Predicting Machinery Downtime

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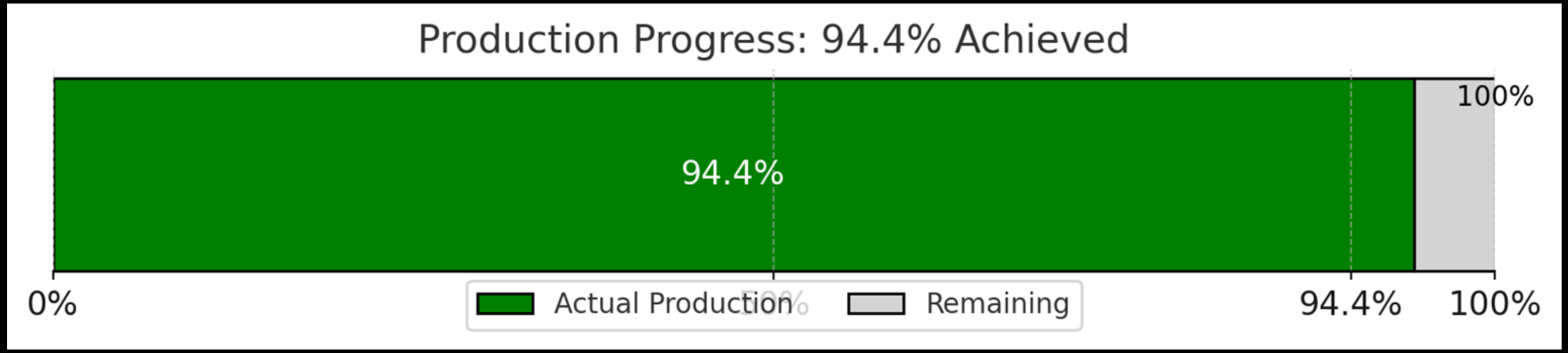
Business Problem

Downtime Costs

Machines fail unexpectedly. Output drops. Deadlines missed.

IMPACT

Efficiency Matters.

