

Redesign of a Wire Rope Drum for Stage Machinery

Students: Brandon Ello, Daniel Gorman, and Czara Mangahis

Sponsor: Creative Conners, Inc.

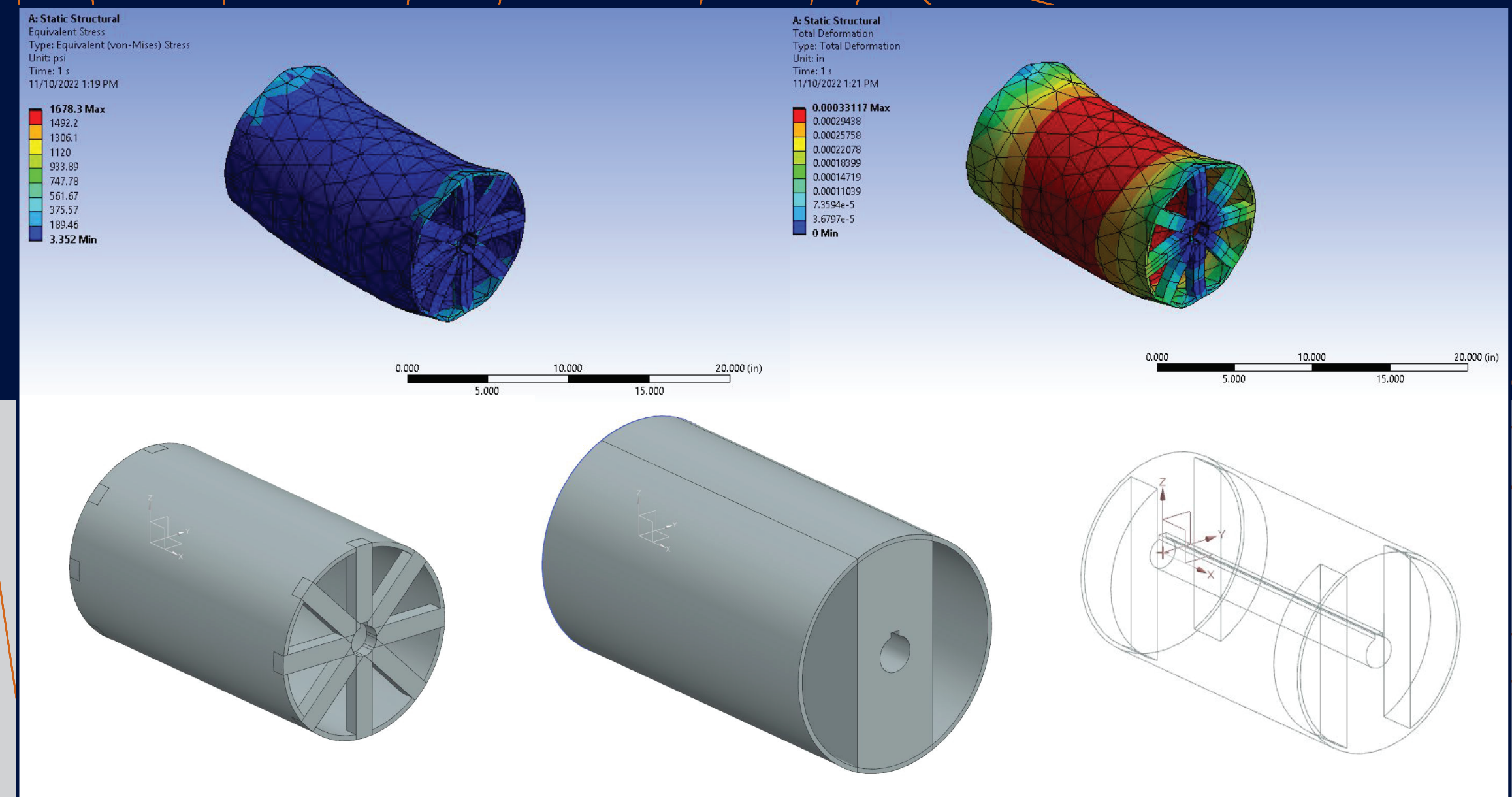
Instructors: Dr. Hongyi Xu and Ed Weingart MFA

Senior Design Project M18

The objective of this project was to redesign, fabricate and test the performance of a wire rope drum. The redesign was required to reduce the cost to manufacture while maintaining and/or improving its current performance. Another factor was the availability of resources due to supply chain difficulties caused by the covid epidemic.

