


DESIGN PORTFOLIO

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2009-2025

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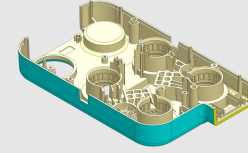
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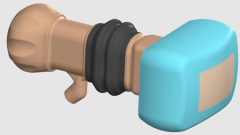
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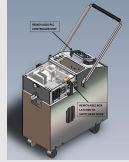
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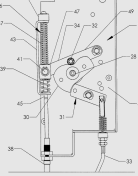
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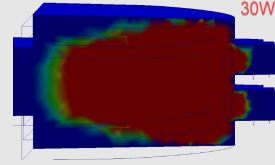
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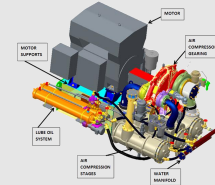
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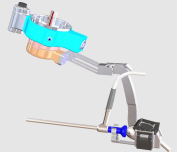
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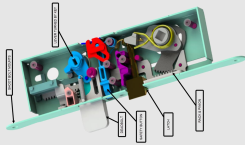
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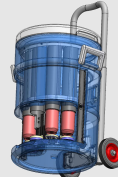
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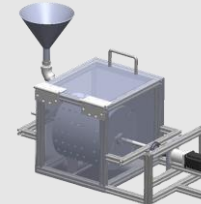
NARROW LOCK



**EPOXY COATED
"ARM"**



CAN DISPENSER



COFFEE ROASTER



**3D PRINTS &
MAKES**

ABOUT ME

BASICS & BACKGROUND

- Hometown: Durham, NC
- Current City: San Francisco, CA, Mission District
- BSME, North Carolina State University, 2009
- 14 years experience as Mechanical Engineer
- Owned a handyman business at age 15



INDUSTRY EXPERIENCE

- Power products
- Medical devices
- Air compressors
- Metal-cutting tools
- Consumer products

HOBBIES & PASSIONS

- Maker & 3D Printer, tinkerer to a fault
- Musician (vocals and production)
- Hiking, soccer, basketball
- Stand-up comedy enthusiast

GOALS FOR NEXT ROLE

- Get back into technical leadership and mentoring
- Drive innovation
- Work on an exciting technology
- Make use of my creativity

3D X-RAY DEVICE

SUMMARY

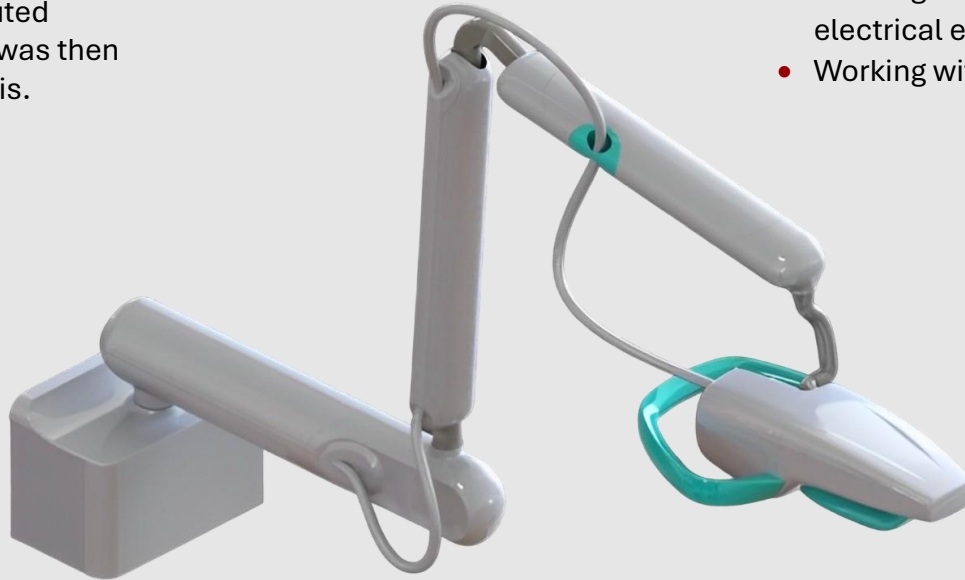
The 3D x-ray machine is designed to provide both a clearer and more comprehensive image to healthcare providers, the first of which being dentists. The technology uses multiple beams to create an image similar to that of a Computed Tomography scan (CT). It was then adapted for Tomosynthesis.

REQUIREMENTS

- Product specs
 - Reach and position
 - Force/torque required to position
 - CT image quality
- FDA/IEC requirements

ROLE

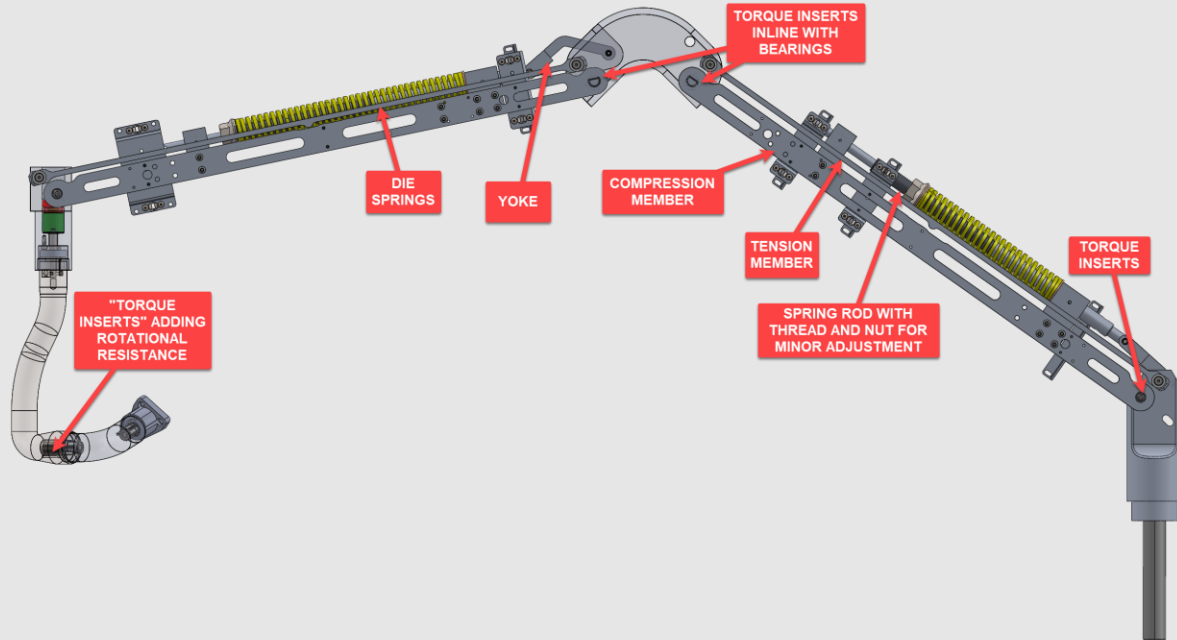
- Mechanical lead and sole Design Engineer
- Prototyping and testing, including test protocols
- Chemical compatibility studies
- Working with software and electrical engineering
- Working with international suppliers



3D X-RAY DEVICE (CONT'D)

POSITIONING

- Without a brake, and many degrees of freedom, great accuracy is needed
 - Arm must move under low load, and fully static under no load, at all angles
- Die springs act as a suspension system of sorts (tuned per assembly)
- Built a calculator to predict the force required to move the arm at any angle, and compared that to the forces acting upon the system



SURGICAL 3D ROBOTIC MICROSCOPE

SUMMARY

The 3D microscope allows neurosurgeons performing microsurgery to get a clear, three-dimensional, “zoomed in”, visual representation of the patient as they perform surgery. The robot allows for ease of motion.