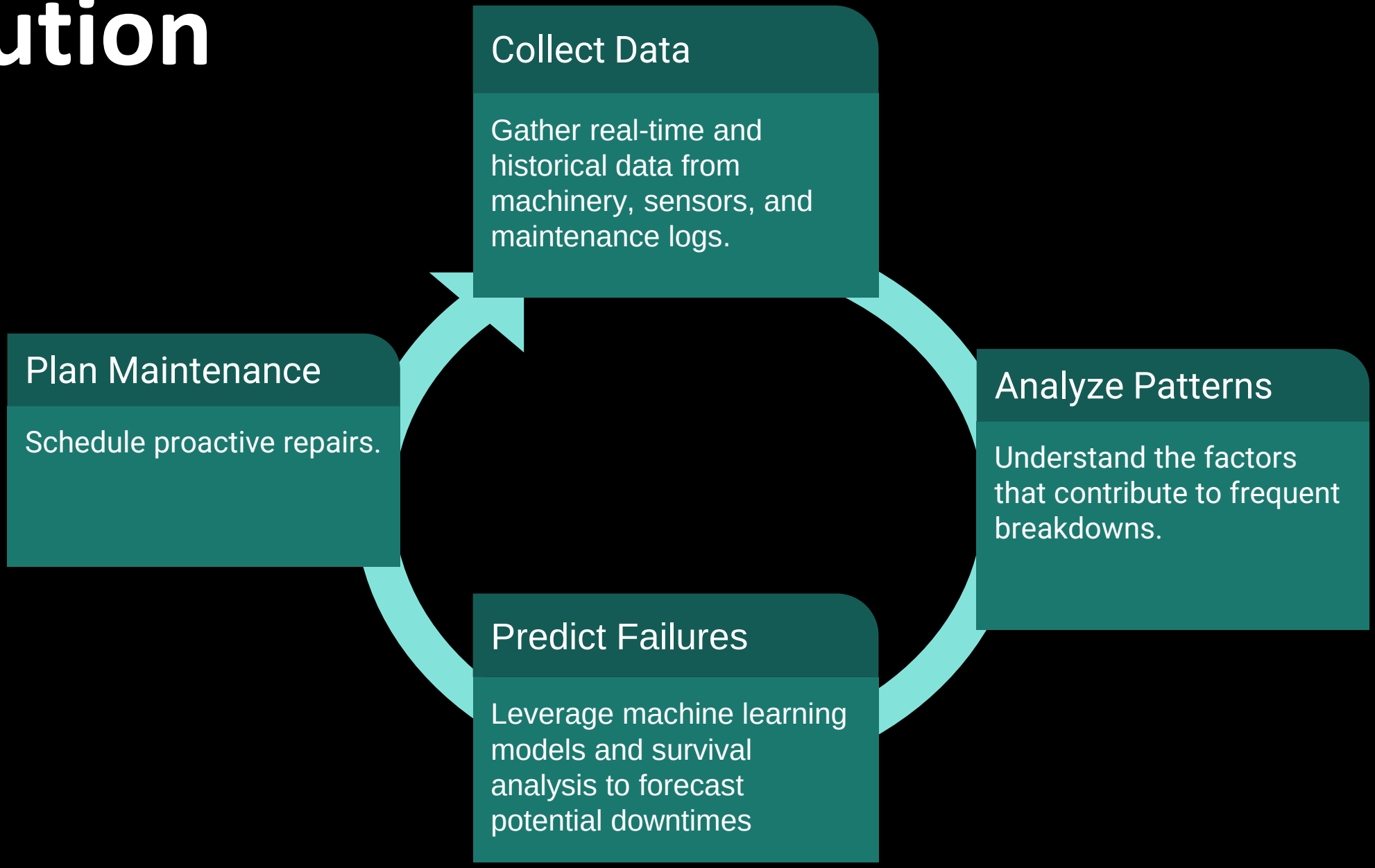


-$60M

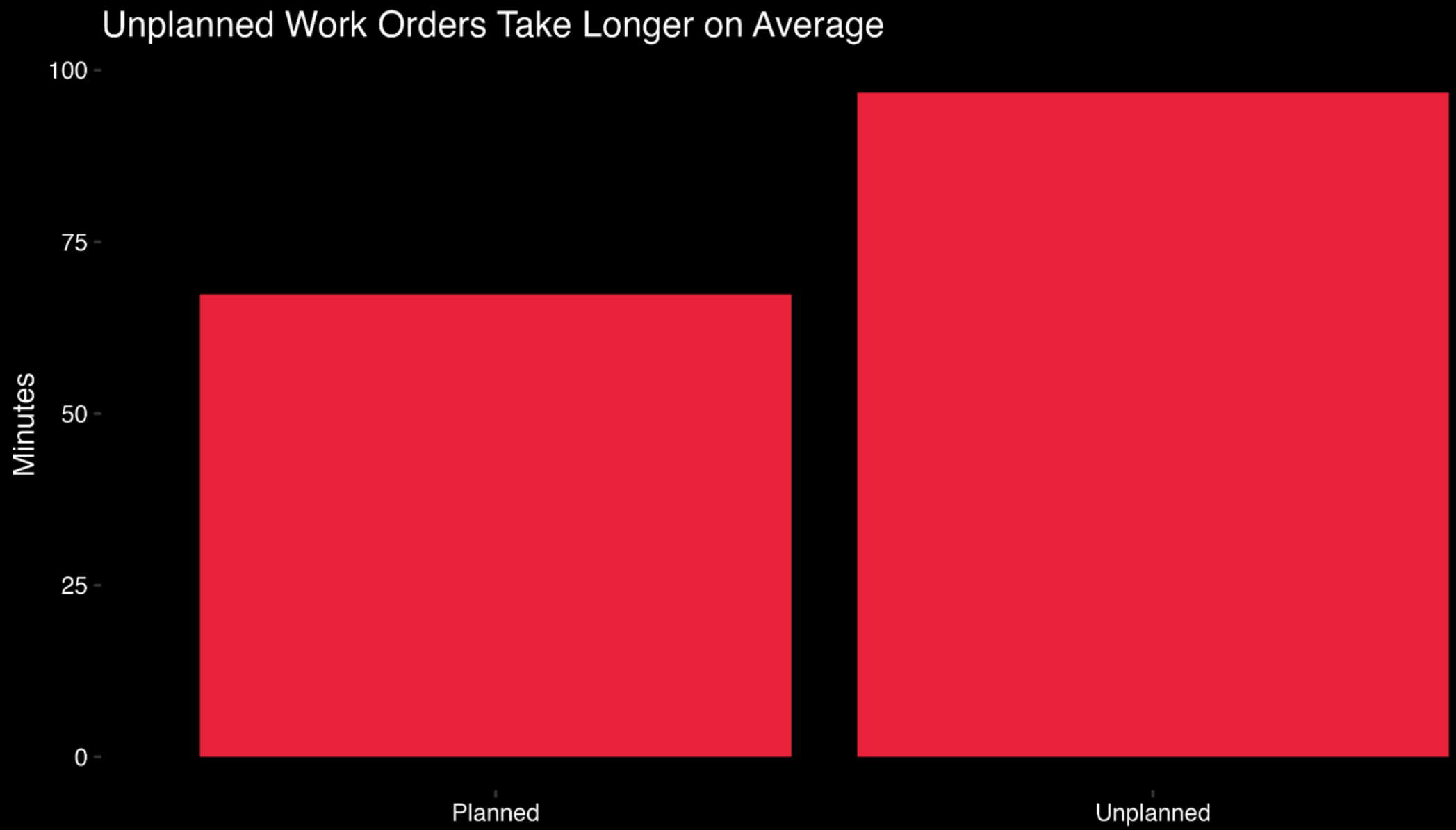
What success looks like

- Reliable: Machines running consistently without unexpected stoppages.
- Efficient: Maximized output with minimal delays.
- Scalable: A solution that grows with your production needs.

