



Company Information

Company Name	<i>Pattons Medical</i>	Date Submitted	<i>04/20/23</i>
Project Title	<i>Redesign of an Air Compressor System for Small Space (PATTONS_SMALL)</i>	Planned Starting Semester	<i>Fall 2023</i>

Senior Design Project Description

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

Please provide your estimate of staffing in the below table. The Senior Design Committee will adjust as appropriate based on scope and discipline skills.

Discipline	Number	Discipline	Number
Mechanical	3	Electrical	1
Computer	1	Systems	

Company and

Pattons Medical (<https://www.pattonsmmedical.com/>) located in Charlotte, NC, is a leading manufacturer of medical air and vacuum systems for hospitals, surgery centers, dental facilities, and outpatient clinics. Pattons also manufactures compressed air systems for industrial, academic and clinical laboratories. In addition, Pattons Medical offers a portfolio of medical pipeline equipment. Pattons Medical is owned by ELGi (<https://www.elgi.com/us/company/>), a worldwide leader in compressed air solutions.

Medical air systems provide life sustaining breathing air for patients in applications such as respirators and breathing tents. Medical vacuum is used for patient suction in medical, dental, surgical, and waste anesthetic gas disposal applications.



INDUSTRIAL SOLUTIONS LABORATORY

Air System



Vacuum System



A vacuum system consists of vacuum pumps, an ASME receiver tank, a control panel with HMI interface, and piping.

In the United States, most of the medical air and vacuum systems are installed in a large equipment room in a hospital. There is a growing need for systems with a smaller footprint for installations in surgery centers where they are installed in closet sized rooms.

Project Overview:

This project is to redesign a current vacuum system to the smallest footprint possible with a current Pattons tank (30 gallon) and vacuum pumps, while reducing material content where possible. This includes reducing the size of the electrical panel and reducing the voltage from 120V to 24V.

Project Requirements:

The team will redesign a current vacuum system into a footprint smaller than 34" x 38". The system will need to be bolted to the floor when installed. Structural stability needs to be considered when the system is turned off and when the system is running. For the electrical panel, the current PLC system should be redesigned into a 24V system from the current 120V system. The PLC system can be converted into a PCB with a microcontroller. The HMI should be at eye level when standing or sitting in a chair.

Expected Deliverables/Results:

- Prototype of the system



- Circuit board layout (if used)
- System wiring diagram
- 3D cad model for system (compatible with Inventor)
- Bill of material for system
- Cost analysis of system
- FEA analysis of system
- Vibration simulation of system (if possible)

Disposition of Deliverables at the End of the Project:

Students are graded based on their display and presentation of their team's work product. It is mandatory that they exhibit at the Expo, so if the work product was tested at the supporter's location, it must be returned to campus for the Expo. After the expo, the team and supporter should arrange the handover of the work product to the industry supporter. This handover must be concluded within 7 days of the Expo.

List here any specific skills, requirements, specific courses, knowledge needed or suggested (If none please state none):

- FEA analysis
- CAD
- Vibration simulation
- Circuit board design