Mobile Elephant Fence

Practical Scientific Solutions

Funding Provided by: NCIDEA, Kauffman Foundation for Entrepreneurship & Innovation

Western Carolina University

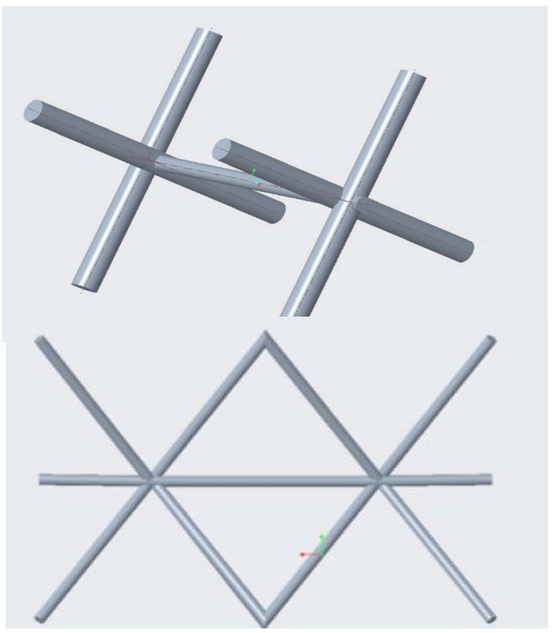
PROBLEM STATEMENT

- Dealing with elephants in general comes with a whole slew of complications of both the technical and conceptual variety, but the most daunting of which is the sheer strength that they possess. Elephants have been seen flipping cars, tossing other animals in the air, and toppling full-blown fence posts with minimal effort. The main challenge that has been highlighted by the sponsor is their intelligence. Elephants have both the power and the wit to render many of the modern fences useless. The figure below demonstrates a modern-day fence post style electric fence being knocked down by an elephant.

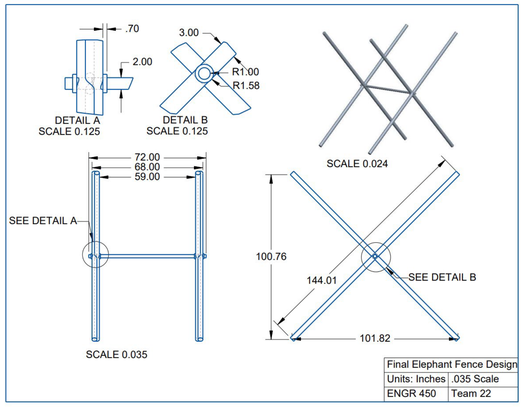
REQUIREMENTS

#	Description
1	The cost of the Barrier must be comparable to the standard electric fence. ($3684 Per KM)
2	Design needs to be simple
3	Design needs to be easily moved
4	Design must resist the weight of an Elephant (6000 - 12000 Pounds)

CONCEPTS

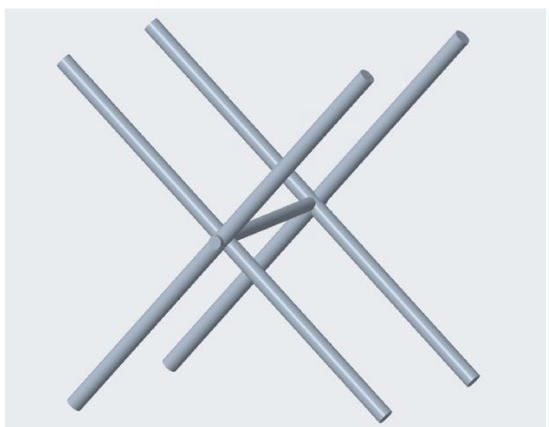


FINAL DESIGN. APPROACH. PLAN



The Engineering Drawing of the final design

- The final design is a variation of the conceptual designs that incorporates the best parts of both. The width of beams is to 2" and 3". The 2" beam is 72" long and the 3" beams are 144" long. The whole assembly is going to be held together by 2" steel shaft collars to ensure that the fence assembly and disassembly is simple.
- The whole design except for the shaft collars is going to be made out of 6061 Aluminum. This material was chosen due to its light weight. Another benefit is its weather and corrosion resistance. The shaft collars are going to be made out of 1215 Carbon Steel.

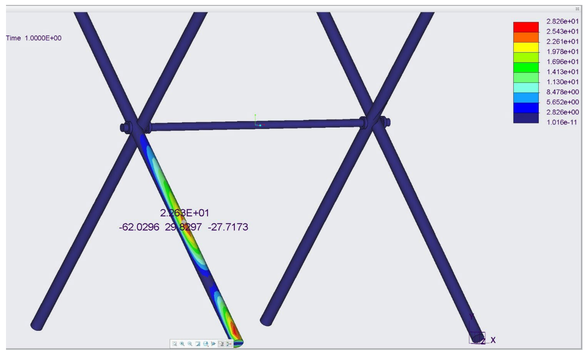


3D model of the final design

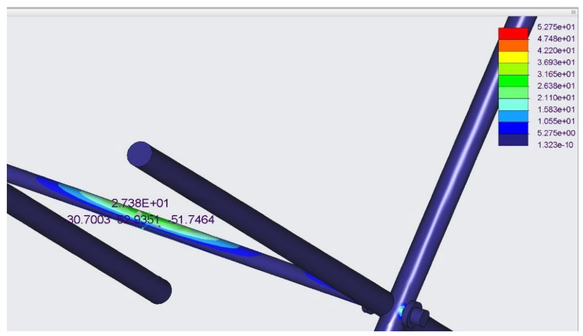
RESULTS

- FEA Analysis was done in CREO Parametric. The forces is being measured in pounds force, and the units used for the design were in inches. 3000 pounds force were applied to the fence along a 10 in circle placed on the aluminum rods to simulate the shape of an elephant's foot. The highest stress was located around the shaft collars from the X post rods pushing on it.

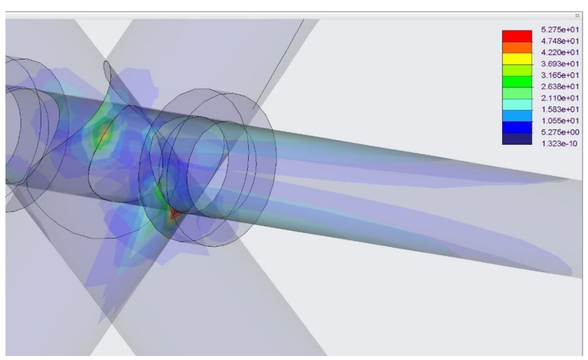
FEA: X-Post



FEA: Center Beam



FEA: Shaft Collar Assembly



SUMMARY AND CONCLUSION

The final steps for the project was to machine the ordered parts and begin testing. Several manufacturing difficulties arose due to the rods being round.

To use the machine properly, specialized braces were required for the parts which led to slow down in the machining process. This led to a delay in testing, and ultimately led to no testing being conducted on the prototype.

In any future iteration of the fence, it is recommended to opt for square posts for the X-posts for ease of manufacturing.

FUTURE WORK

Aspects of the project that still need work would be the entirety of the electrical component of the project, as that was deemed out of the scope of this iteration of the project by the sponsor. The fence is designed to be electrified, providing enough voltage to stop an elephant from prodding at the fence and acting as a deterrent from anything seeking to damage the fence.

The application of electricity would require further modifications to the fence, such as through holes for wiring, housing for important electronics, and insulation of the ends of the fence to make sure the fence is grounded.

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