REQUIREMENTS

FDA and IEC regulations (510K submission),
myriad product specs

ROLE

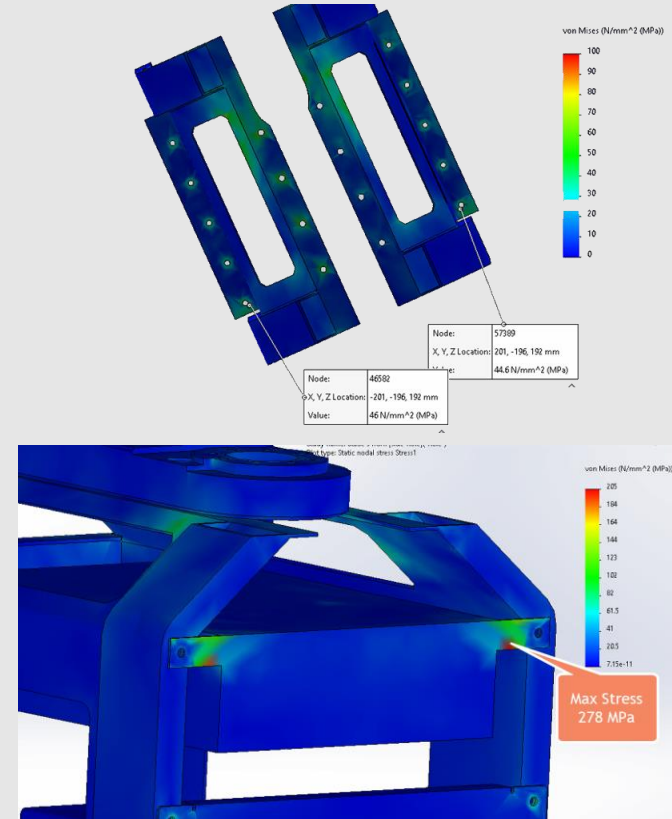
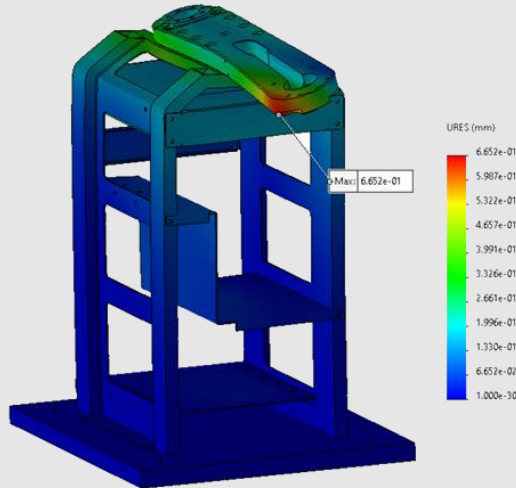
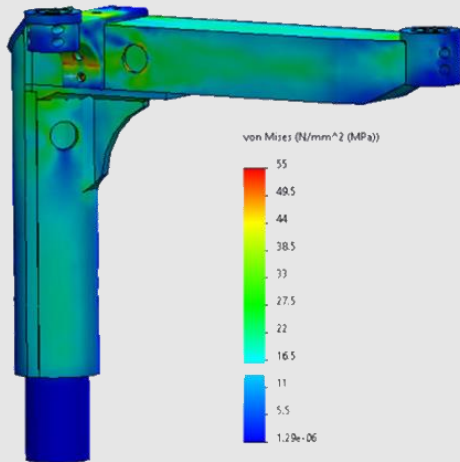
Design and analysis (finite element and modal in SOLIDWORKS Simulation) of functional and aesthetic parts.



SIMULATION (3D MICROSCOPE)

SUMMARY

- Static analysis of fully assembled frame, including fasteners to determine highest points of stress and verify safety factors in accordance with IEC 60601.
- Fastener pull-out force verified
- Modal analysis performed on cantilevered screen arm



DIAPHRAGM PUMP CATHETER DEVICE



SUMMARY

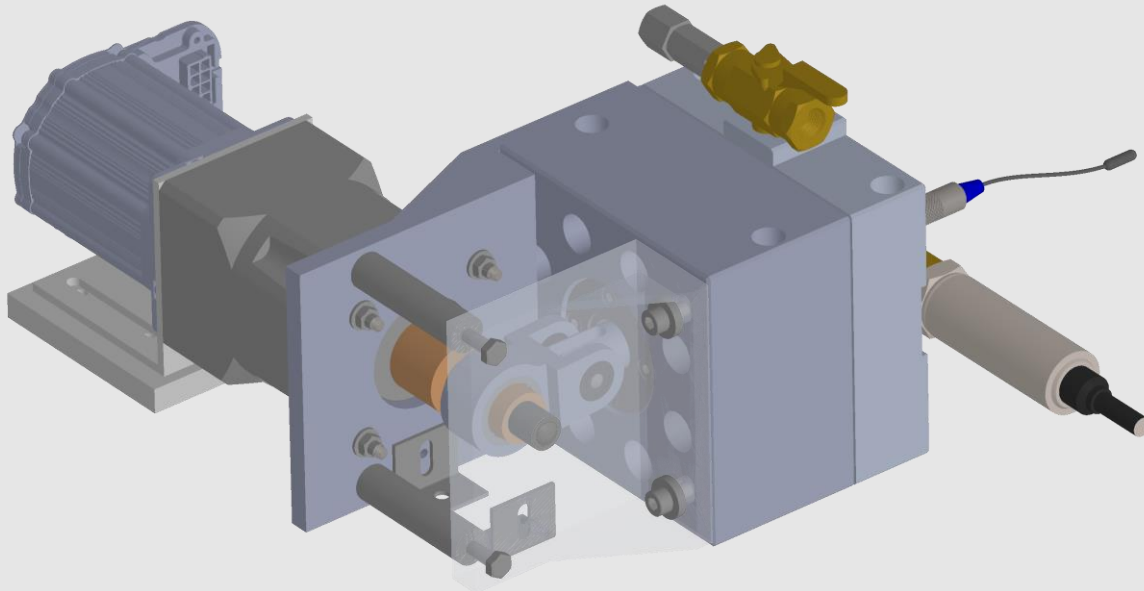
A balloon catheter is used to remove intravascular calcified lesions. The balloon pulsates with force driven by a diaphragm pump, controlled by a servo motor / Arduino controller.