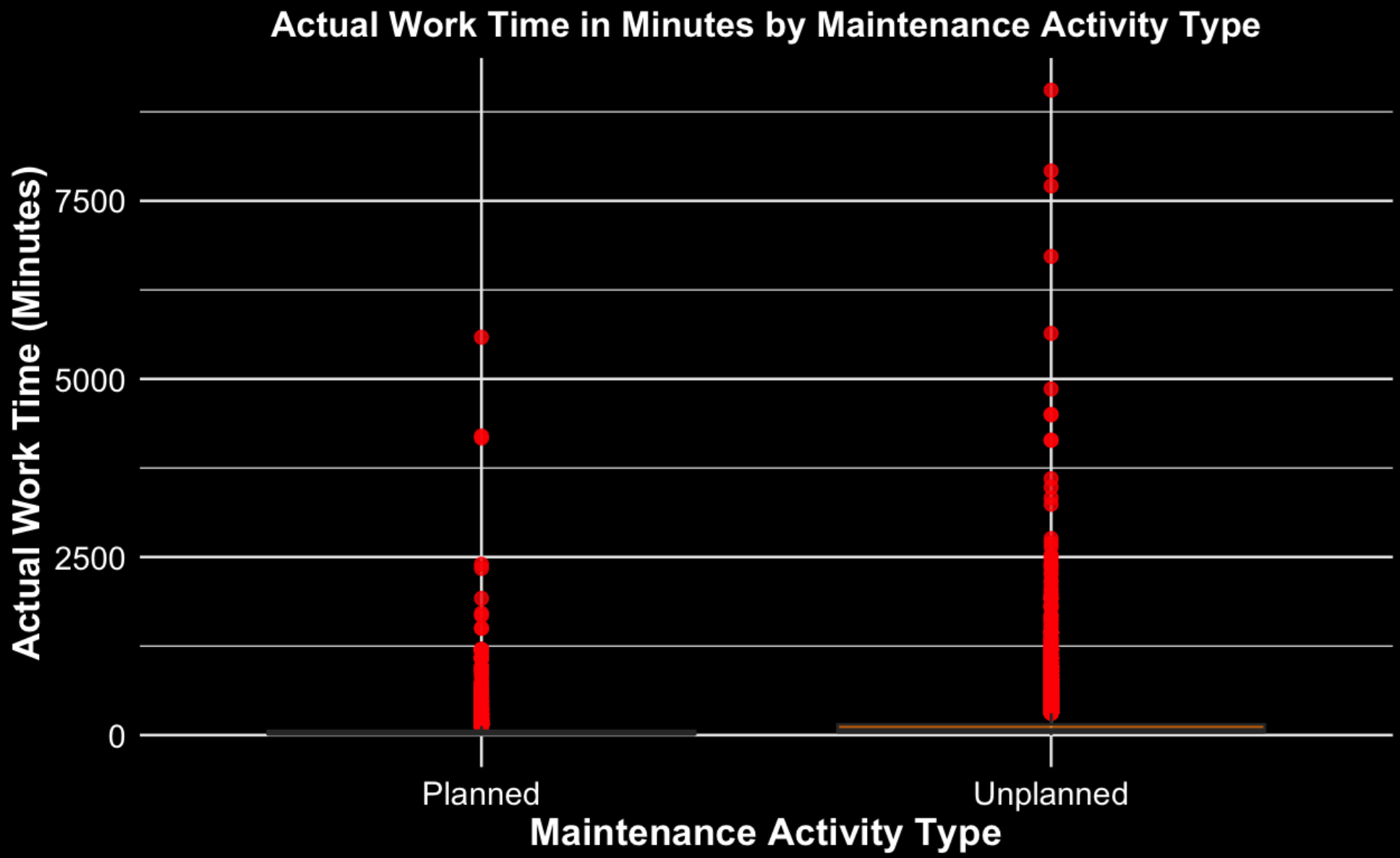
Solution


Collect Data
Gather real-time and historical data from machinery, sensors, and maintenance logs.
Analyze Patterns
Understand the factors that contribute to frequent breakdowns.
Predict Failures
Leverage machine learning models and survival analysis to forecast potential downtimes
Plan Maintenance
Schedule proactive repairs.

