STULZ-CHSPL INDIA

Date:

INTERNSHIP REVIEW

IT Department

Team members

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Mentor

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BACKGROUND

- Processed historical machine breakdown data to identify failure patterns.
- Used Python, Pandas, and Scikit-learn within Jupyter Notebook for analysis and modeling.
- Focused on failure prediction to enable early detection and minimize service disruption.
- Analyzed breakdown ticket data to understand root causes and resolution timelines.

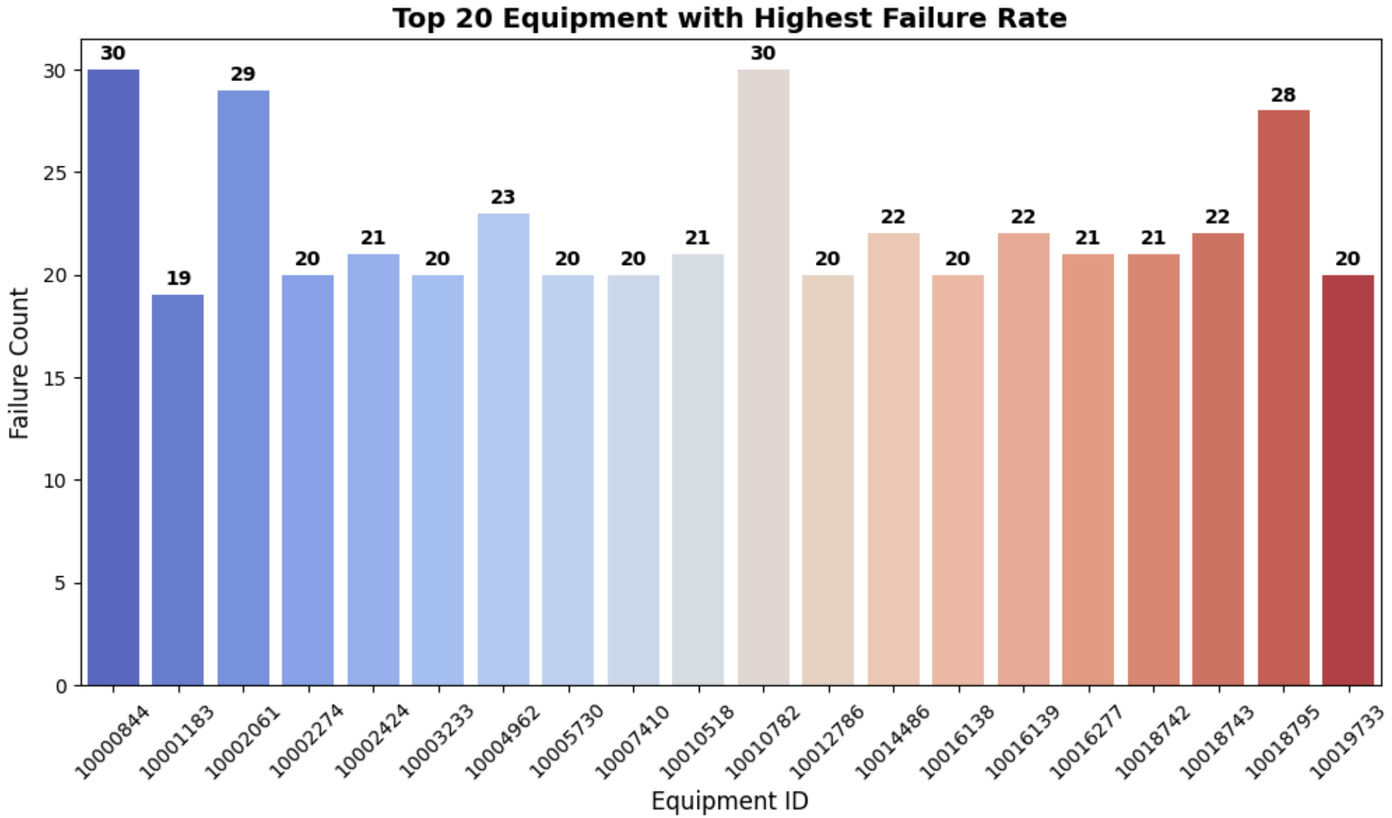
PROJECT GOALS

- Predict machine failures in advance using data-driven insights.
- Develop a Machine Learning model that supports proactive maintenance decisions.
- Reduce unplanned downtime and operational risks through timely interventions.
- Provide actionable intelligence to maintenance teams for resource optimization.

