# Schnitzer Steel Tacoma Industries Applied Project

## Metal Shredder Performance Analysis and Optimization

## Project Introduction

**Data Access**
Built a SQL server to access the data

**Descriptive Analytics**
Created joined data frames, and data dictionary to describe the process variables for the Shred.

**Predictive Analytics**
Created a predictive model that can predict shredder performance using R

**Power Bi Dashboards**
Data can be used to make decisions.

**Project Business Case:**

Scrap metal recycling is an essential and imperative part of reusing and recycling efforts that involve the collection and processing of metal parts recovered from end-of-life products such as appliances or cars. Schnitzer Steel's goal is to improve shredder productivity by increasing throughput and reducing downtime. Attempted to identify best operating practices to increase throughput (as measured by tons per hour).

**General Project Requirements:**

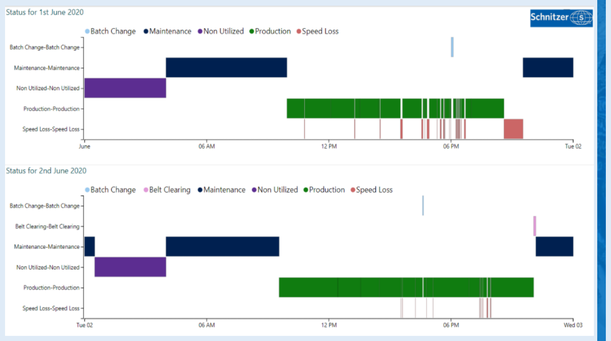
- MSBA consultants will first focus on building the operational dashboard with the available metrics and KPI's* and improvise further once they have a better understanding of data.
- The next focus of MSBA consultants will be to develop a maintenance dashboard to track the previous maintenance and try to determine the maintenance needed in the near future.

## Data Understanding & Building a Data Dictionary

**Data Discovery:**
Our data consists of Process Variables that are measured at different points in the Shredding Process. Ferrous Belt Scale is measuring Tons of metal that get shredded. Mill Motor Current is sensor recording amps. These are some examples. There are a total of 36 Process Variables and other variables as the data captured for this shredding system.

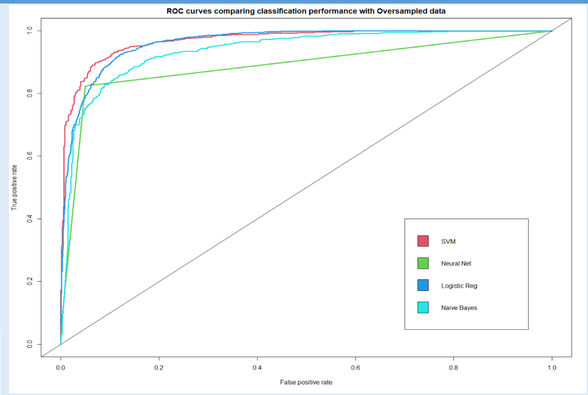

## Business Intelligence & Power BI Dashboards

**Business Intelligence Dashboards:**
To the right is a Power BI visualization is a snapshot of our overall project goal. Our team was tasked with improving scheduled maintenance efficiency by creating a maintenance dashboard. Another key aspect of the project is to identify how to improve production and limit speed losses. The green bar in graph is continuous production throughout the day. Each red section is downtime where the shredder had to decrease shredding speed or shut down altogether. As you can see, June 01 had significantly more downtimes than June 02. The ability to predict and reduce the number of unscheduled downtimes will substantially increase Schnitzer's production capacity. During the descriptive and diagnostic analytics phase, the team had to use utilized R and Power BI software to investigate the historical shredder production data.




## Predicting Performance and Maintenance Risks

**Predicting Shredder Performance:**
Using machine learning techniques in R our team wanted to predict when the shredder would be in production or in downtime. The goal was use that information to predict and forecast the shredder performance and plan maintenance around high production days. The Models used were classifiers Support vector Machines (SVM), Naïve Bayes, and neural network. Using oversampling methods and PCA to train our model, we evaluated our performance using ROC curves as you can see on the right graph. The ROC curve shows that SVM had the best performance predicting when the shredder is in production. Recommendations to build a better model included importing a bigger dataset to train the model. Get more information on the down time classification, and set up a data refresh that can continuously provide the predicted information for the next week.




## Added Business Value

**Save Time**

**Faster Reports & Faster Decisions on Operations**

**Advance Calculations for Performance**

**Save Mental Energy**

## Meet the Project Team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