charles river analytics

Automated Pressure Vessel Regulator

Background

Since 1983, Charles River Analytics has been applying computational intelligence technologies to develop mission-relevant tools and solutions to transform our customers' data into knowledge that drives accurate assessment and robust decision-making. Charles River continues to grow its technology, customer base, and strategic alliances through research and development programs for the DoD and the Intelligence Community, addressing a broad spectrum of mission areas and functional domains, including: sensor and image processing, situation assessment and decision aiding, human systems integration, and cyber analytics. These efforts have resulted in a series of successful products that support continued growth in our core R&D contracting business, as well as the commercial sector. Charles River became an employee-owned company in 2012, to set the stage for the next-generation of innovation, service, and growth.

Project Details

In this project, students are tasked with designing a method and the tools to automate the pressurizing and vacuuming process of a pressure vessel. These should be incorporated into a physical unit that the pressure vessel sits in, with a focus on safety and usability.

Figure 1: Example of a Pressure Vessel for underwater use

A pressure vessel (PV) is an air tight enclosure that protects its contents from the extreme pressures in its environment. The tight seal makes them difficult to open. There are many ways to open a pressure vessel, depending on its style and capabilities. A common way is to apply air pressure to a pressure port and let the air pressure pop it open. However, applying hand-throttled pressure to a closed cylinder risks a high speed release of the heavy end cap. A tool to make the process safer and more efficient is desired.

charles river analytics

+ Charles River Analytics Inc.   + p: 617.491.3474
∘ 625 Mount Auburn St.   ∘ f: 617.868.0780
∘ Cambridge, MA 02138   ∘
∘   ∘
∘ www.cra.com   ∘

When a PV has been closed and sealed, it must be leak checked. A partial-vacuum is pulled using the same pressure port and a pump, and the PV is left overnight to monitor any pressure increase. This is a simple process, repeated frequently by technicians, that should be automated.

Deliverables

The students will have a lot of design freedom with this project. We are seeking creative ideas that can accomplish this task. In the end we are looking for a fully functional standalone fixture that has the following capabilities:

- The functional fixture should work with range of pressure vessels.
- The functional fixture should display PV's internal pressure.
- The functional fixture should be able to safely open any pressure vessels.
- The functional fixture should be able to safely vacuum any pressure vessels.
- The functional fixture should be able to data log the PV's internal pressure.

Team Description

Electrical Engineer

Design and develop the wiring logic for the autonomous pressure regulator.

Design and develop PCB for the functional fixture.

Computer Engineer

Design and develop the logic control for the autonomous pressure regulator.

Design and develop the interface for the fixture.

Design and develop the data logging for the fixture.

Combine Task:

Design and develop the physical frame for the fixture

Design and develop the pneumatic control for the fixture