DATA ANALYSIS INSIGHTS

1. Top 20 Failed Equipment

- Highlights the equipment with the highest failure count, guiding preventive maintenance prioritization.
- Targeting these assets can reduce downtime and enhance operational reliability.



DATA ANALYSIS INSIGHTS

2. Average Resolution Time per Equipment

- Shows average repair duration per equipment to identify delays in service closure.
- Long resolution times suggest the need for process improvement or better spare availability.

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Average resolution time per most failed equipment (in days):

equipment_id
10012786    275.9
10004962    128.8
10016277    117.0
10018742    115.4
10001183    113.2
10018795    101.7
10014486     89.9
10005730     89.0
10002424     88.8
10007410     71.6
10018743     66.2
10016139     62.6
10000844     54.2
10019733     53.6
10010782     53.5
10002061     52.6
10010518     44.4
10003233     30.6
10002274     29.8
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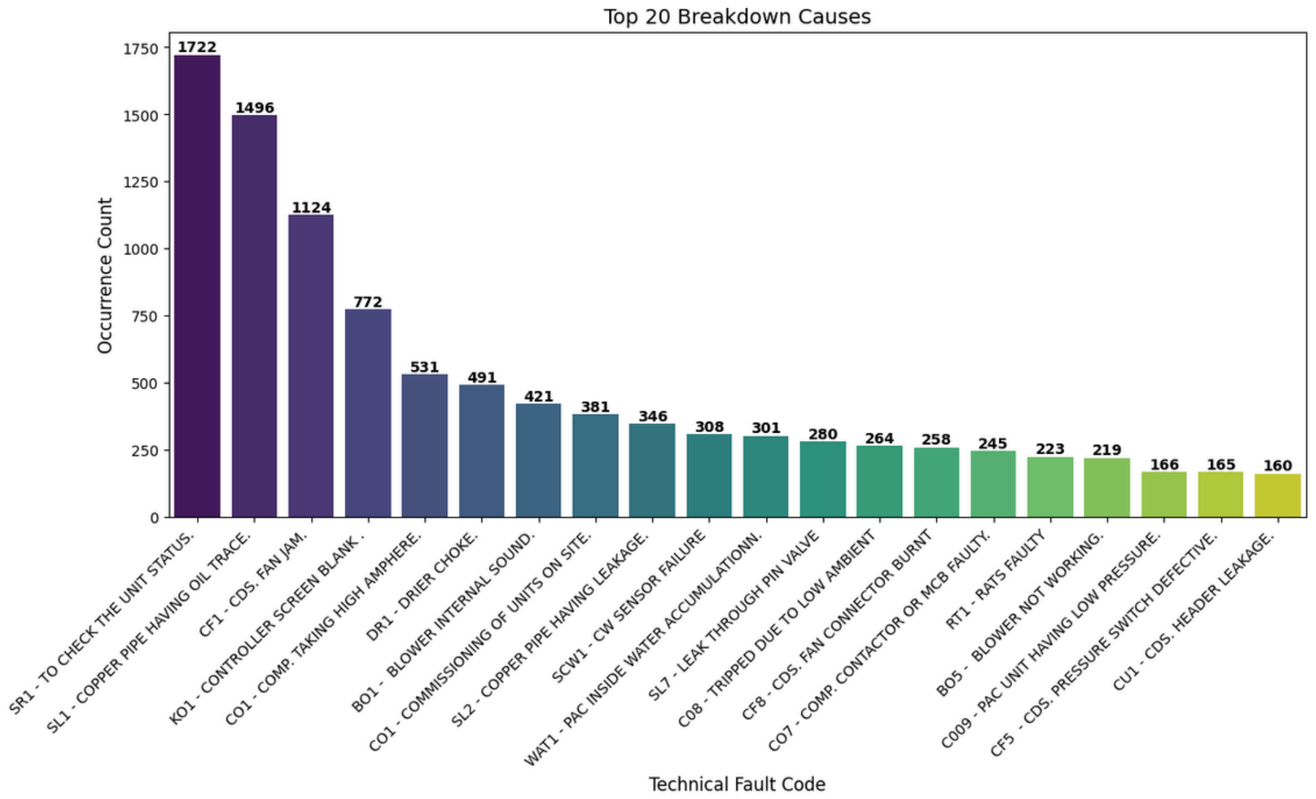
DATA ANALYSIS INSIGHTS

