Predictive Maintenance Insights

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Introduction

Business Problem

- Swire Coca-Cola needs more productivity and revenue due to unplanned machine downtimes at its production plants. These unexpected breakdowns cause significant disruptions in meeting production targets, leading to an estimated $60 million in annual losses.

Our Purpose:

- Identifying key drivers of downtime, predicting major breakdowns, and providing actionable recommendations

Challenges & Methods

Challenges:

- High volume of unplanned maintenance events affecting downtime
- Inconsistent tracking of machine-specific metrics
- Data gaps (98% of unplanned maintenance for time-centric values missing)

Models:

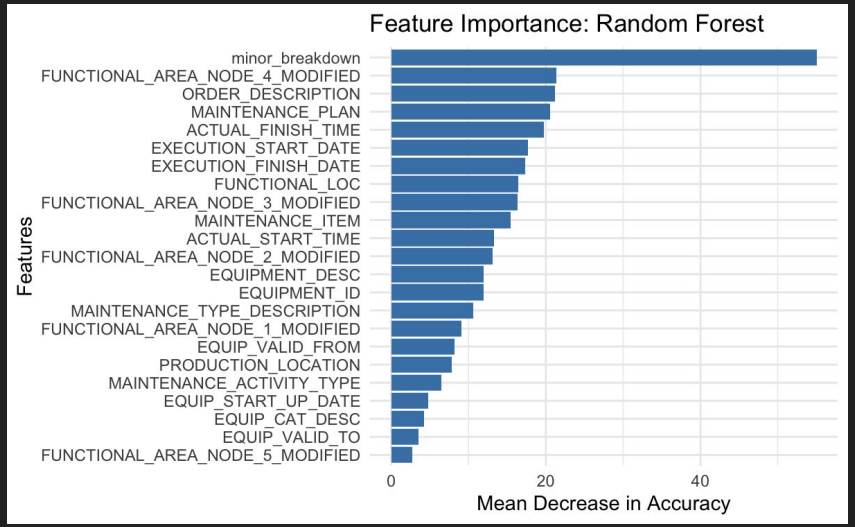
- Random Forest (curated Major and Minor Breakdown)
- Logistic Regression (curated Machine Age)

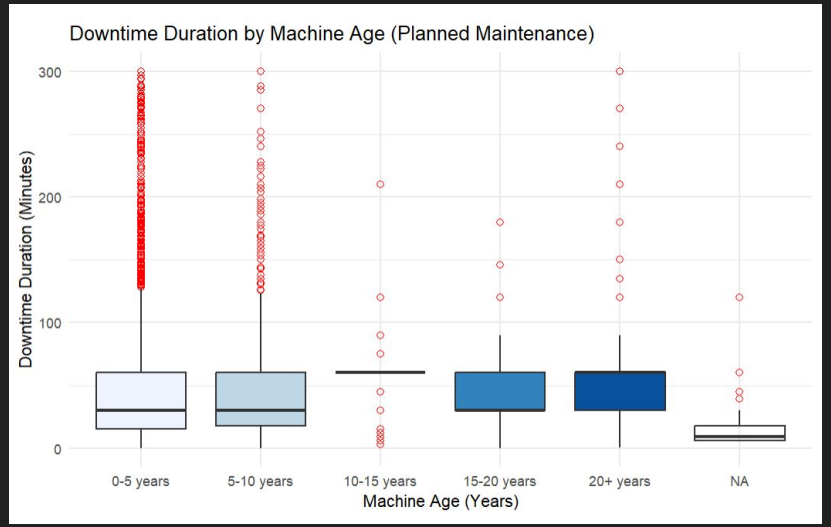
Insights & Key Findings

- **Top Predictors:**
  - **Minor Breakdown (RF):** Machines with minor breakdowns (breakdowns under 60 mins) are more prone to a major breakdown (breakdowns over 60 mins) causing further downtime
  - **Machine Age (LR):** Equipment between 0-5 years, opposed to 5+ years, is where most planned maintenance occurs

- **Random Forest Model Accuracy:** Our Random Forest model achieved an Out-of-Bag error rate of 6.93% and an accuracy of 89.59% identifying key predictors effectively

Visual Results





Recommendations

Minor Breakdowns - Implement Management Procedure

- **Due Diligence Check**
  i. Potential cause from due diligence processes around minor breakdowns in order to get machines running
  ii. Minor breakdowns lead to higher percentage of major breakdowns following
- **Root Cause Analysis**
  i. After flagging minor breakdowns, perform a root cause analysis to identify recurring patterns or issues
  ii. Preventative maintenance is an ongoing process of improvement

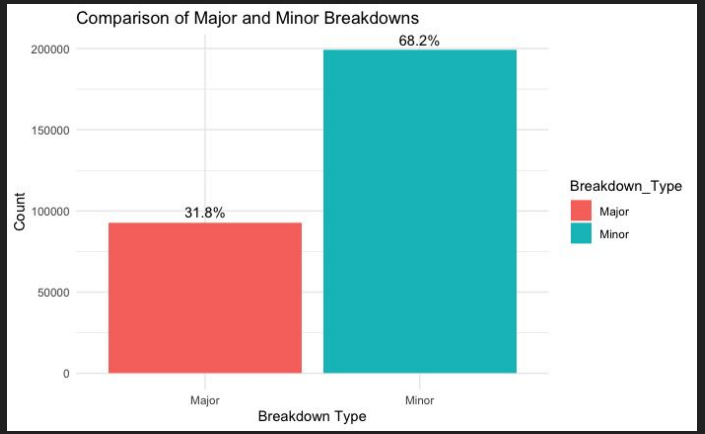
Recommendations

Machine Age Tracking - Implement Data Tracking

- Machine age was a strong predictor in planned maintenance analysis where 0-5 years had the most
- Implement machine age tracking for unplanned maintenance events
- Variables like machine age could impact unplanned maintenance, but data is lacking

Business Impact

- Major breakdowns contribute to ~32%
  i. Estimated annual loss of $19.2 million.
- By reducing major breakdowns following minor breakdowns we predict downtime could be reduced by 20%
  i. Saving approximately $3.8 million annually.
- This translates to a 6.4% reduction in total machine downtime losses



Conclusion

1. **Prioritize Minor Breakdown Management**
    - Flag Minor Breakdown & Root Cause Analysis
    - Implement Procedure For Managing Minor Breakdowns
2. **Fine Tune Machine Data Collection**
    - Address Data Gaps
3. **Implement Predictive Downtime Reduction Strategies**
    - Deploy & Test Finding

Thank You