REQUIREMENTS

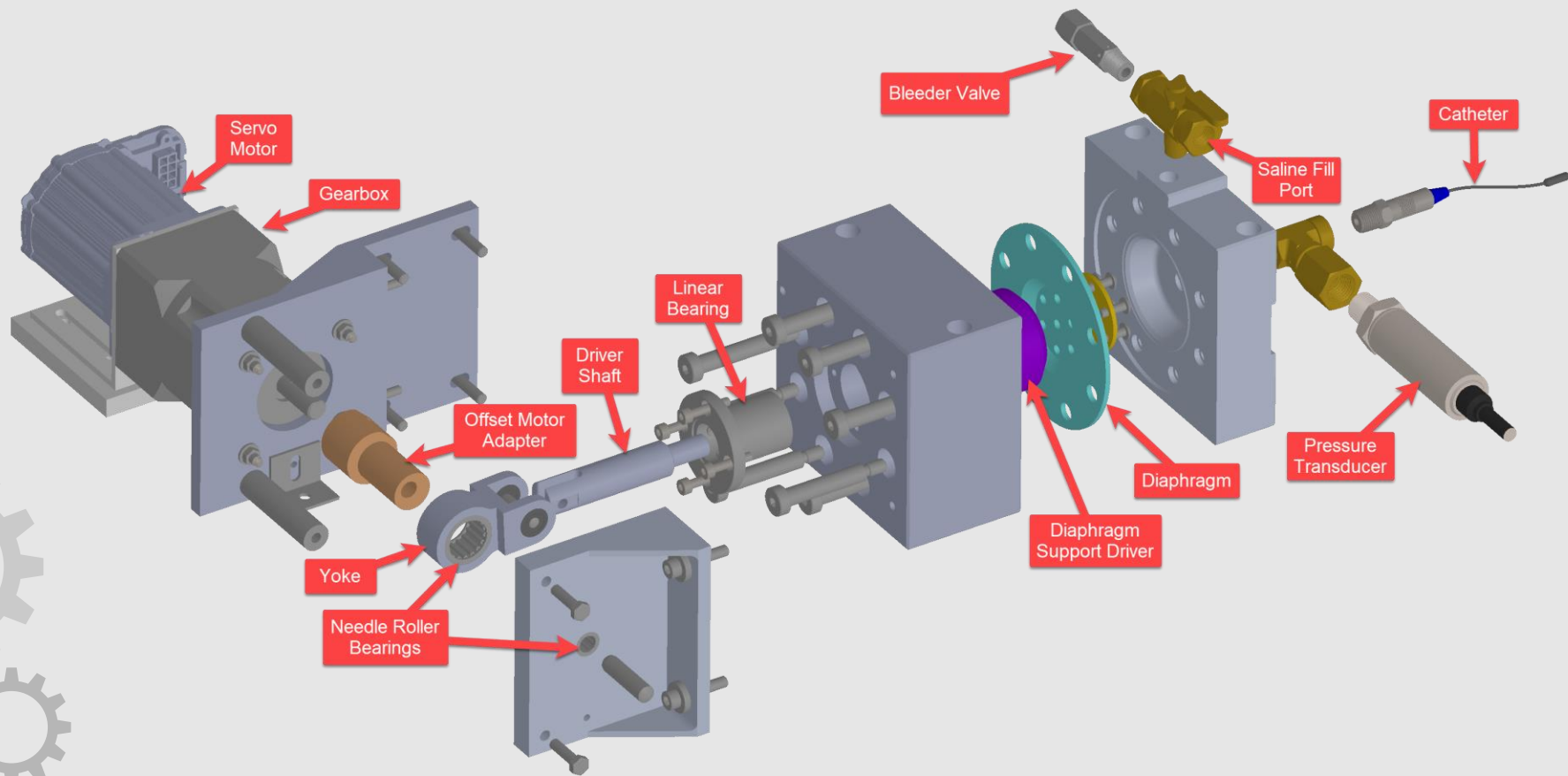
- Product specs
 - Frequency, balloon pressure
 - Catheter/balloon size
- FDA/IEC requirements
- Low budget relative to complexity
- ~1Nm of torque required for 5.5kN force from chamber pressure

ROLE

- Initial proof of concept
- Research, design, and simulation
- Testing and design iterations
- Prototyping using manual machining, silicone molding, 3D printing
- Project management
- CAM and CNC machining parts



DIAPHRAGM PUMP EXPLODED



ROBOTIC ENDOSCOPE, INJECTION MOLDED PARTS

SUMMARY

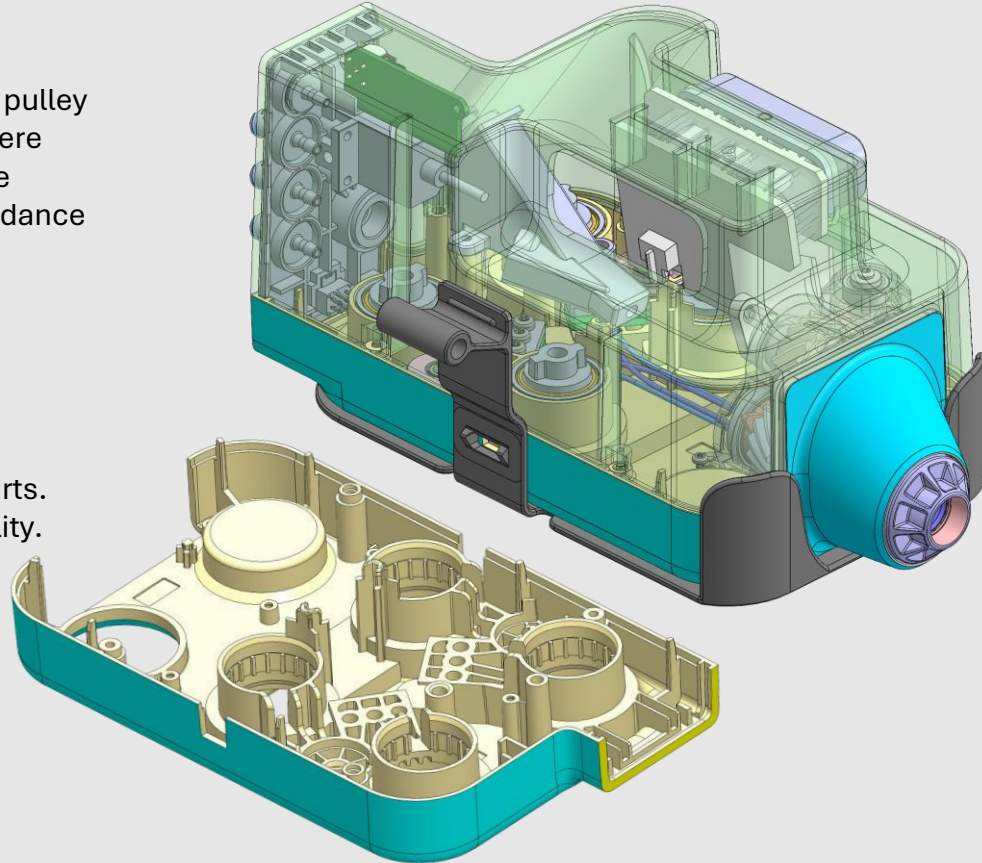
A surgical device used sterilized plastic parts as part of a pulley driven push-pull cable system. The parts in the system were designed for 3D printing in a prototype. They needed to be redesigned for injection molding and redesigned in accordance with direction from industrial design.