3. Most Frequent Breakdown Causes

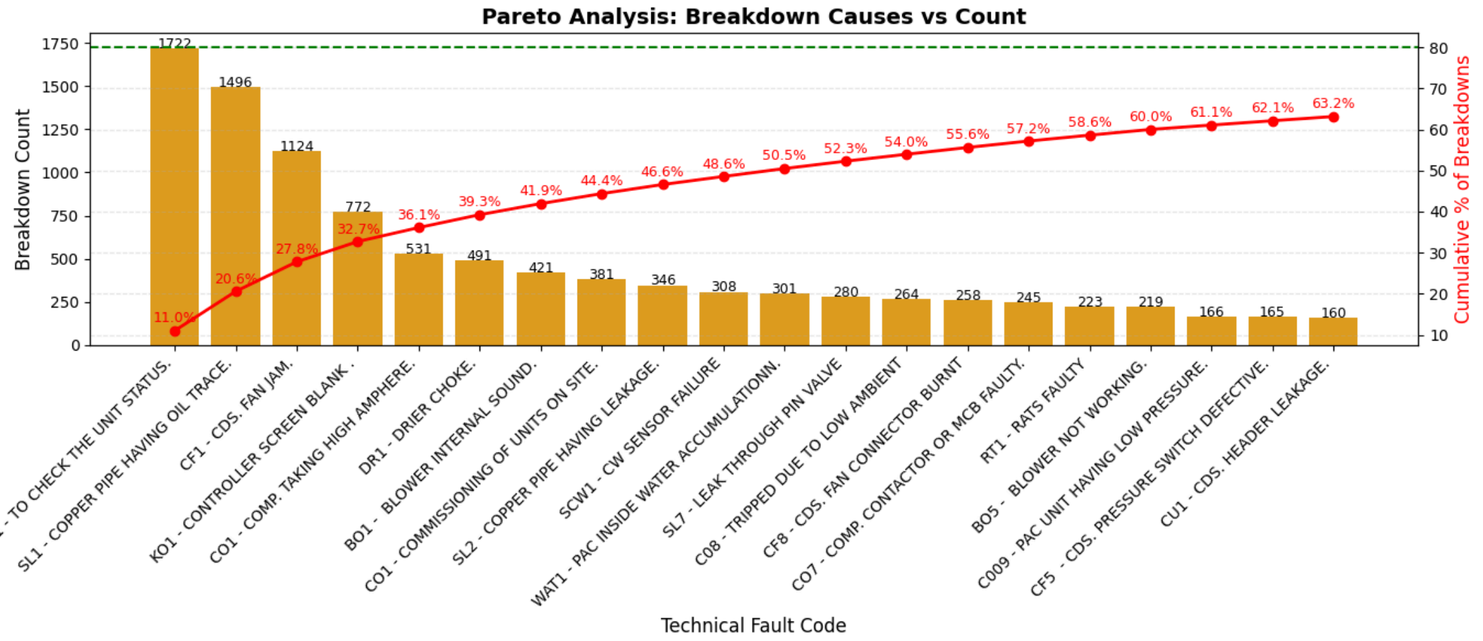
- Lists top recurring fault codes, revealing dominant failure types.
- Enables training or design modifications to reduce repeated breakdowns.