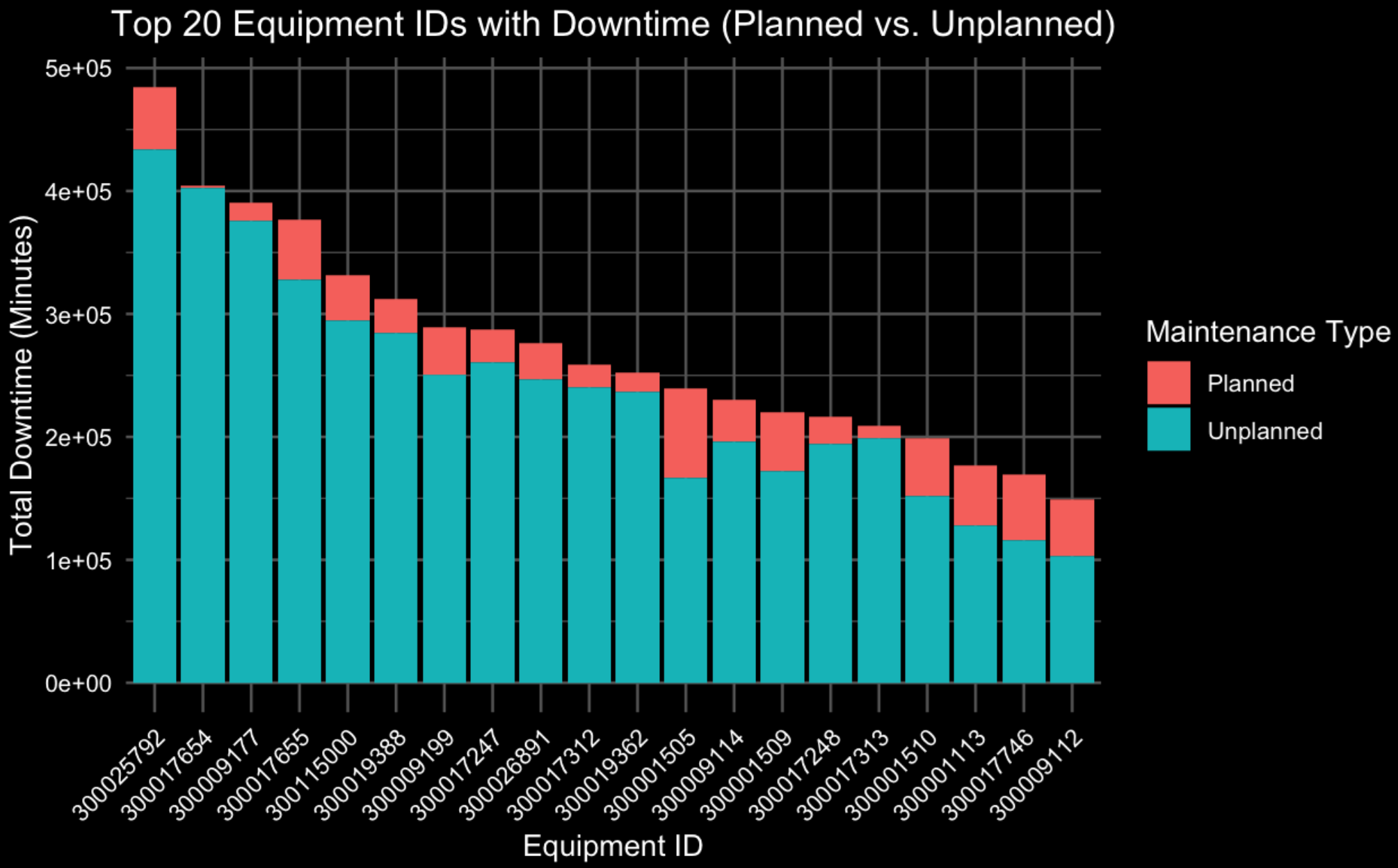
Planned vs Unplanned Failures



Failure Types Cont.