The deliverables for the team were to:

- Understand current designs stress levels/forces
- Review and research alternative materials that can increase drums strength and/or reduce manufacturing cost
- Generate new construction methods
- Determine new ways to fasten the spokes to the drum

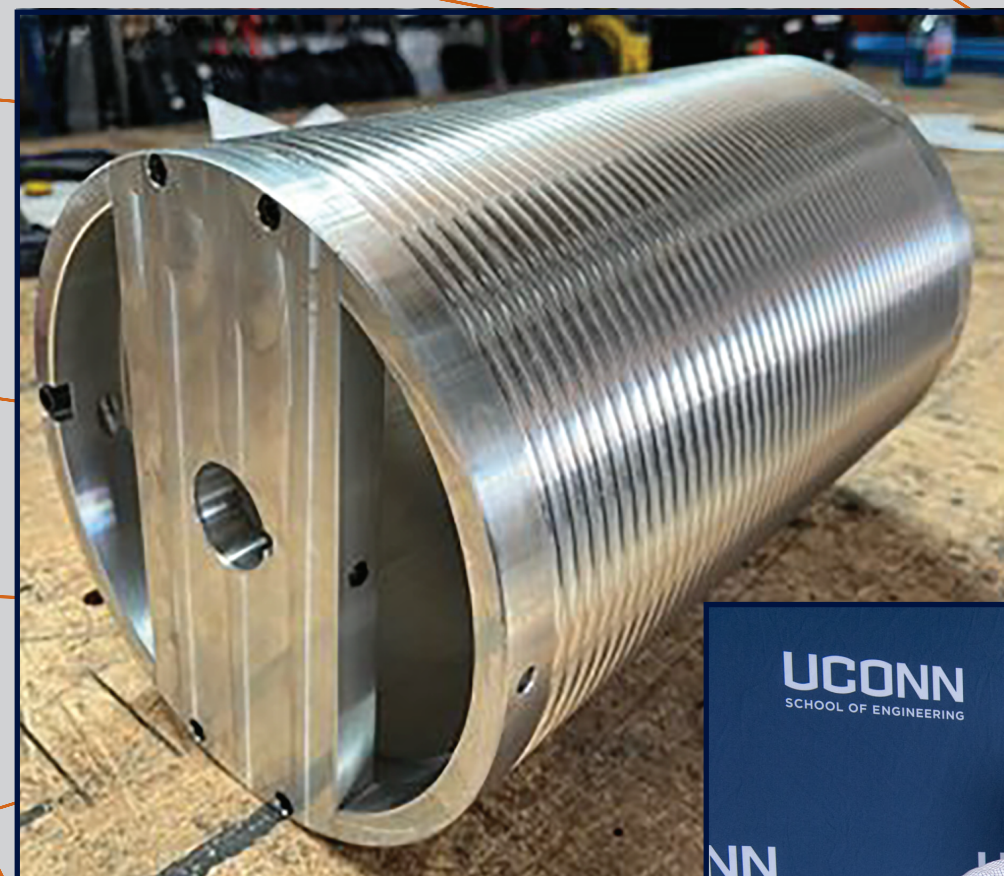


A winch is a device that converts the rotary motion of a motor into linear motion. A basic deck winch includes a drum, motor, speed reducer, spring-set brake, encoder, limit switches, and, tensioning system.

It uses a grooved drum to wind a closed loop of wire rope back and forth. The groove supports and protects the wire rope while the ends are threaded through holes in the drum to prevent any slip or overwrapping that may occur while it is automated. As the drum spins, the wire rope unwinds from one side of the drum and winds onto the other.

The current 8 inch drum is made from 6061-T6 aluminum using a 4-axis CNC milling machine.

The simulation and material data above shows that the drum is more than capable of supporting the maximum load while deforming within acceptable parameters. Utilizing the current drum design results in the drum being “over designed” or able to support a factor of safety higher than is necessary.



UConn | UNIVERSITY OF CONNECTICUT

KRENICKI ARTS AND ENGINEERING INSTITUTE