The Data Mine

01 02 03 04 05 06 07 08 09 10 11 12

BACKGROUND INFORMATION

IVERSITY

Allison Transmission: Largest global manufacturer of medium and heavy-duty fully automatic transmissions Walker Die-Casting: Leader, aluminum high-pressure die casting

- **High Pressure Die Casting(HPDC)**: Molten metal injected into a steel mold under high pressure
- **Porosity**: Small holes, air pockets within a die-cast part
- Leaker: Fails the leak test at final stage, internal • leaks or trapped air

Goal:

- Provide **analysis of data** to Allison/Walker
- **Reduce scrap** by improving casting reliability **Projected Scrap Cost:** 57% increase from last year if no changes are made



Figure 1: Image of part



Q Grid #6002

Figure 2: Example of porosity

Initial Steps:

Main Research:

- Comparison of **SPC variables**
- **Porosity/leaker spikes** machining data
- Overlaying **parameters** and # of **defects/day**
- Overlaying thermal data versus defect analysis data





DATA DRIVEN DEFECT ANALYSIS IN **HIGH PRESSURE DIE CASTING**

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RESEARCH METHODOLOGY

• **Cleaned data** + created standardized format • **Filtered** out unnecessary values

Scrap Spike % versus **Internal Log Events**

Figure 3: Comparison of shots for one high defect day versus one low *defect day.* Highlights differences per shot that could be *leading to higher #* of defects

- Inverse relationship between leaker defects and porosity defects (e.g., due to thermal control).
- Leaker defects **increase** in summer; possibly due to cyclical conditions
- Porosity defects **peak** in spring; possibly due to cyclical conditions
- Leaker defects occur **more frequently** than porosity defects

Creation of a **machine learning model** that could be used on site:

- A time series model would be effective • Compares data from the present with past
- data and trends
- If a past trend which is correlated with an increase in defects occurs, workers would be notified.
- testing, and deployment.
- Further analysis of data, taking factors such as humidity and seasonal change into account.

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CONCLUSIONS



• Furnace temperature remains stable, showing no significant impact on defects • Specific cavity number could be associated with an increase in defects

FUTURE GOALS

• Would likely take **2-3 months** for **training**,



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