DATA ANALYSIS INSIGHTS

4. Pareto Analysis (80/20 Rule)

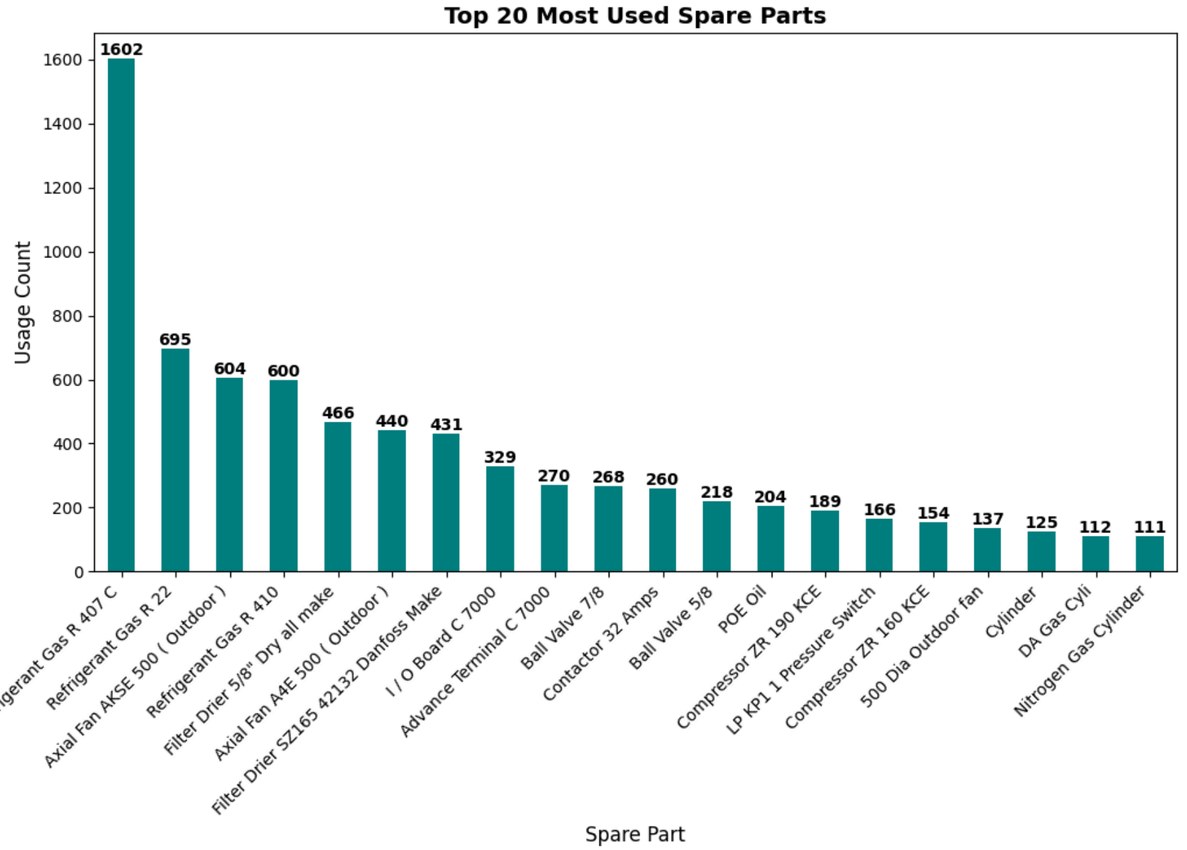
- Demonstrates that 20% of fault codes cause nearly 80% of failures.
- Prioritizing these key issues can deliver maximum impact with minimal effort.



DATA ANALYSIS INSIGHTS

5. Most Spare Parts Consumed

- Displays the most frequently used spares, highlighting high-demand components.
- Aids in inventory planning and identification of wear-prone parts.



DATA ANALYSIS INSIGHTS

6. Year-Wise Spare Consumption Analysis

- Tracks spare usage across years and ranks by frequency and recurrence.
- Supports long-term procurement strategy and highlights critical inventory.