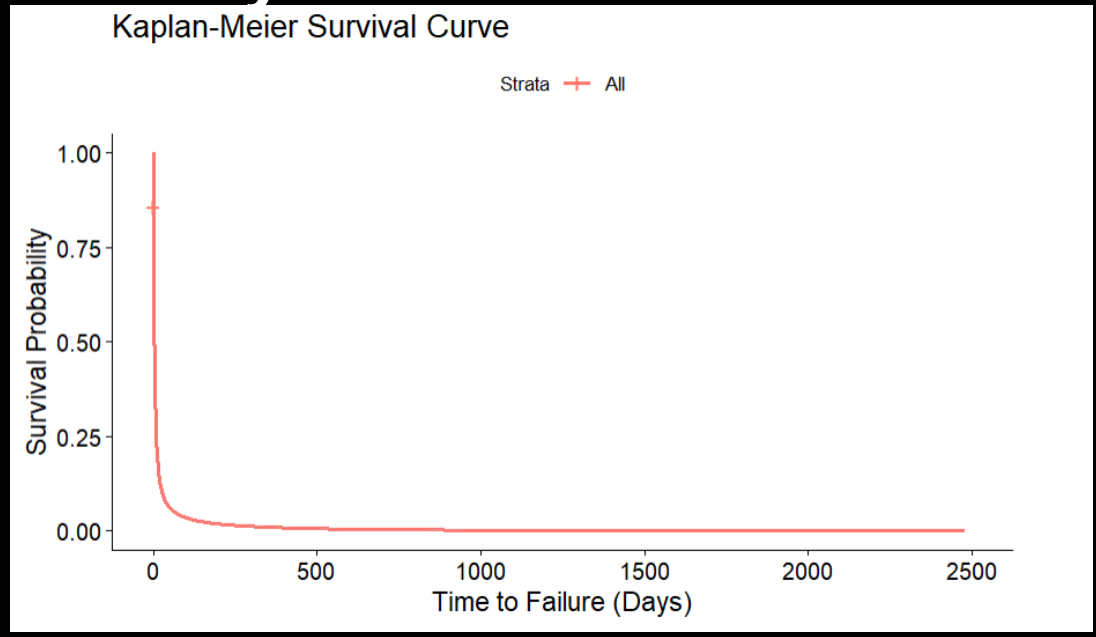


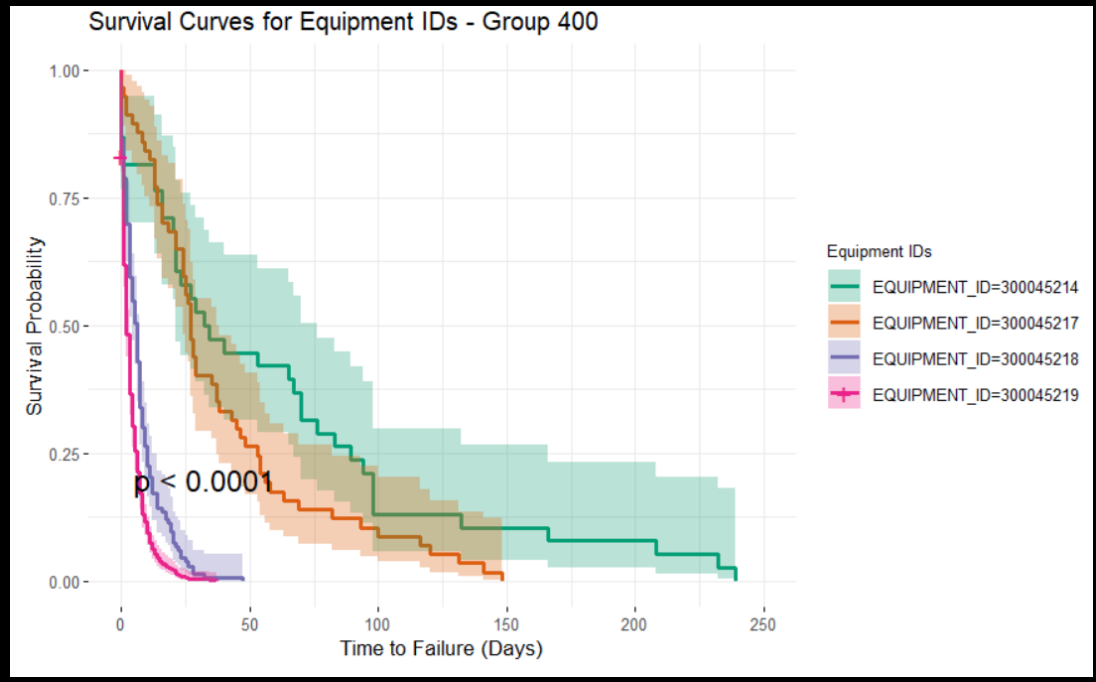
Equipment_IDs With Highest Downtime



Our Solution: Survival Analysis

- A statistical approach to model the time until an event occurs e.g. machine failure
- Improves Maintenance Planning to reduce downtime and cost
- Identifies high risk Equipment that contributes to failure
- Kaplan-Meier Survival Curve to show survival probability across all 7 years
- p-value: <0.0001

