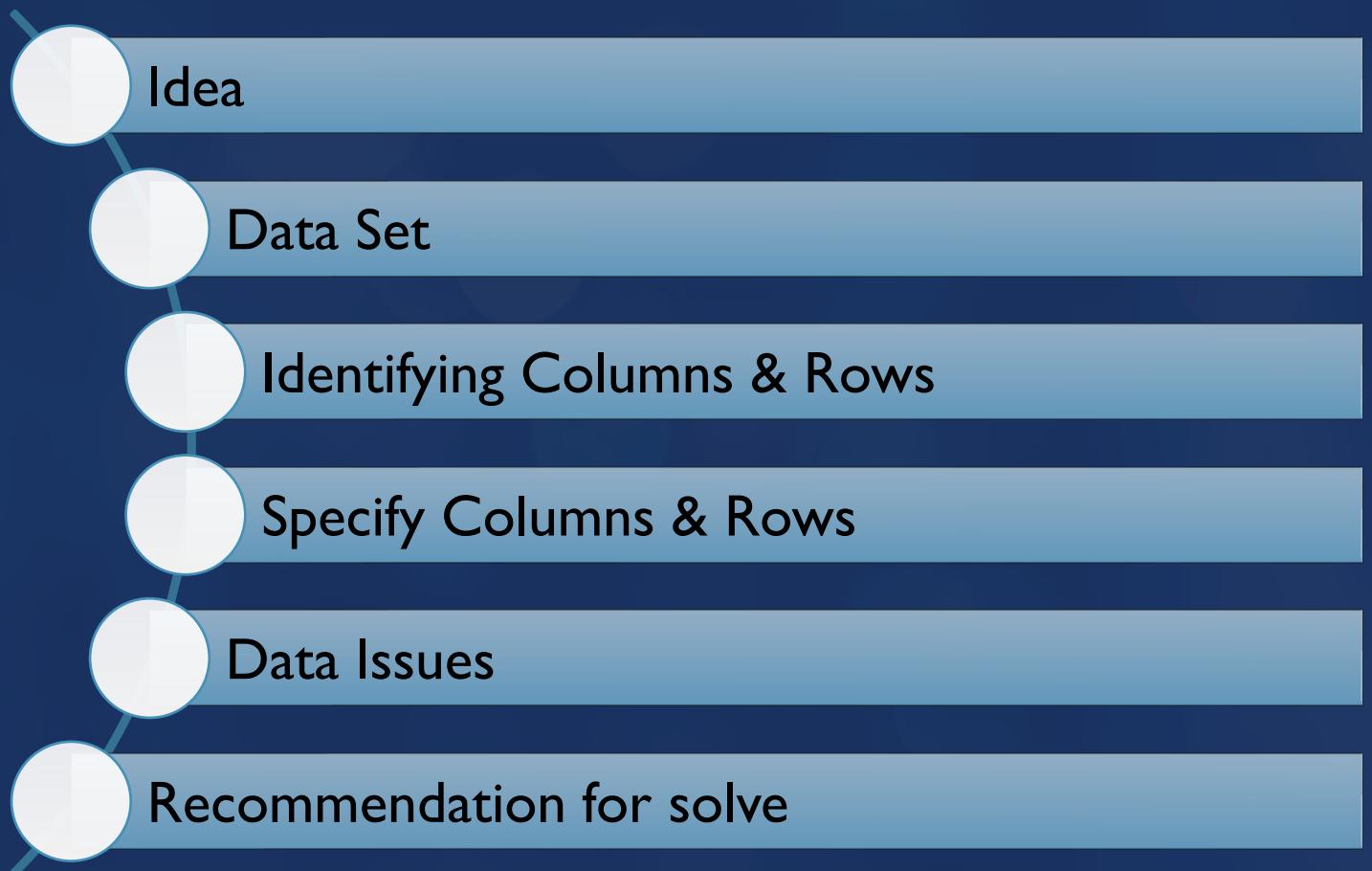


The background of the slide features a complex, abstract network structure composed of numerous glowing blue and pink lines and small circular nodes. This visual metaphor represents connectivity, data flow, and the intricate nature of manufacturing operations. The network is set against a dark, slightly blurred background, creating a sense of depth and technological sophistication.

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 : Neglcict 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



Excel

- https://drive.google.com/drive/folders/1IH9s_fSWb8EyCjZmDtcEsVlhlfsp-iKa?usp=drive_link



THANK YOU

TEAM NAMES:

ABD-ELRAHMAN ALI (TEAM LEADER)

ADHAM WALID BOGHDADY

MAHMOUD ERAKY

AHMED ABD-ELMAKSoud

AHMED ELSHAIR