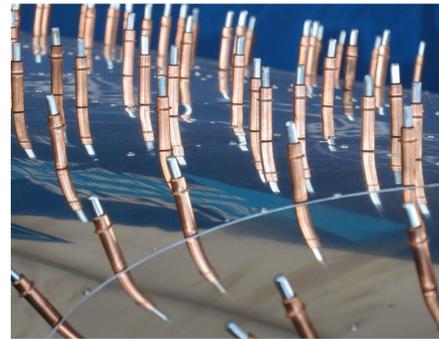


Boeing Clamp Force Measuring Device

Project Description

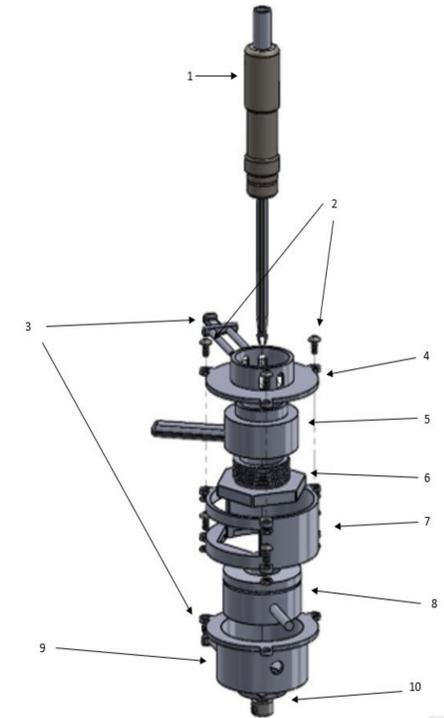
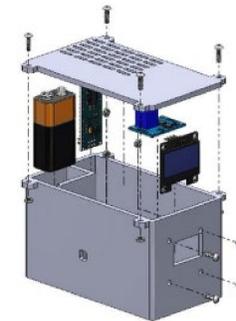
Boeing needs a clamp that can measure a specific amount of force. When building aircraft, the outer panels need to be fastened so that there are no sharp edges. These sharp edges increase drag and increase the risk of the aircraft structure being compromised. Boeing needs to be able to use an exact amount of force on their aircraft panels to ensure the safety of the aircraft and the general public.

The design specifications were that the clamp device needed to be portable, under \$1000, and can accurately measure forces between 2.5lbs and 50lbs.



Design Description

- A set screw will be put onto the hole that needs to be clamped down. Then the force measuring device will be placed on top. The clamp will be placed through the hole and tightened.
- Then the handle is rotated counterclockwise. The forks are then disengaged and the clamp will hold using the set screw clamp at the bottom.



1. Cleco clamp
2. Screw
3. Holding fork
4. Top housing
5. Lever
6. Hex lever holder
7. Central housing
8. Load cell
9. Bottom housing
10. Set screw clamp

Performance Review

- The clamping force increments and range did not meet their respective targets, but did meet their thresholds. Since the load cell capacity is 35,000 lbs, the load cell cannot accurately measure a force of 1 lb, with the minimum measured force being 5 lbs.
- The borehole diameter, product length, material thickness, and weight were within specifications.
- The install/uninstall time was about 61.7 seconds, too slow for the target and threshold values



Conclusion

- Our product hit on most of the design requirements and restraints. While the incorrect load cell leads to a lack of specification, the right load cell can yield an accurate and precise instrument.
- We learned to adequately research parts for a prototype. Some products have to be custom-made or shipped from around the world, so lead times need to be considered more. We also learned to allow for adequate time for testing and correction between iterations of a design.
- The design needs a load cell with a 17mm hole in the center of it that can measure forces between 1 and 75 lbs. It should also be made more simple to use quickly. It would be best if the housing was machined out of aluminum to properly hold the compressive forces of the Cleco.