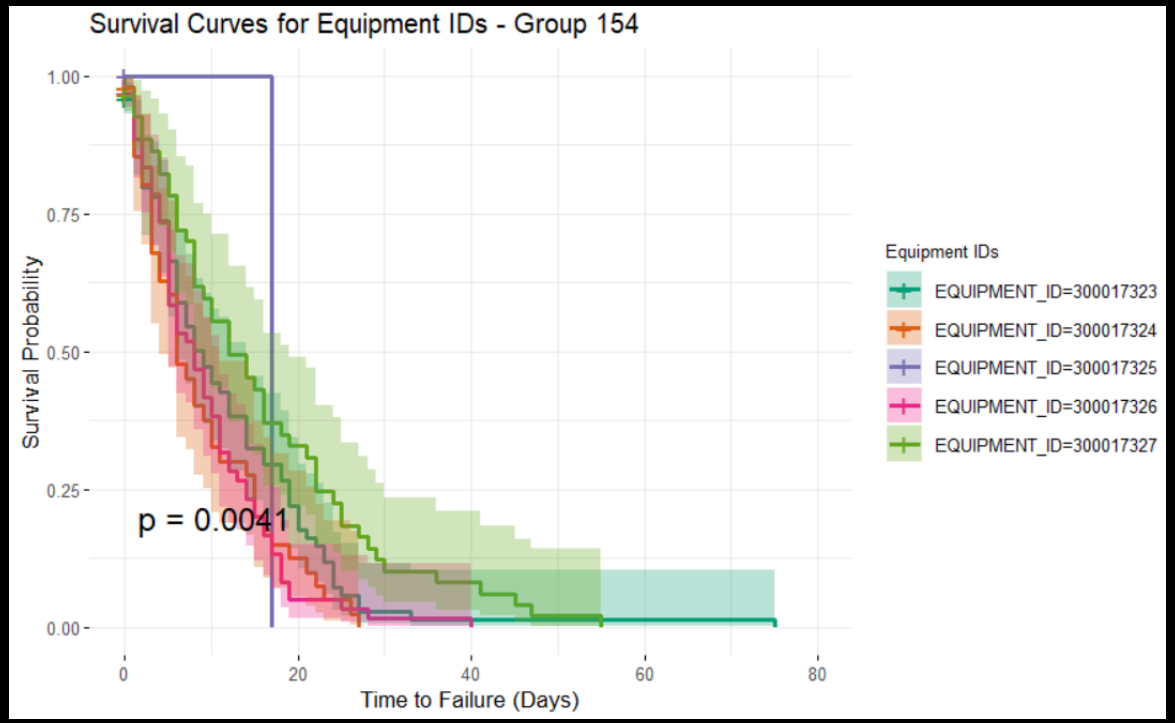


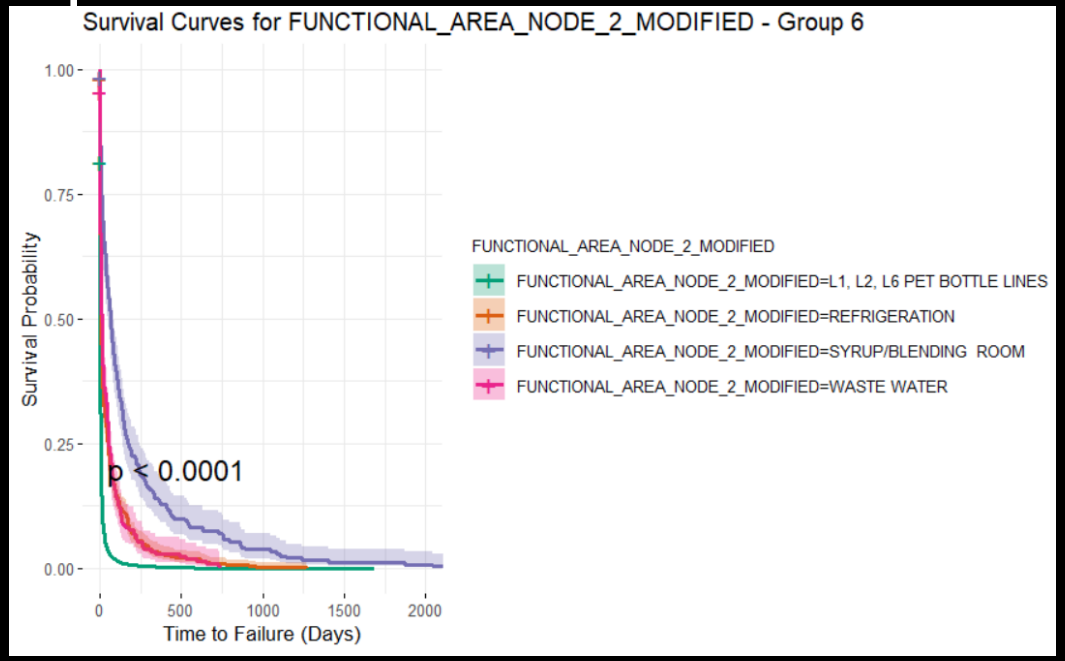


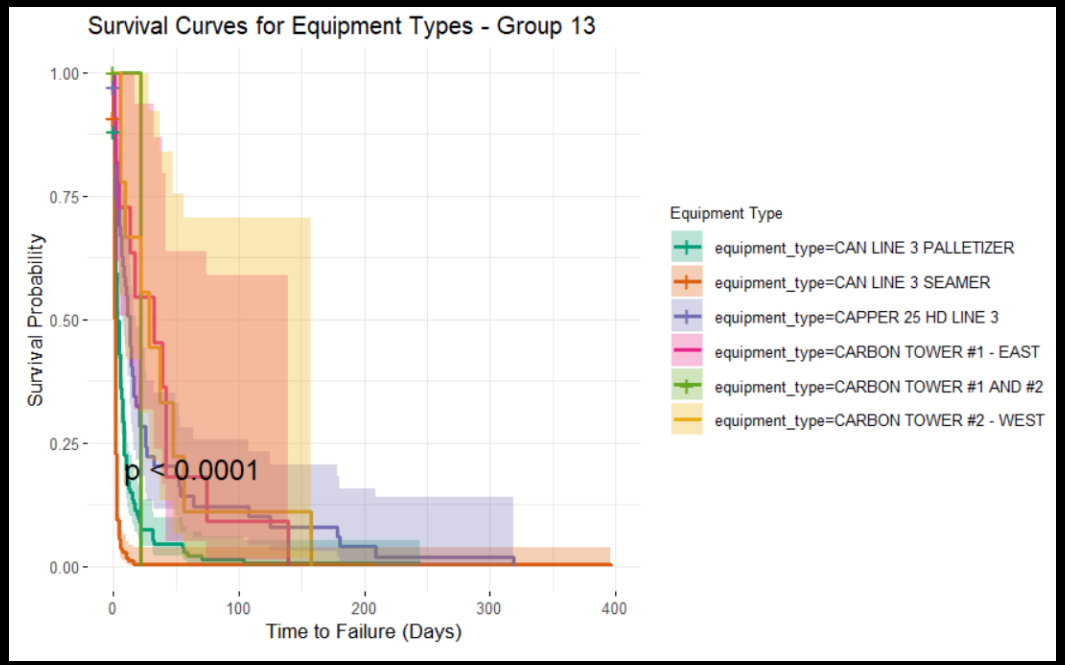
Survival Analysis Across Multiple Granularities

