EARS (Electromechanical Automatic Pressure Relief System) 10/23/2019

Product Design Specification v1.0

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Summary - The EARS is a device which measures the pressure of a fluid and control a relief system to alleviate the pressure. We chose this device because of its practicality for safety systems. This could be used in any application that has to deal with high pressure systems. The device is designed with ease of use in mind, meaning that it should be lightweight, portable, and simple to vary the pressure at which it activates.

Market Analysis:
Customer - This product is intended for individuals who want to take extra steps with regards to safety when working with high pressure systems. It's intended to prevent dangerous pressure build-up from causing damage to the individual and the equipment.

Competition -

Electromechanical Pressure Controls - https://ab.rockwellautomation.com/Sensors-Switches/Pressure-Sensors/Electromechanical-Pressure-Controls

Electromechanical Pressure Switches https://www.imi-precision.com/uk/en/list/pressure-switches/electro-mechanical-pressure-switches

Electromechanical Pressure Sensor http://www.tesensors.com/us/en/product/reference/XMLA010B2S11/

While our product is similar to the ones listed, we expect to innovate on the price. Keeping with the open source license, our product will also be open sourced, unlike the competitors.

Price - The expected price for this product is **$200**, the price of parts is ~$60 so we expect to sell for a little over 3x factoring in development and labor.

Requirements -

Must:

- Be able to measure the pressure of a fluid.
- Be able to control a relief valve of said fluid.
- Provide a method for releasing pressure at a specified threshold.
- Safely hold 100 psi pressure in a chamber.
- Contain at least one electronic sensor.
- Contain at least one electronic actuator.
- Have one or more processing modules which control actuators based on sensors.
- Have a PCB that is at least two layers.
- Use at least 25% surface mount components.

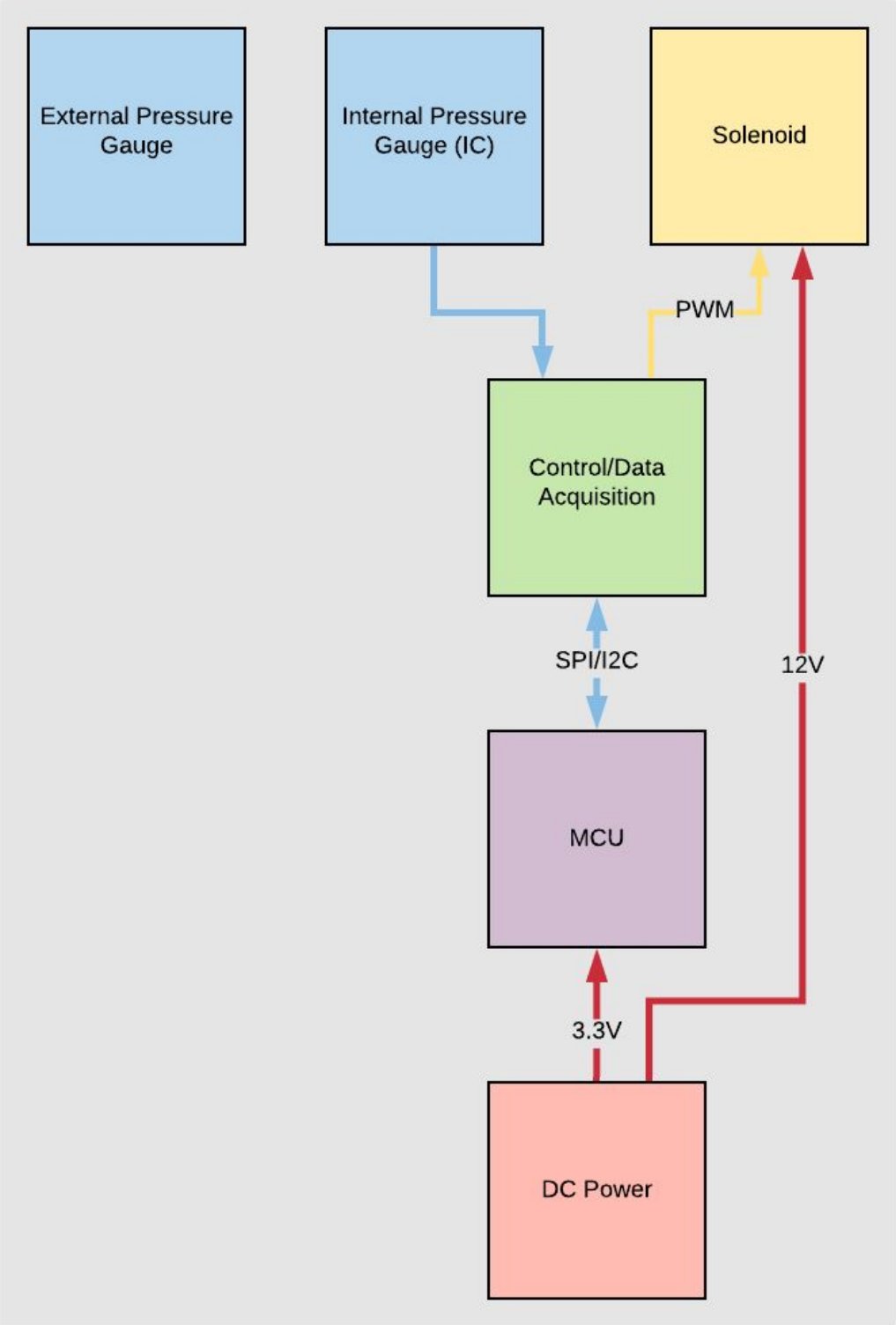
Should:

- Visually indicate the pressure to operators.
- Visually indicate the current state of the valve to operators.

May:

- May include temperature sensor for the fluid. (Future feature that's needed for TSAR.)
- Transmit the state of the valve and the current pressure level to another system.
- Include a variable pressure relief threshold.
- Include an ignition system to safely ignite vented fluids.

System Architecture -



Design Specification -

- STM32152RET6 Microcontroller
- STMCubeIDE/MX
- NPP-301 SMD Pressure Sensor
- 12V 1A AC/DC Power Supply
- USSOLID Electric Solenoid Valve- 1" 12V
- 1-2” PVC Chamber
- Standard PSI gauge for visual verification
- Milton (S-684-4) 1/4" MNPT Male Tank Valve
- TPS62172 DC-DC Buck Converter