DENTSPLY Professional 1 – Low Aerosol Polishing Nozzle

Overview
DENTSPLY Professional designs and manufactures dental equipment for dentists and hygienists. One of their products is the Cavitron® JET Plus, which is used to remove tough tooth stains. The unit combines sodium-bicarbonate crystals, water, and compressed air to accomplish this task. When cleaning teeth, a large spray cloud is formed which lands onto the patient and hygienist, creating a large mess

Objectives
The main objective of this project is to improve the cleaning effectiveness of the low aerosol polishing nozzle.

Approach
- Gathered customer needs to be able to produce a product that satisfies DENTSPLY and the hygienist.
- Performed an analytical hierarchical process matrix to find that durability and ergonomics are the most important.
- Created various concepts and ranked and analysed each one to select the most appropriate idea. In this case, the premixing nozzle concept was selected.
- A SolidWorks model of the premixing nozzle concept was created.
- Before testing, a basic nozzle was created to represent premixing.
- Testing was performed in the following manner:
  - The original nozzle tip was mounted one inch away from a beverage can.
  - The beverage can was sprayed at varying air pressures and water flow rates.
  - Duration of spray time at the can was performed from 1 second up to 15 seconds.
  - The diameter of paint removal was measured using calipers.
  - The above steps were then repeated for our new premixing nozzle design.
  - All data was recorded and graphs of Diameter vs. Time for the different flow rates and pressures were created
- The graphs were analysed to find amount of time it took for the diameter to reach a 90% settling time.

Outcomes
After analysing the data and results two very successful outcomes could be made:
- The premixing nozzle reaches maximum diameter before the original when at the highest settings.
- If DENTSPLY chooses to continue using the original nozzle, the experimental data shows that the system can run at 45 psi instead of 60 without a significant change in diameter. This would result in less sodium-bicarbonate deflection.