# ABC Beverage: Non-Technical Report on pH Prediction

By: Alex Ptacek, Amanda Knudsen, Curtis Elsasser, and Yana Rabkova

In this project, our team partnered with ABC Beverage, a fictional company in the beverage manufacturing sector, to help them better understand and predict the pH levels of their product during the production process. Monitoring and controlling pH is critical in beverage manufacturing because it affects the overall quality of the final product.

Our goal was to build a predictive model that could help their team predict future pH levels based on measurable variables in the production environment. In addition to building the model, we were asked to interpret the data, explore patterns, identify the most important variables, and make the results understandable for decision-makers without technical expertise.

The dataset included various sensor readings and process parameters recorded throughout the beverage production line. Some of these included temperature, pressure, and flow rates. Our team started by cleaning the data and exploring the variables. We looked at how different features were related to pH and whether any data needed to be corrected or removed. We then applied different modeling approaches to determine which algorithm would provide the best prediction results. Among the models we tried were linear regression, non-linear regression, decision trees, and random forests. These are common methods used in data science to find patterns in data and make predictions.

We found that certain variables, such as *MnF Flow*, *Bowl Setpoint*, *and Filler Level* were highly correlated with pH, meaning they would likely be important predictors in our models. Our best-performing model turned out to be the random forest model. This model had the highest accuracy in our tests, and it explains 63% of the variance in pH. Within this model, *MnF Flow*, *Brand Code*, *and Pressure Vacuum* are among the most important predictors. Therefore, monitoring and controlling these variables will be critical to maintaining and predicting pH.

This project demonstrated how predictive modeling can support manufacturing processes. Using data science techniques, we successfully developed a model that helps anticipate pH fluctuations before they occur. Our collaboration with ABC Beverage highlights the value of combining technical analysis with operational insight to drive better decision-making in the production environment. This means that ABC Beverage could use this model to monitor and adjust production in real time, potentially improving quality control and reducing waste.