



Quality Assurance Process Improvement Gas Leak Inspection



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Background

About Concoa:

Concoa is the leader in manufacturing gas-distribution products. They are located in Virginia Beach where they manufacture most of their Regulator products.

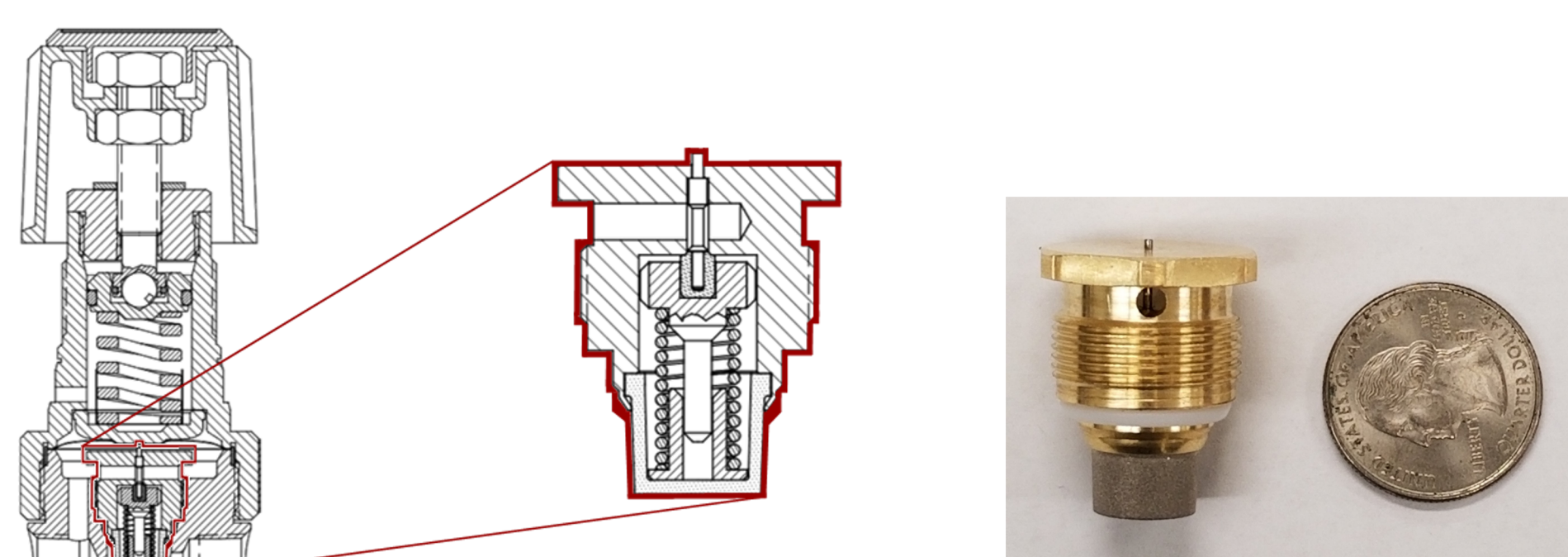
Project Background:

Concoa's regulator product controls the flow of gas between gas sources to applications. Pictured below is a regulator.



Concoa's Regulator

Inside the regulator is a part called an Encapsulated Seat Assembly (ESA) which is responsible for controlling the flow of gas through the regulator.



Location of ESA in Regulator

Size of ESA Part

While not frequent, regulators can fail final inspection due to a faulty ESA that lets too much or too little gas through to the outlet side. If this occurs the regulator must be taken apart and a new ESA must be installed.

Impact

Our design is an essential step in fully automating manufacturing process that the ESA goes through. Ideally, it will eliminate the need for rework on the regulator product due to the defective ESA parts, because most of the defects of ESA will be found before the regulator is assembled. In addition, the collection of data through our design will help Concoa diagnose problems within the ESA itself in the future.