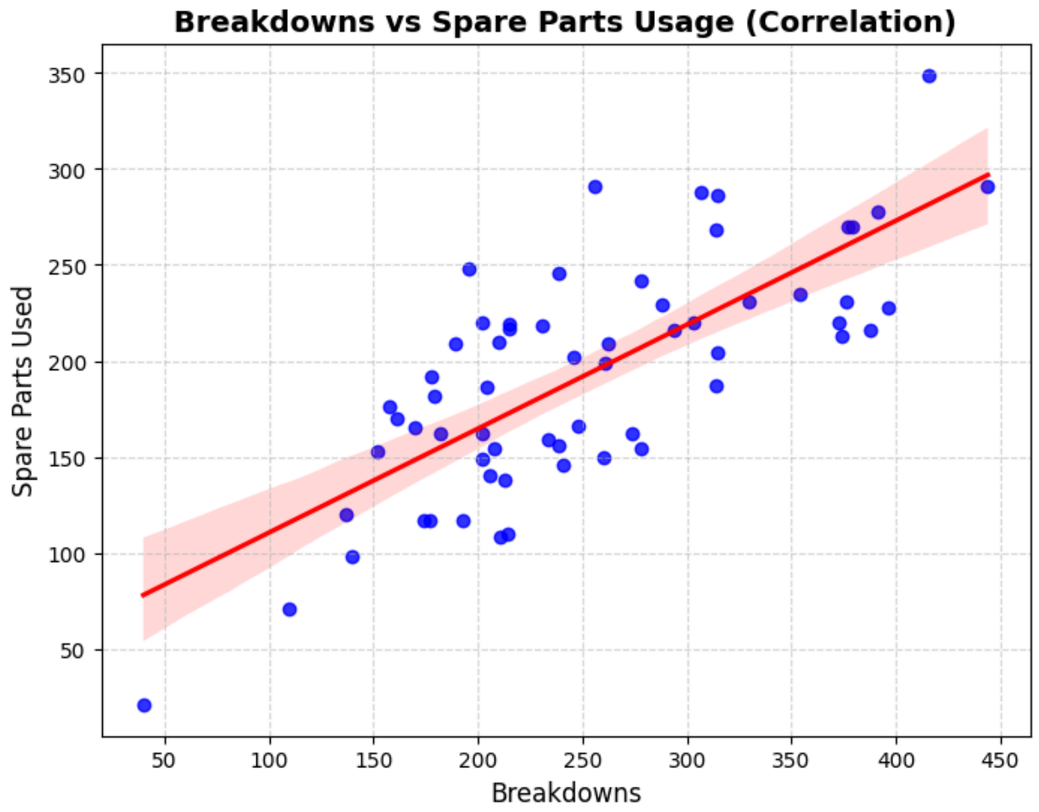
Spare Usage Grid Sorted (Rows 1 to 20 of 388)

	material_name	2020	2021	2022	2023	2024	2025
0	Refrigerant Gas R 407 C	Yes	Yes	Yes	Yes	Yes	Yes
1	Refrigerant Gas R 22	Yes	Yes	Yes	Yes	Yes	Yes
2	Axial Fan AKSE 500 (Outdoor)	Yes	Yes	Yes	Yes	Yes	Yes
3	Refrigerant Gas R 410	Yes	Yes	Yes	Yes	Yes	Yes
4	Filter Drier 5/8" Dry all make	Yes	Yes	Yes	Yes	Yes	Yes
5	Axial Fan A4E 500 (Outdoor)	Yes	Yes	Yes	Yes	Yes	Yes
6	Filter Drier SZ165 42132 Danfoss Make	Yes	Yes	Yes	Yes	Yes	Yes
7	I / O Board C 7000	Yes	Yes	Yes	Yes	Yes	Yes
8	Advance Terminal C 7000	Yes	Yes	Yes	Yes	Yes	Yes
9	Ball Valve 7/8	Yes	Yes	Yes	Yes	Yes	Yes
10	Contactor 32 Amps	Yes	Yes	Yes	Yes	Yes	Yes
11	Ball Valve 5/8	Yes	Yes	Yes	Yes	Yes	Yes
12	POE Oil	Yes	Yes	Yes	Yes	Yes	Yes
13	LP KP1 1 Pressure Switch	Yes	Yes	Yes	Yes	Yes	Yes
14	Compressor ZR 160 KCE	Yes	Yes	Yes	Yes	Yes	Yes
15	DA Gas Cyli	Yes	Yes	Yes	Yes	Yes	Yes

