machine downtime in minutes
Downtime_Reason	Reason for machine downtime
Daily_Output_KG	Daily output by weight (kilograms)
Workers_Count	Number of workers operating the machine
Energy_Consumption_kWh	Energy consumption in kWh
Water_Consumption_L	Water consumption in liters
Depreciation_Percent	Depreciation percentage (the decrease in the value of an asset over time)
Waste_KG	Waste amount in kilograms

SPECIFY COLUMNS & ROWS

Column Name	Data Type
MachineID	Text (Categorical)
ProductionLine	Text (Categorical)
ProcessStage	Text (Categorical)
MachineType	Text (Categorical)
Date	Date
Shift	Text (Categorical)
OperatingHours	Numeric (Float)
Downtime_Minutes	Numeric (Integer)
Downtime_Reason	Text (Categorical)
Daily_Output_KG	Numeric (Float)
Workers_Count	Numeric (Integer)
Energy_Consumption_kWh	Numeric (Float)
Water_Consumption_L	Numeric (Float)
Depreciation_Percent	Numeric (Float)
Waste_KG	Numeric (Float)

DATA ISSUES

Data Issue	Affected Columns	No_values
Negative Values	Waste_KG	(2295 values)
Missing Values	Downtime_Reason	(189356 values)
Zero Values	Water_Consumption_L	(All Values)
	Downtime_Minutes & found DownTime Reason	(6083 values)
Outliers	Downtime_Minutes	(176 values)
	Daily_Output_KG	(10 values)

RECOMMENDATION FOR SOLVE

Data Issue	Recommended Solve
Negative Values	Col: Waste_KG 2 solutions : ABS () OR Neglect it (only 0.6% From Data)
Missing Values	Col: Downtime_Reason 2 Solutions : Power Query Replace With “UnKnown” OR Replace With Mode
Zero Values	Col: Water_Consumption_L Solution : Neglect Column Col: Downtime_Minutes Solution : Replace 0 Values With Average OF Down Time Minutes
Outliers	Col: Downtime_Minutes 2 Solutions : Neglect it (Only 0.005%) OR Replace With Median Col: Daily_Output_KG Solution : Neglect it (Only 10 values)

EXCEL SHEET LINK FOR VIEW



- https://drive.google.com/drive/folders/IIH9s_fSWb8EyCjZmDtcEsVlhlfsp-iKa?usp=drive_link



THANK YOU

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