REQUIREMENTS

Industrial design directions, molding best practices.

ROLE

Mechanical Design Engineer, functional and aesthetic parts. Worked with overseas CM to ensure moldability and quality.



AUTOMATED FOOD PROCESSING DEVICE

SUMMARY

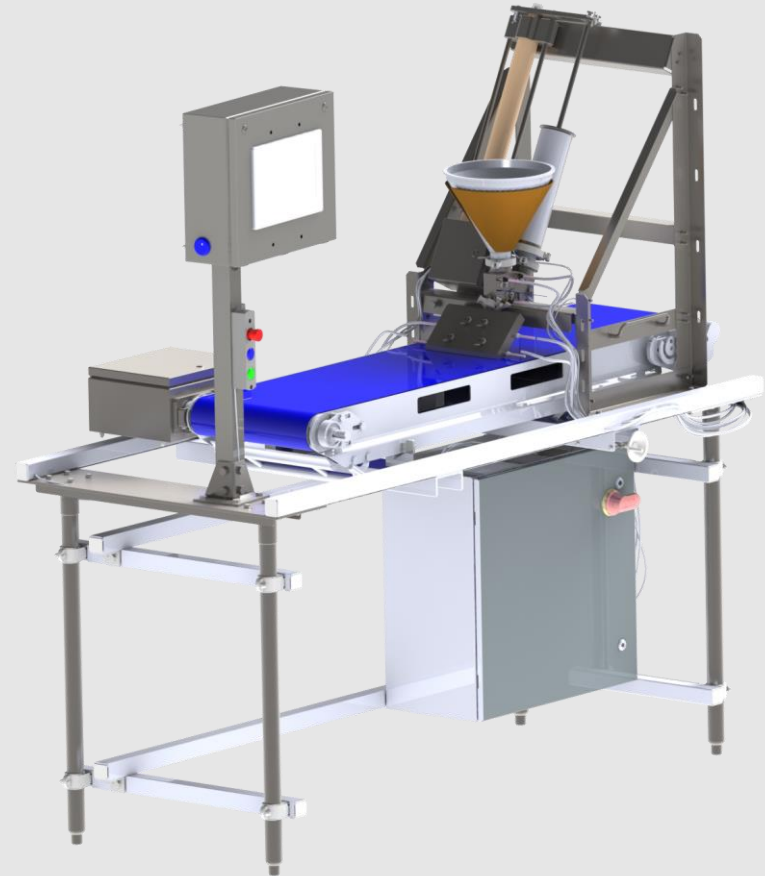
A gelatinous material is poured into the temperature-controlled hopper. A piston uses negative pressure to pull the material into the cylinder, and then pushes it out through a nozzle into the desired form onto trays on a conveyer belt.

REQUIREMENTS

FDA and NSF regulations, product specs

ROLE

Designed framework, linear rail/actuator systems, conveyer motor system, modal analysis. Prototyping using CNC and manual machining, 3D printing, assembly, wiring.



SPRING-LOADED LOCKING SYSTEM, MED DEVICE

SUMMARY

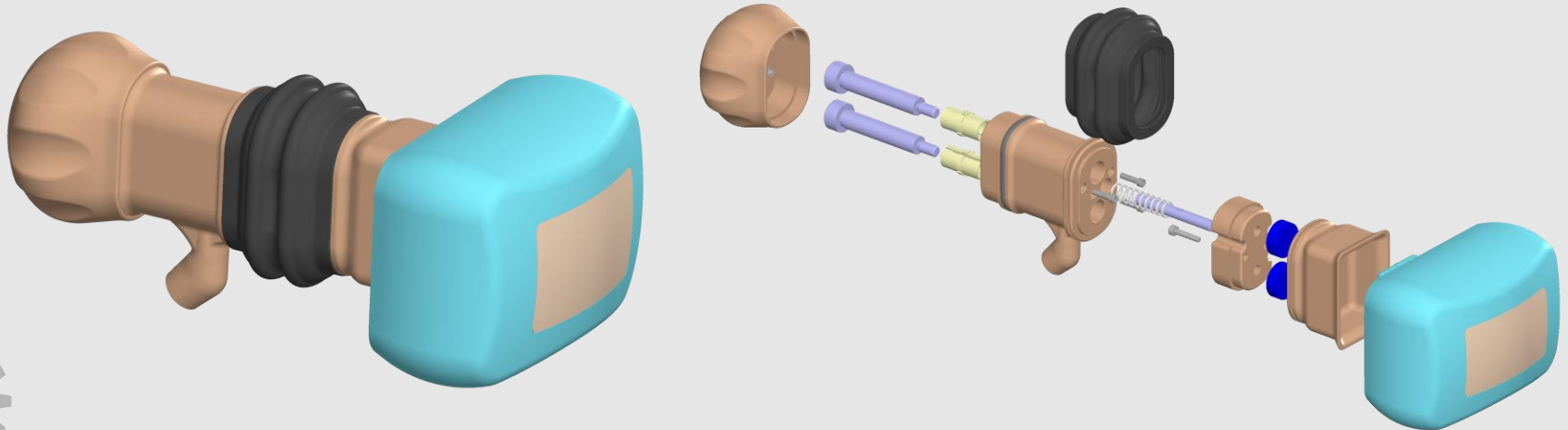
The surgeon places the device against the patient's skin and had to hold it still for upwards of 30 min. The new device allows the surgeon to use an off-the-shelf armature and the spring-loaded mechanism to secure the device for the length of the procedure.

REQUIREMENTS

- FDA/IEC requirements
- Holding force of 25N
- Stroke of 20mm
- Sealing with a custom elastomeric seal

ROLE

- Mechanical lead and sole Design Engineer
- Prototyping and testing, including **designing a mold for and molding** the elastomeric seal
- Defining materials
- Identifying and managing vendors



SWITCHGEAR REMOTELY OPERATED RACKING DEVICE

Patents 9,876,335 and US8654513B2

SUMMARY

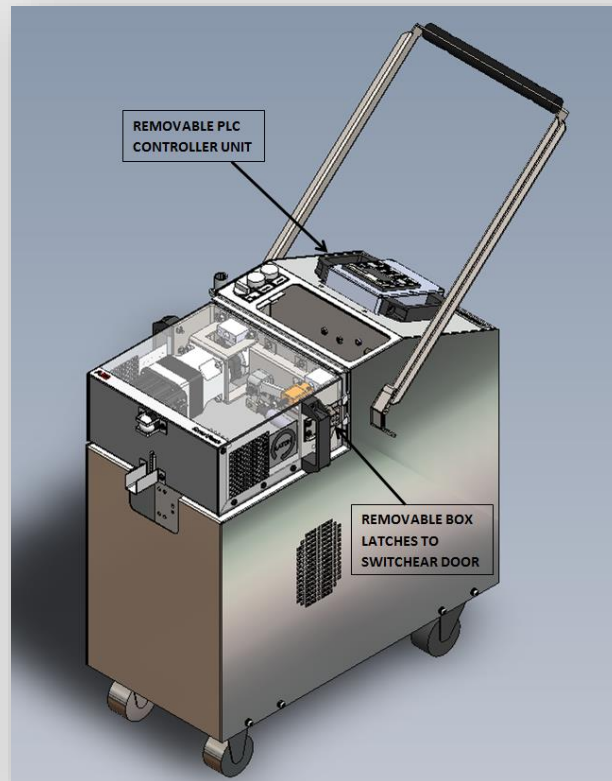
The electric remote racking device is intended to assist technicians with the process of racking medium voltage circuit breakers and associated equipment. The main function of the device is to perform the racking operation with minimal manual interaction. If the operator is nearby and the circuit breaker is charged when it disconnects, there can be a deadly explosion.

