INTRODUCTION:
Rio Tinto is one of the largest mining companies in the United States. One of their exports is copper from the Bingham Canyon Mines in near SLC. During the refining process, impure plates are placed in electrolytic cells. These cells are covered with a tarp using the system shown in Figure 1 to help retain heat. Unfortunately, the current system fails every 3-4 days which is undesirable.

PROBLEM STATEMENT:
Our task was to analyze their current system, improve the lifespan and reliability of the current design, while also ensuring that any new design would be available “off-the-shelf” and be easy to assemble.

KEY PROBLEMS:
- Shaft and Sleeve Separation
  - Inner drive shaft and outer aluminum sleeve may separate during use.
- Socket Failure
  - Inner drive shaft socket frequently cracks during normal use.
- Weight of the System
  - Users complain about the weight of device.

PHYSICAL TESTING:
- Hung both drills by the handles and suspended increasing weight from the end where failure is most likely to occur.
- Ideally needed to sustain at least 15 kg to be viable.
- Both designs successfully held 45 kg without separation.

CONCLUSION:
The two prototypes give Rio Tinto options on how the company wants to move forward. The V3 design is simpler, but does require drilling holes in the outer sleeve. On the other hand, the V4 prototype requires no modifications but is more expensive. Our team is confident in the reliability of both designs. They are an improvement from the original, have been validated by both analytical and physical testing, and will prevent Rio Tinto from replacing the drills as frequently.