DATA ANALYSIS INSIGHTS

7. Breakdown Trend Over Time

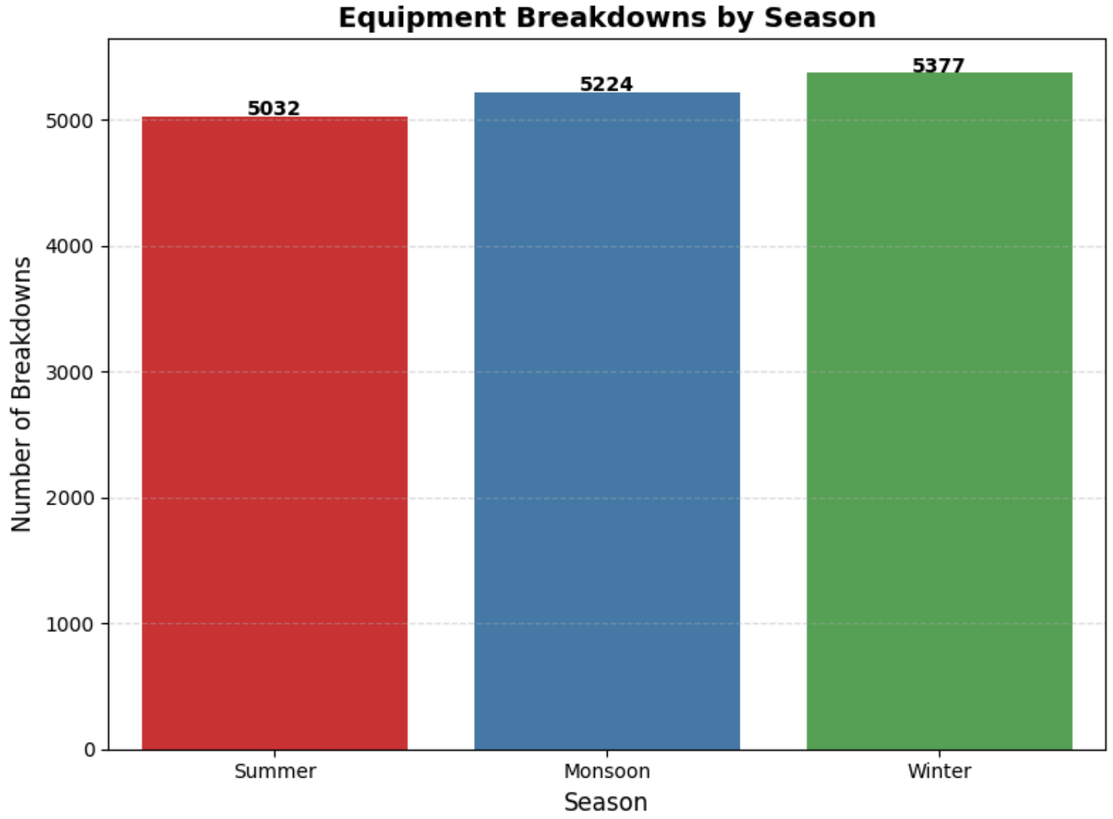
- Visualizes monthly breakdown and spare trends with correlation metrics.
- Enables predictive planning and validates the link between faults and consumption.
- Correlation between breakdowns and spare parts usage: 0.75



DATA ANALYSIS INSIGHTS

8. Seasonal Breakdown Analysis

- Categorizes breakdowns by season (Summer, Monsoon, Winter).
- Helps allocate workforce and schedule maintenance as per seasonal stress.