REQUIREMENTS

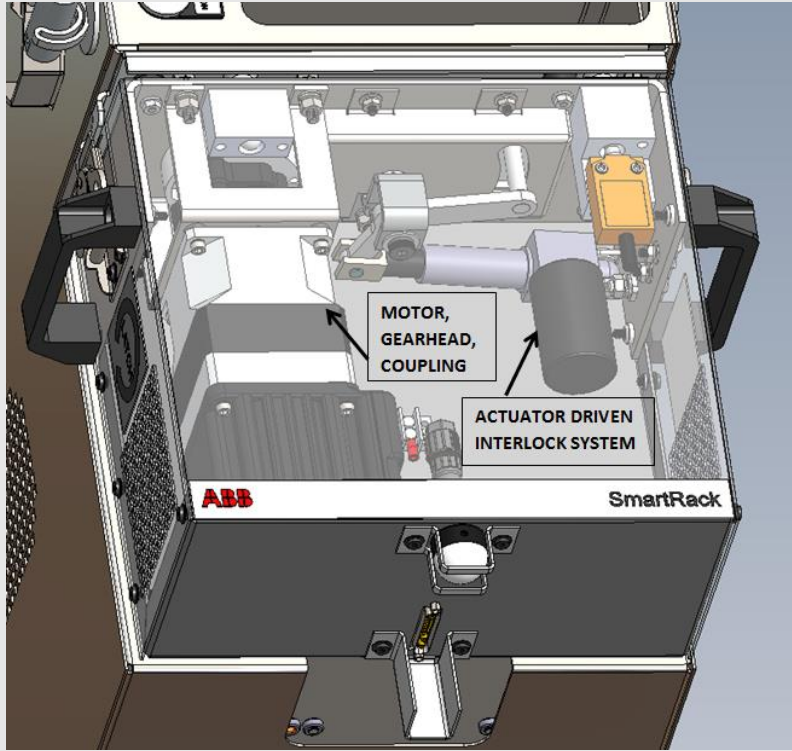
Move from connect to disconnect in 2 minutes, operate interlock, control all three positions, operator to lift no more than 45 pounds, cost under \$3,000 to manufacture in small quantities.

ROLE

Design, motor and PLC programming, prototype construction, testing, supplier identification, project management, presentations to all parties including upper management, manufacturing support.



RACKING DEVICE CONT'D



PORTABLE MECHANISM OPERATED CELL

SUMMARY

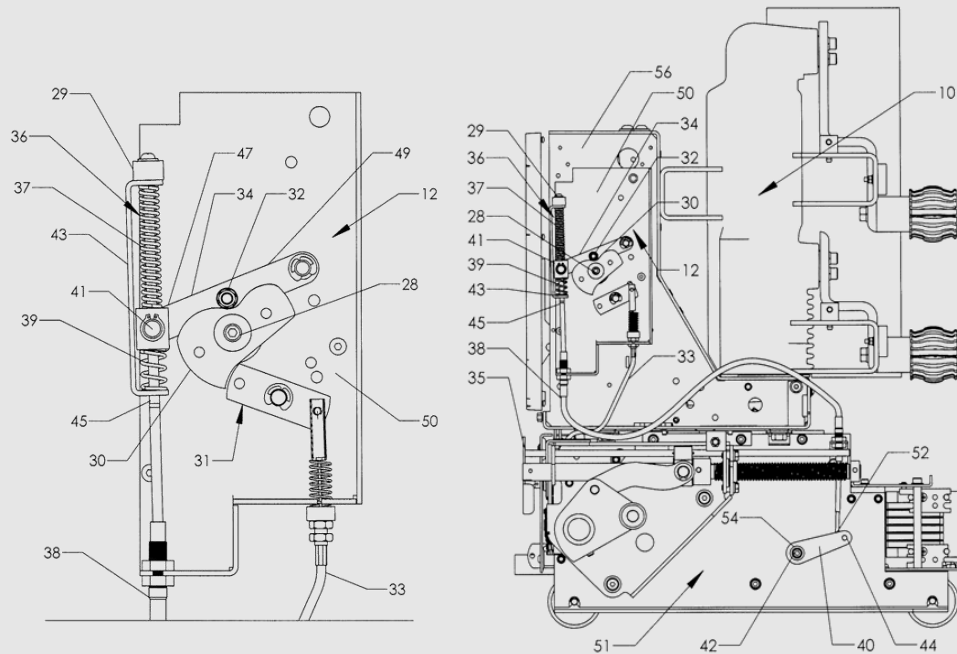
Circuit breakers retrofitted to existing breaker compartments or switchgear operated by rolling in or out have mechanical and electromechanical interlocks. The methods of interlocking often vary. A centralized, universal solution was desired.

REQUIREMENTS

Internal standards, IEEE, ANSI, ISO, and UL

ROLE

Adapt proposed solution to a wide range of circuit breakers, changing the proposed solution as needed.



ENDOSCOPIC VISION SYSTEM

SUMMARY

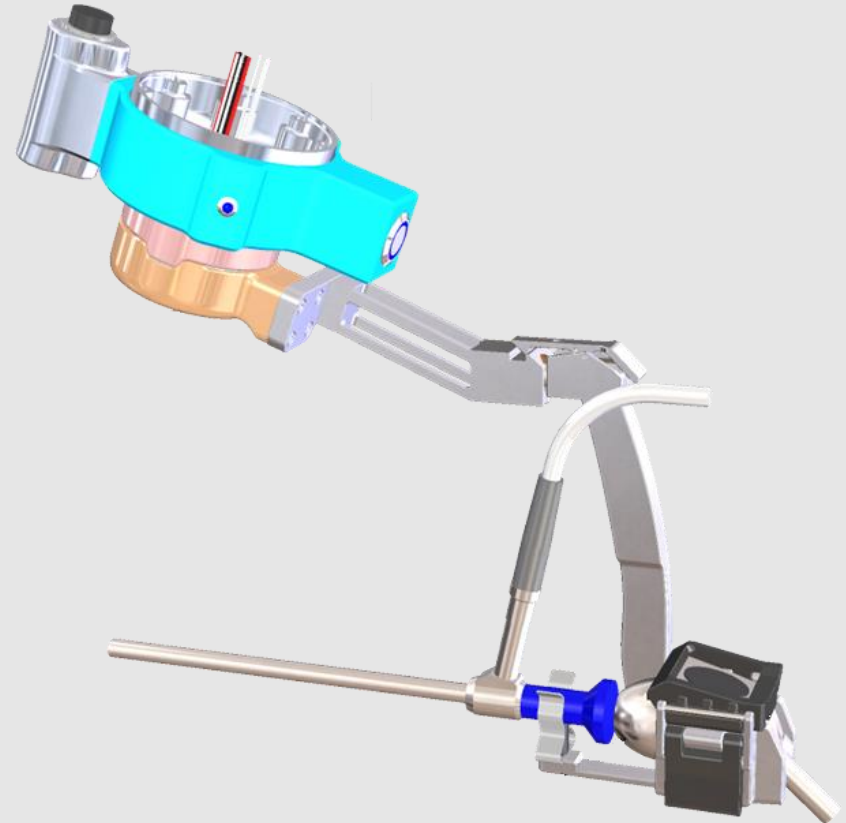
An endoscopic camera must be held in place to a specific tolerance. A magnetic coupling is held by a “quick-release” system, in a position held to a tolerance with respect to the camera/endoscope.

