NexSys PCS is a second generation device that improves the quality and compliance in plasma collection centers. By integrating ramped up hardware, a sleek UI, and a cloud system, Haemonetics hopes to unlock meaningful value for customers.

What is plasma collection?

During a plasma donation, blood is drawn from one arm and channeled through a sterile, single-use collection set to an automated machine. The machine collects the plasma only, and then safely returns the remaining blood components to the donor.

My work

I worked on a sensor that monitored the flow of the different blood components and their separation in the machine. I worked closely with the product development team while collaborating with software, mechanical, and systems engineering teams to explore various sensing techniques and the costs and the manufacturability associated with each solution. I gained hands-on experience in a rapid prototyping environment. Lastly, I presented to managers of the project and executive members of the company.

My project was important for the following reasons:

* High-profile: my sensor will be implemented in the next year or so
* Increased efficiency in the sensor can mean increased yield and improved quality in plasma
* The Plasma extracted by these devices is used to create drugs for the global immunodeficient population
* NexSys PCS is an integral part of Haemonetics’ future growth

The Embedded Micro-Battery Laboratory at CEA focuses its research on the development of new micro-storage energy solutions, specifically high performance lithium microbatteries, with the help of ST Microelectronics. During this internship, my role was mainly to characterize a solid-state electrolyte, Lithium Phosphorous Oxynitride (LiPON), using electrochemical impedance spectroscopy (EIS).

**Why is it important?**

Some of the major disadvantages to a conventional liquid electrolyte are dendrite formation that trigger explosions and leakage of hazardous materials. To overcome this problem, solid state electrolytes have been introduced; advantages include no leakage, no vaporization, and no phase transitions at low temperatures. One of the most commonly used solid-state electrolytes is LiPON.

The following are parameters to be explored to increase the efficiency of a microbattery:

* Lithium composition – two different compositions were compared, called “s” and “o”
* Deposition chamber
* Architecture
* Process of deposition – the electrolyte was deposited through a mask or deposited full-sheet and etched.

**What I did**

* Determined the properties of the micro batteries’ electrolytes for the fabrication of efficient batteries
* Collaborated with team of five members and communicated in French
* Presented findings to lab of 40 people

Climber

MakeMIT is a hardware focused hackathon held annually at MIT. My team, consisting only of Mechanical Engineers decided to use our strengths and create a stretcher that can climb stairs. As one of our team members had experience being transported in an MIT dorm that did not have an elevator, we saw an opportunity for innovation.

Process:

* Explored existing technologies of wheels capable of climbing stairs
* Assessed material/time availability and built a rough schedule
* Build!
* Testing
* Implemented changes to improve the comfort of the patient on the stretcher

Challenges:

* Limited materials (ex. no wheels, we literally invented the wheel)
* Limited time (15 hours to ideate, build, test)

Future Work:

* Active suspension
* Motorized wheels
* A bed that rotates within the stretcher frame to keep the patient flat even on an incline
* Wheels that can yaw

<https://devpost.com/software/climber>

2.007

2.007 Design and Manufacturing, also an inspiration for the FIRST Robotics Competition known worldwide, is a class where each student independently designs, manufactures, and iterates their own robot for the final competition at the end of the semester.

My robot successfully completed tasks in an efficient manner to consistently score points. To do this, I created a rack and pinion mechanism that yielded high torque at a reasonable speed to lift a heavy load. I placed Top 32 out of 160 students, and it was such an exciting experience with a lot of Star Wars references.

Challenges:

* Manufacturability
* Time (lab was only opened from 9am-5pm)
* Design feasability with available materials
* Withstanding large load

Post picture of notebook