Rock Strength Borehole Probe (RSBP)

Overview
We worked with the PSU Energy and Mineral Engineering Department to develop a probe that will estimate the strength of a rock mass. Our team worked on the design of a 1.5 inch probe to move inside of a borehole and scratch the surface of the rock surrounding. The probe continuously measures the depth of the scratch and stores the data for later analysis. This measurement is vital for the support system for any underground structure, including mines, tunnels, and caverns.

Objectives
- Estimate the strength of the intact rock
- Measure a force of 1000-4000N
- Measure the depth of scratch being made
- Fit inside a borehole of 50.8mm (2in) diameter
- Fit inside a Borehole 3.048-9.144m (10-30ft) long
- Easy to operate by one person

Approach
- Gathered sponsors needs and requirements
- Researched existing patents and similar products
- Generated first SolidWorks design
- Redesigned and researched different alternatives
- Ran an FEA test on SolidWorks model
- Collaborated with sponsor on design at our weekly meetings
- Built final design
- Test probe inside CITEL lab and local mine
- Analysed the data

Outcomes
- Saved the department $35,000 by implementing this design
- Scratches rock surface areas quickly and evaluates strength levels at different locations
- Provides accurate measurements
- Self-sustained and easy to assemble and operate within minutes