Overview
Traditional shaving used flat razor blades. Flat blades were vertically plunged into a medium to collect force versus displacement data to analyse the sharpness of the blades. However, modern shaving uses multi-piece bent and welded blades. The bent blade radius and the welded blade support structure both contact the medium during the conventional plunge testing and therefore a new test must be developed to measure the sharpness of the bent and welded razor blades.

Objectives
In order to produce valid force curves to analyze bent and welded blades, measurements of the blades from the sponsor and their competitors must be determined and then fixtures must be developed to attach to an Instron machine for testing. In addition to blade measurements and Instron attachments, media for testing must be evaluated to conduct accurate plunge testing.

Approach
- The design team began the project by meeting with the sponsor to assess customer needs and learn about flat, bent, and welded razor blades.
- The design team obtained 20x optical microscope pictures and measurements of the bent and welded razor blades.
- The design team sketched drawings for blade fixtures that would hold the blades during force curve testing.
- SolidWorks drawings were created.
- After the drawings were created in SolidWorks, a FEA analysis was used to verify maximum loads experienced during testing.
- The fixtures were machined and then initial testing was performed.
- The design team iterated the original mounting hardware and redesigned the clearance holes to improve the rigidity of the fixture.
- Testing was performed on cellulosic fiber paper, Teflon, low density polyethylene, and fiber optic cables.
- Force vs displacement testing was conducted into the chosen media to determine the validity of cut discrepancies and peak force curves.

Outcomes
- The physical result is a cut in the medium. The experimental result is force versus displacement curves that show repeatable tests from individual cuts.
- The design team delivered blade fixtures and a testing procedure to determine force curves for bent and welded razor blades.