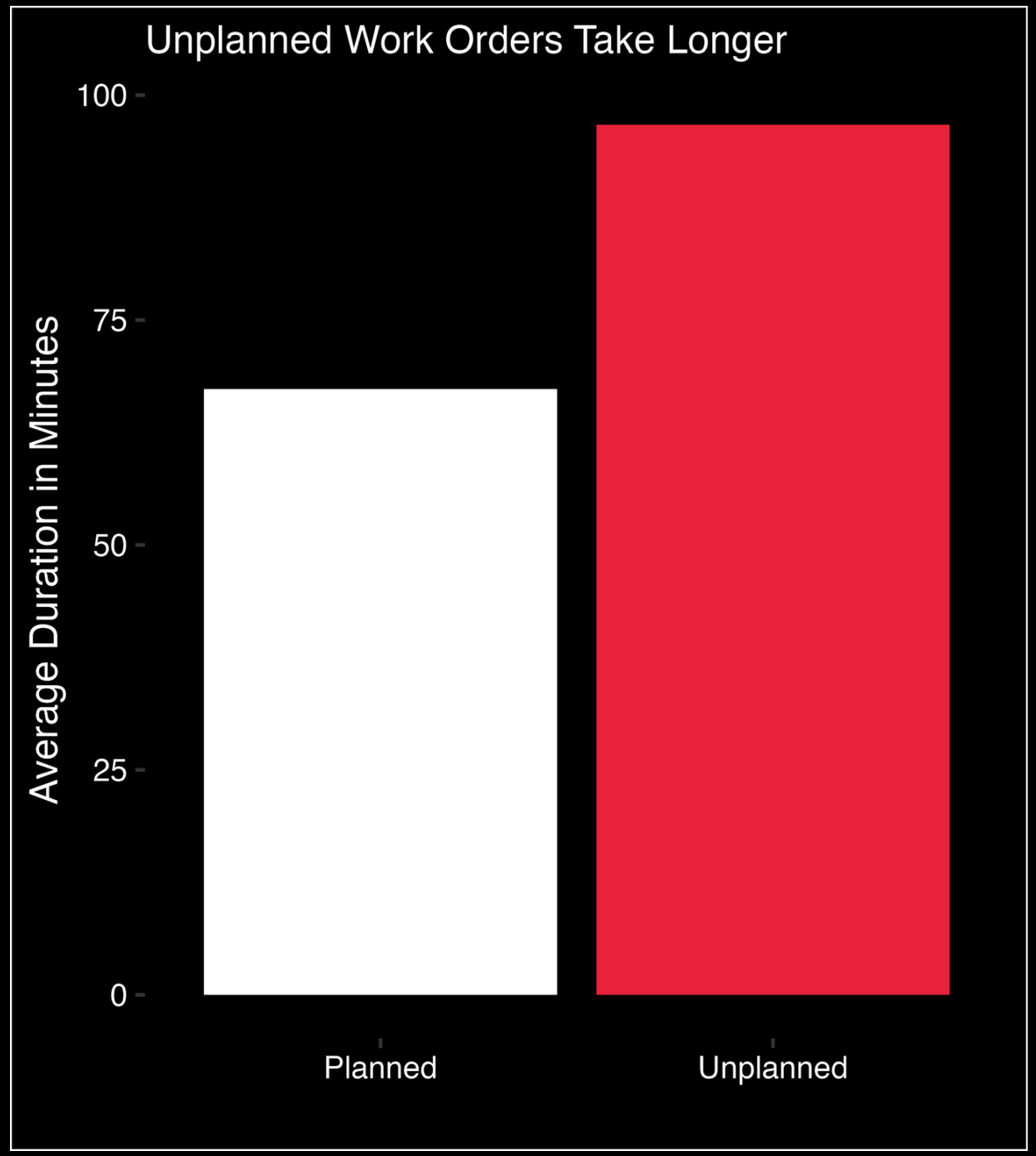
- Survival Analysis at Varying Levels of Detail: From Functional Area to Equipment Types to Equipment IDs

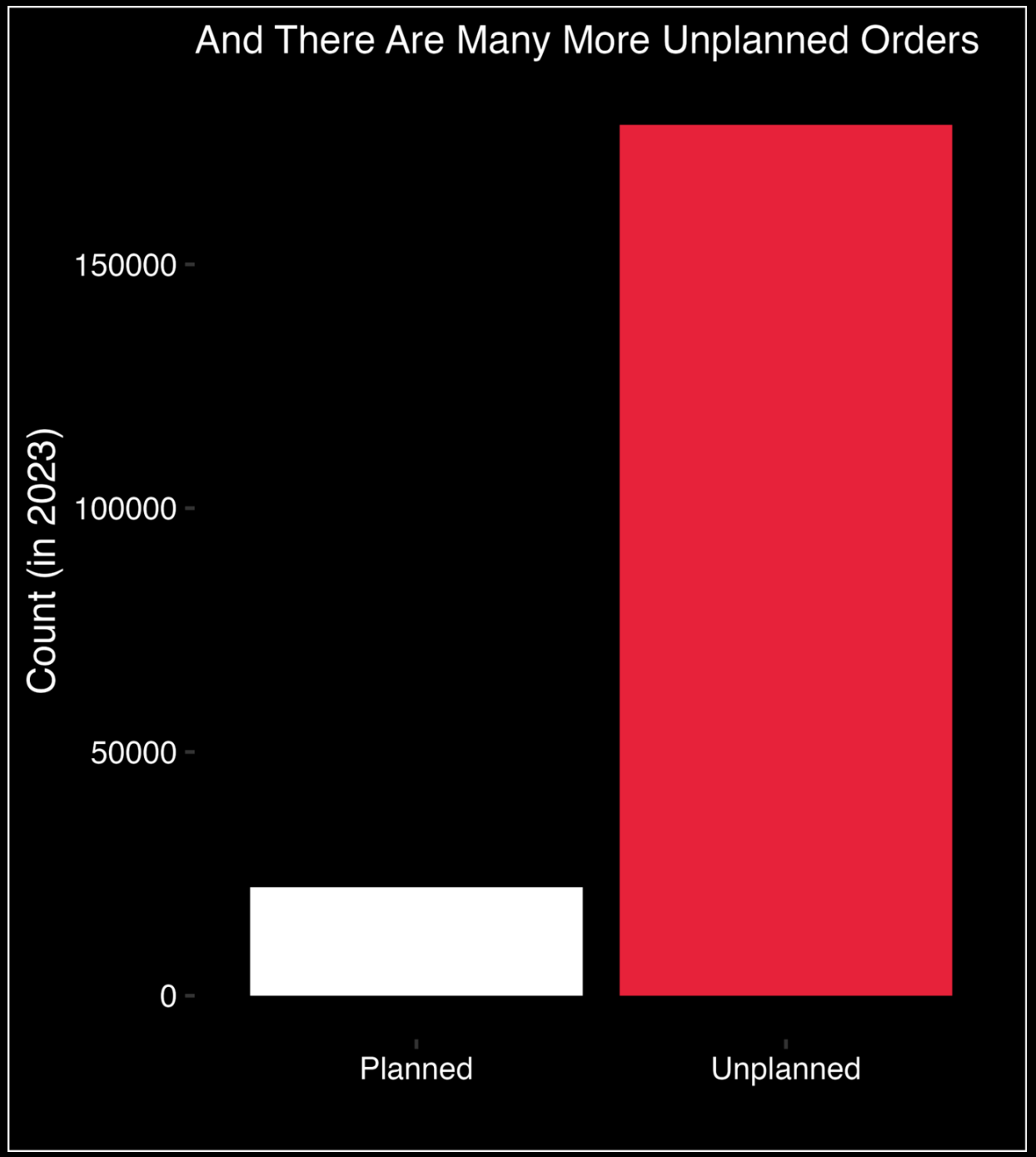
- A total of 2956 Survival Curves were created for each Equipment ID, limited p-value due to the proportion of data available