REQUIREMENTS

FDA and IEC regulations, product specs

ROLE

Mechanical Design Engineer, many functional and aesthetic parts, and analysis and redesign of existing systems. Prototyping using CNC and manual machining, 3D printing, assembly.



TEAR-INDUCING HEATER

SUMMARY

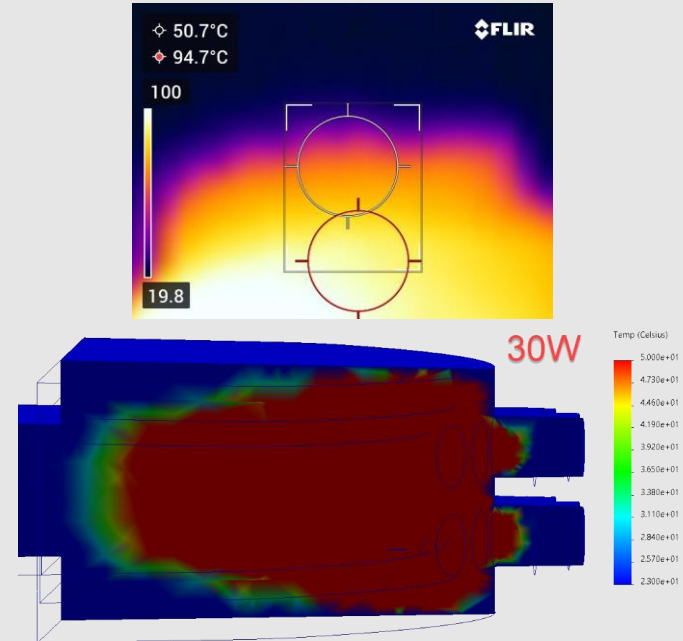
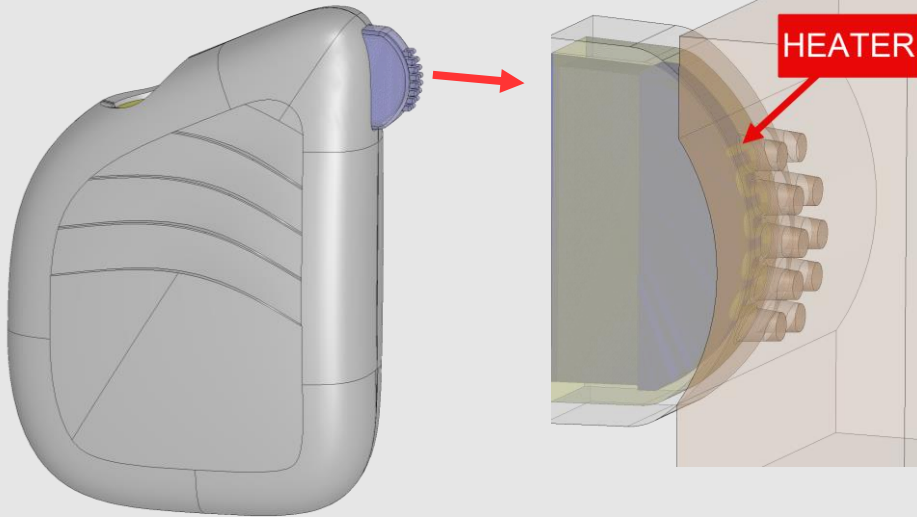
Device used to induce tears in a patient by vibrating against nose or by stroking across eyelid. Designed a silicone cover and a microheater to achieve optimal temperature.

REQUIREMENTS

- Achieve specified temper
- FDA regulations
- Prevent overheating (used PTC)

ROLE

- Design of cover and heater
- Thermal analysis
- Benchtop testing and iteration
- Customer-facing project manager



NARROW LOCK

SUMMARY

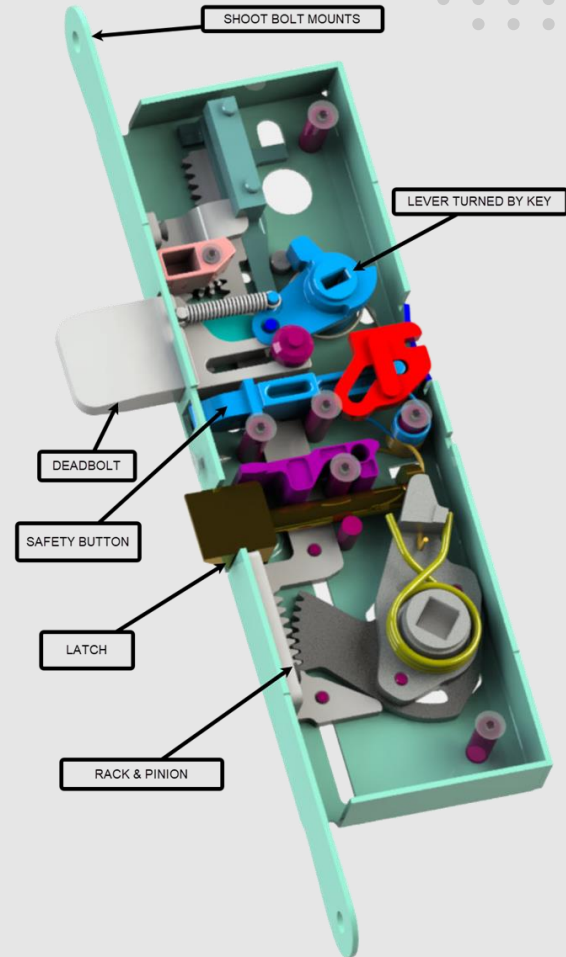
The narrow lock was developed to meet market demand for a door that had less material on the frame and more glass. The lock has the same functionality of the standard lock but is designed to fit in a much smaller space.

REQUIREMENTS

Keep all functionality of standard lock, meet functional requirements of torque and force needed to operate mechanisms, maintain manufacturing cost, cycle test 20,000, and deadbolt load drop test.

ROLE

Design, testing, and manufacturing support.