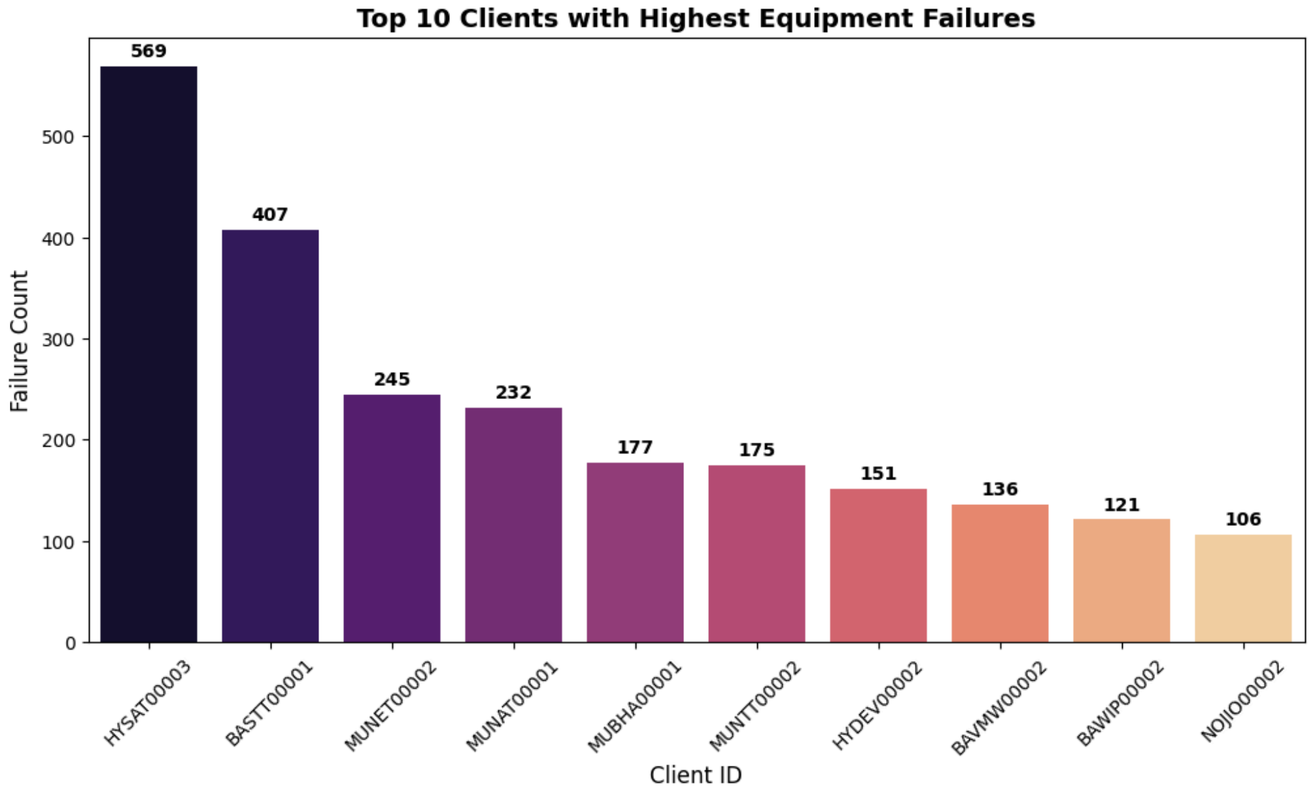


Summer: Feb, Mar, Apr, May
Monsoon: June, July, Aug, Sep
Winter: Oct, Nov, Dec, Jan

DATA ANALYSIS INSIGHTS

9. Client-Based Breakdown Analysis

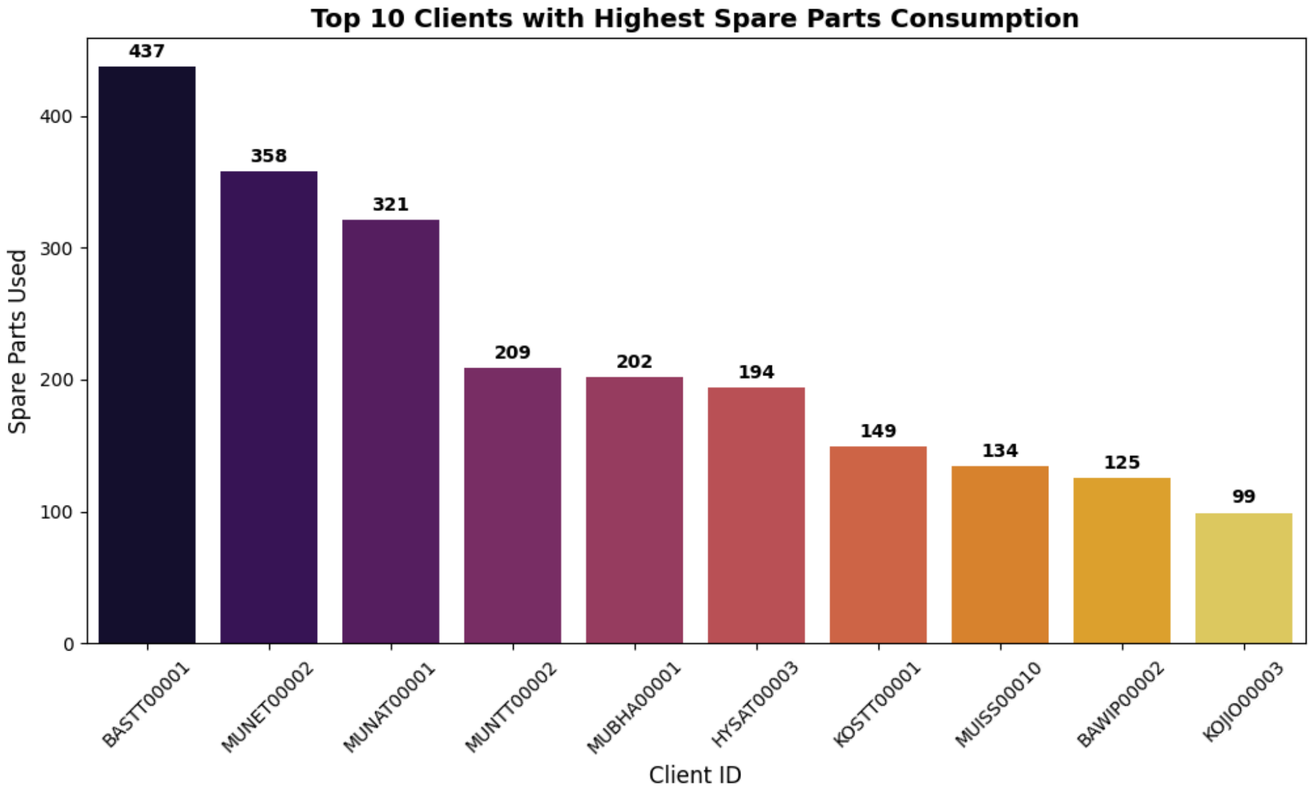
- Identifies clients with the highest number of failures.
- Enables client-focused reliability improvements and support planning.