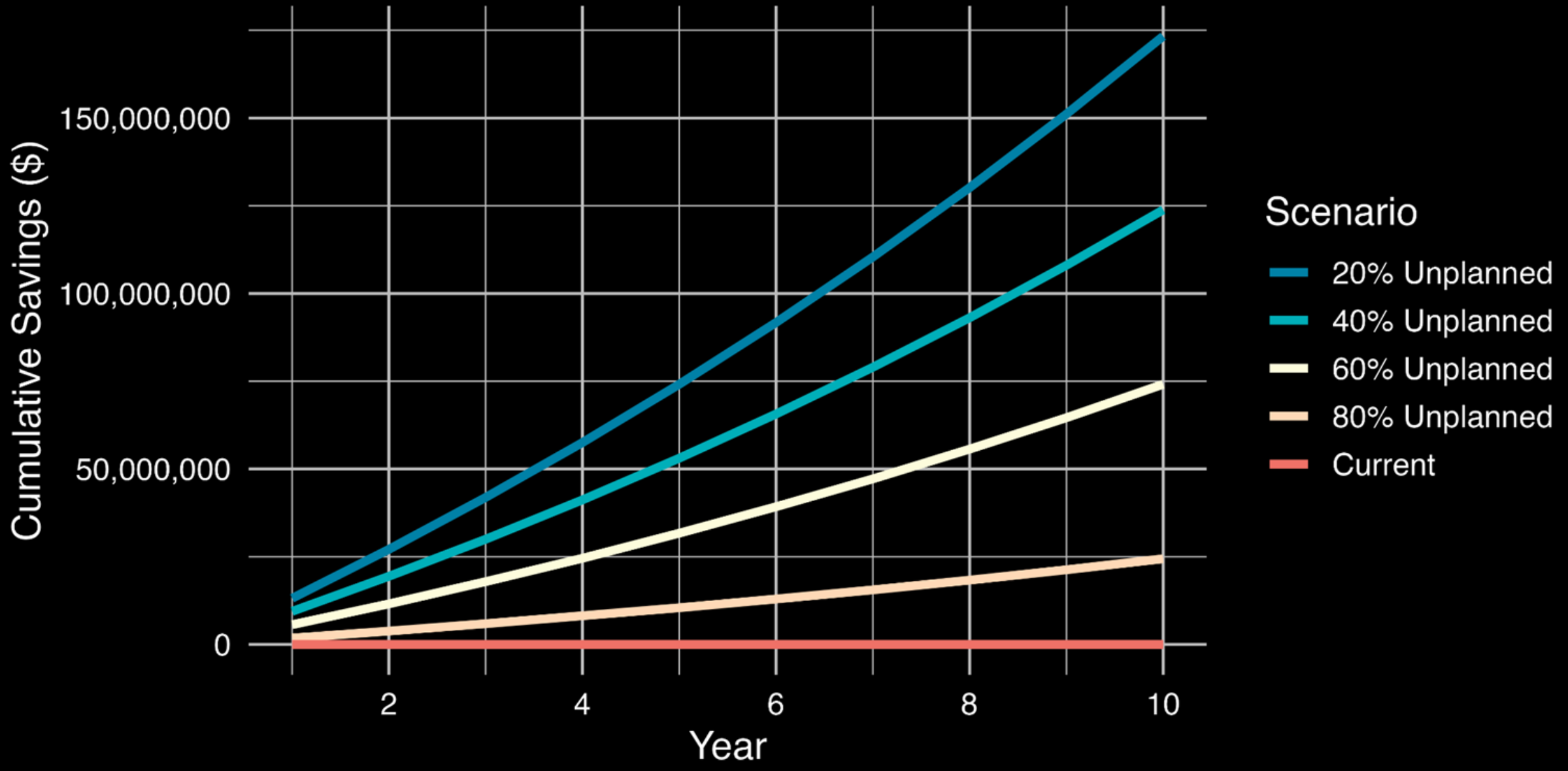





Unplanned Work Orders Take Longer
Average Duration in Minutes
100
75
50
25
0
Planned
Unplanned


And There Are Many More Unplanned Orders
Count (in 2023)
150000
100000
50000
0
Planned
Unplanned

Cumulative Savings from Reducing Unplanned Downtime



Created using bootstrap samples from 2023 data, 6% interest rate, 200000 work orders per year, $3.20 cost per minute of downtime.

Thank You!