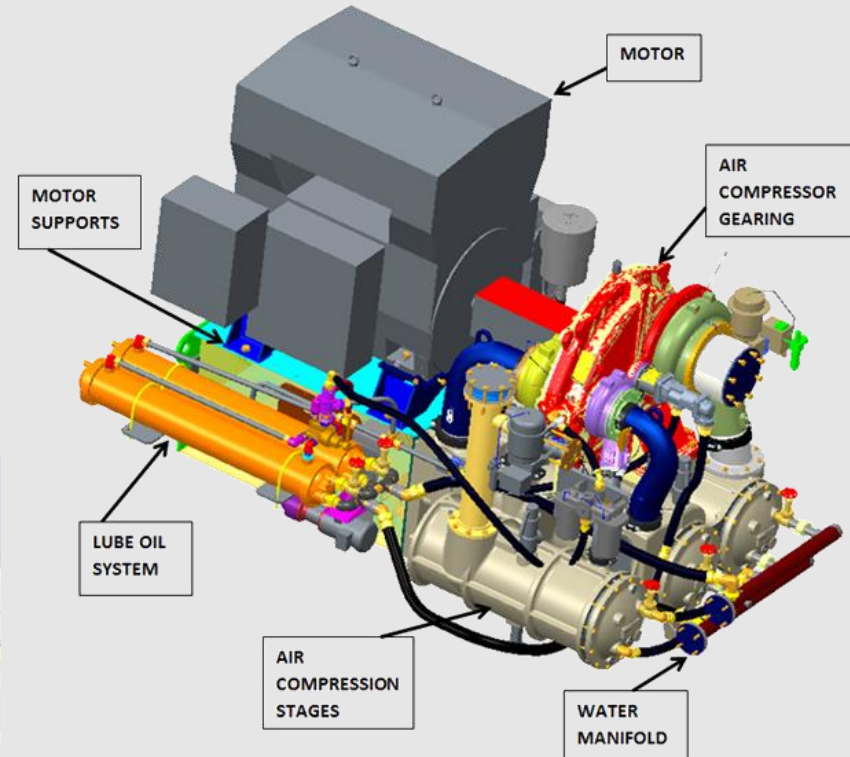
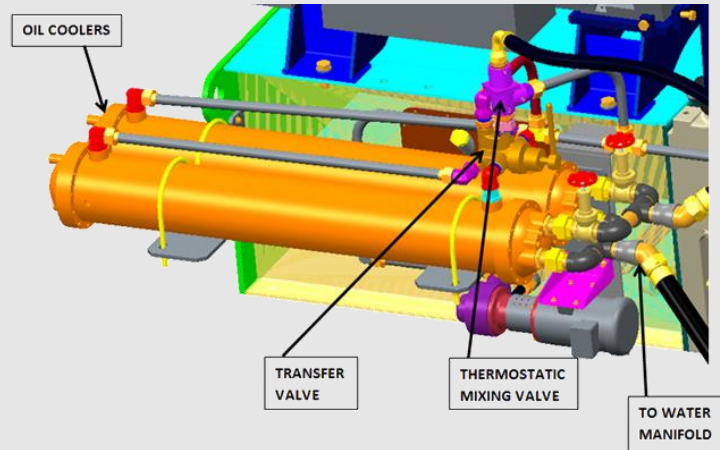
CENTRIFUGAL AIR COMPRESSOR DUAL OIL COOLER

SUMMARY

The oil cooler on an air compressor keeps the air and system components running at the desired temperature, but the cooler occasionally requires service. The dual oil cooler system allows the operator to transfer the switch to a second cooler and keep the machine running during service of the other cooler.

ROLE

Role: Identify cooler, valves, and hardware, layout full compressor model, design tubes, brackets, and incorporate oil pumps and water manifold, manufacturing support.



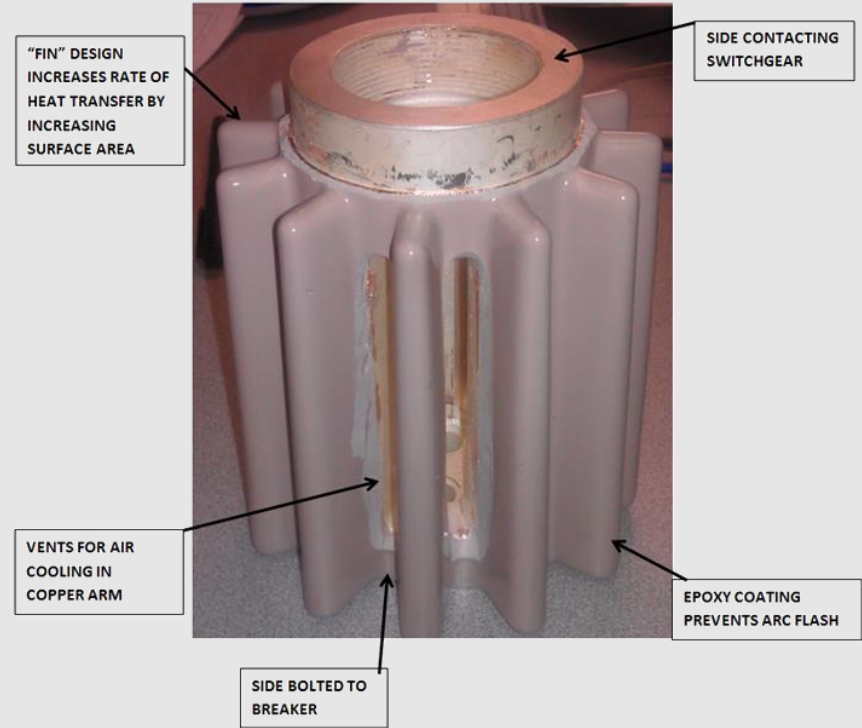
EPOXY COATED “ARM”

SUMMARY

The “arm” connects the circuit breaker and switchgear. Heat can reach a point that causes copper to braze and components to fail. The epoxy-coated, finned arm promotes heat transfer away from the arm, uses air to cool the arm, and is insulated from arc flash through coating.

ROLE

Redesign and optimize arm, fins, and select coating material to reduce heat at contact point. Run thermal simulation in SOLIDWORKS Simulation.