DATA ANALYSIS INSIGHTS

10. Spare Part Consumption Across Clients

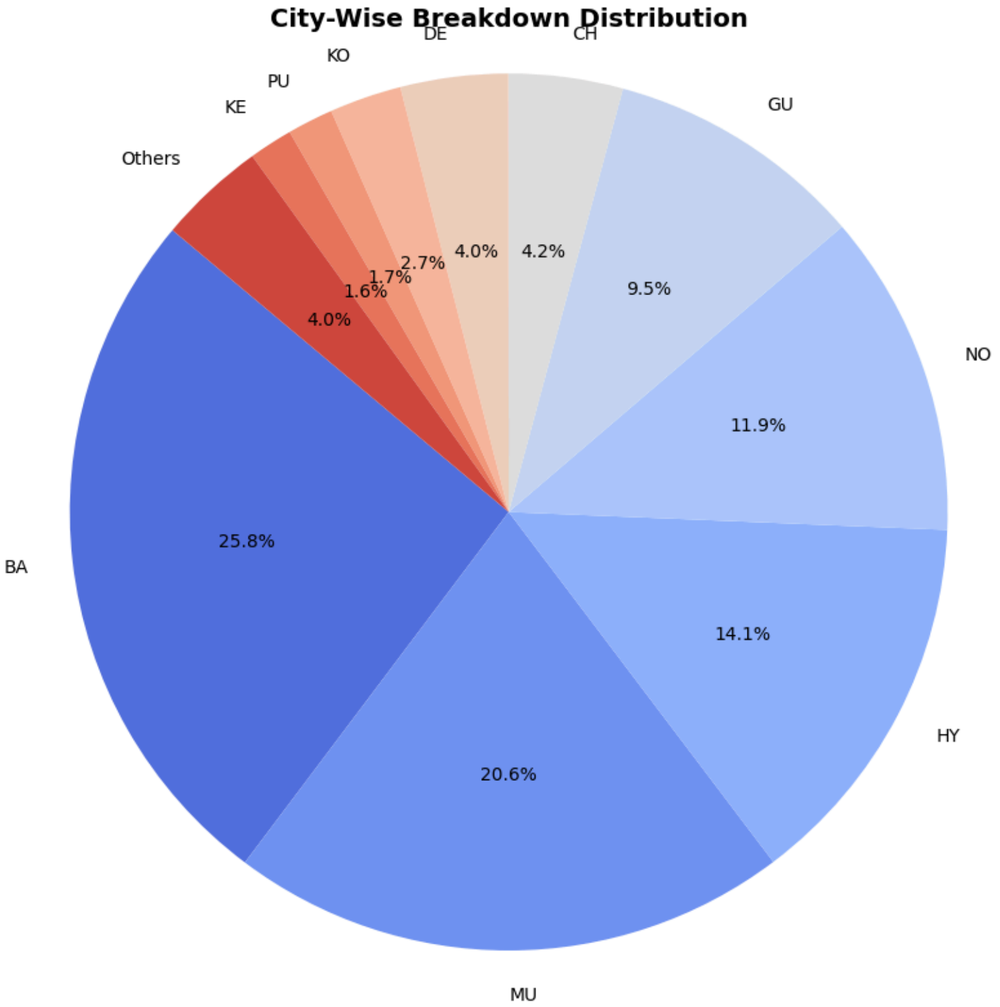
- Shows top clients by spare usage to track demand sources.
- Informs stocking, service agreements, and revenue optimization.



DATA ANALYSIS INSIGHTS

11. City-Based Breakdown Analysis

- Pie chart of failures by city grouped.
- Assists in regional resource allocation and field team deployment.



THANK YOU