CAN DISPENSER

SUMMARY

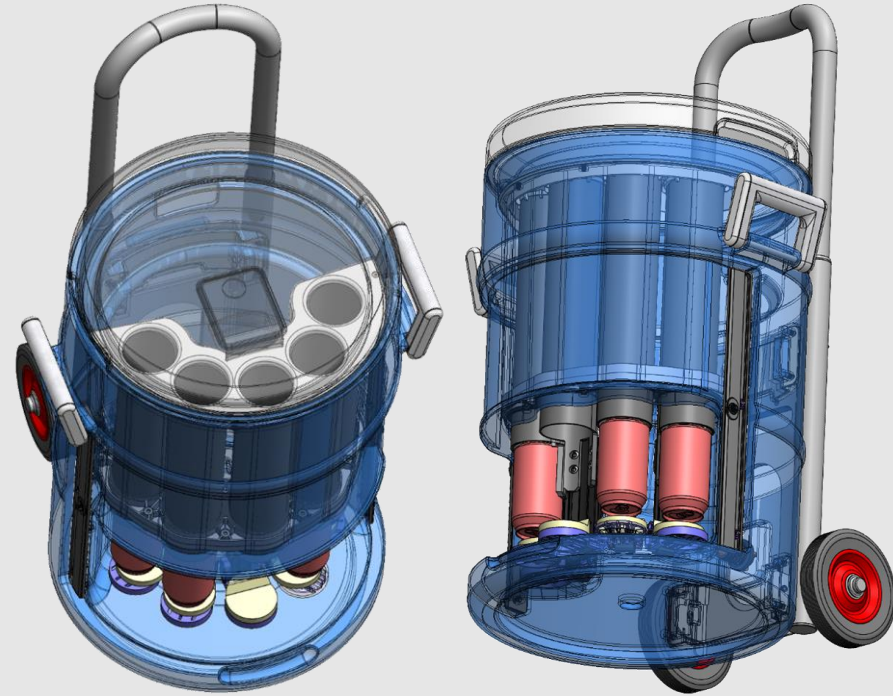
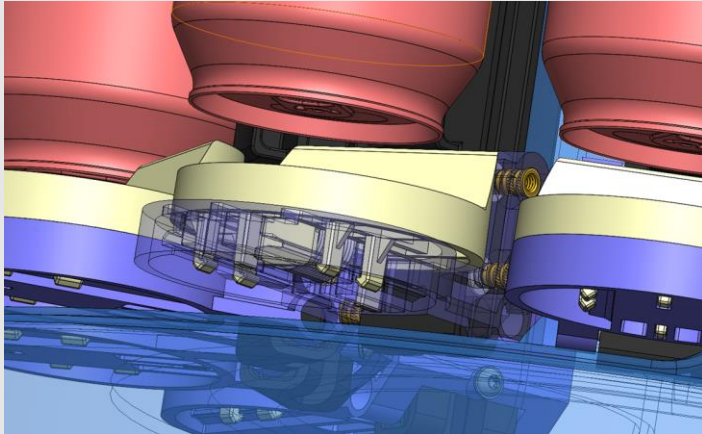
Cooler and dispenser for multiple cans. User slides out one can at a time from the bottom window. Injection molded, overmolded, and machined parts.

REQUIREMENTS

Easily operable with one hand, max can temperature

ROLE

Mechanical Design Engineer, functional and aesthetic parts.



COFFEE ROASTER

SUMMARY

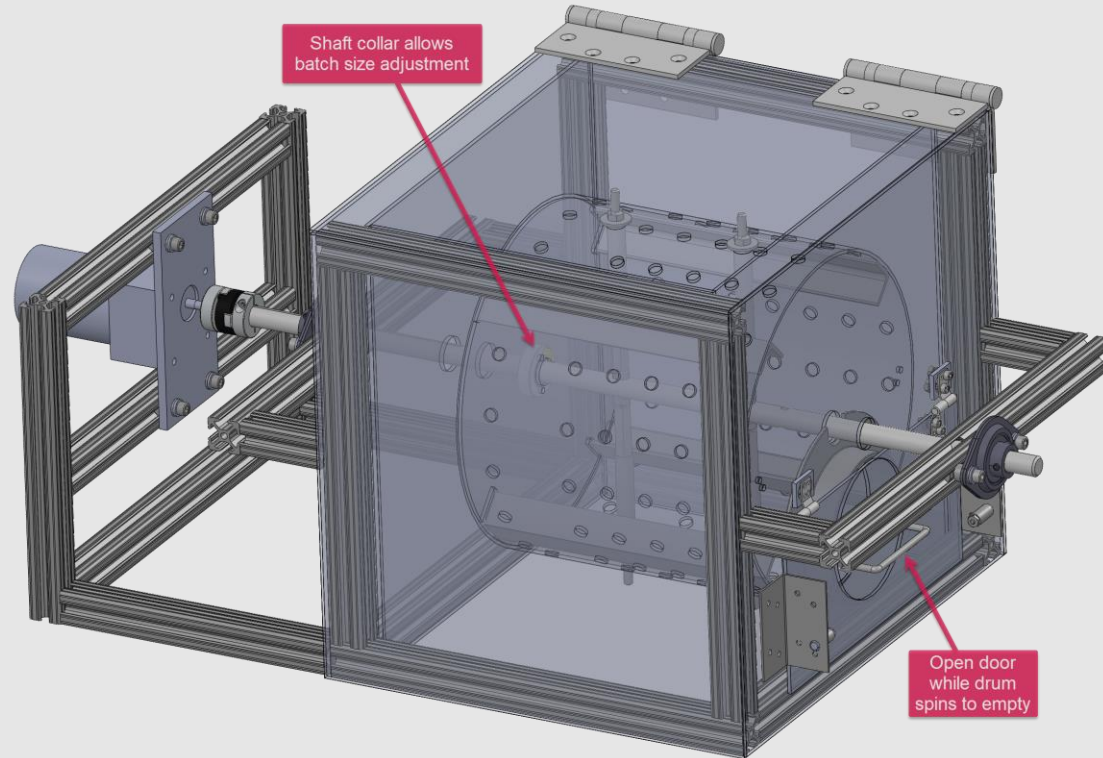
Designed a low-cost coffee roaster using a closed-loop stepper to obtain data and operate the rotary motion. The novelty of the invention lies in its ability to adjust the capacity, eliminating the need for companies to have multiple roasters for different sized loads.

REQUIREMENTS

Adjustable batch sizes, thermal and electrical requirements, rotating speed and motor power based on weight and volume of rotating coffee beans.

ROLE

Sole Mechanical and Electrical Design Engineer



3D PRINTS & MAKES



LED Backed 3D Printed Lithophane



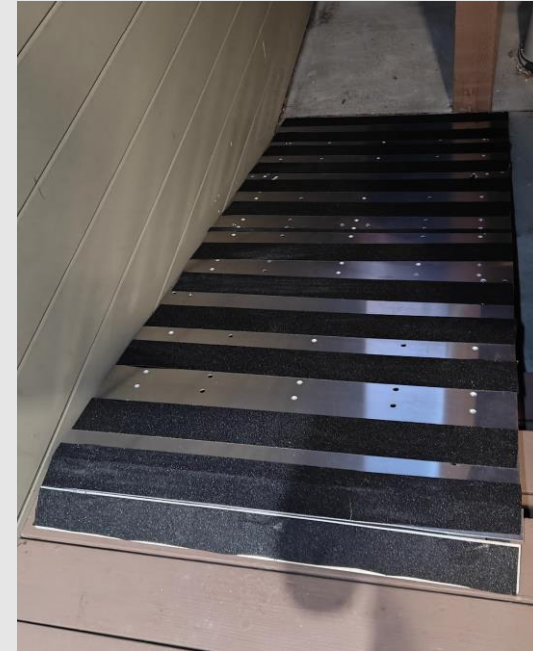
3D PRINTS & MAKES (CONT'D)



Laser cut and Etched
Wedding Coasters



Ramp for Steps (made
from scrap metal)



Microphone
Isolation
Chamber

Sound
Isolation
Ball & Pop
Filter



Height
Adjustment
Collar

Interface
Stand