Decreased
Reworks on
Regulators



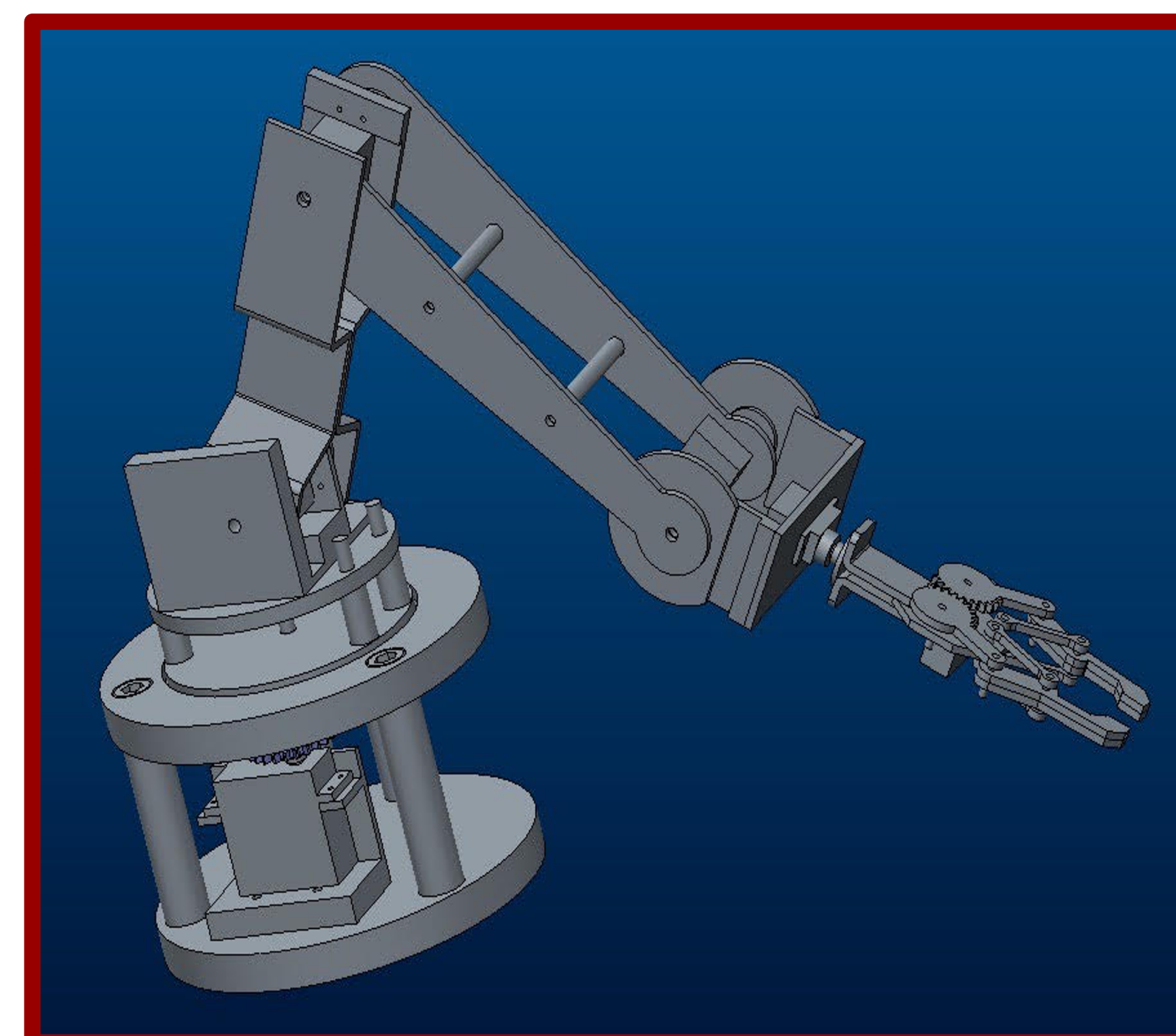
Ability to Diagnose
Problems



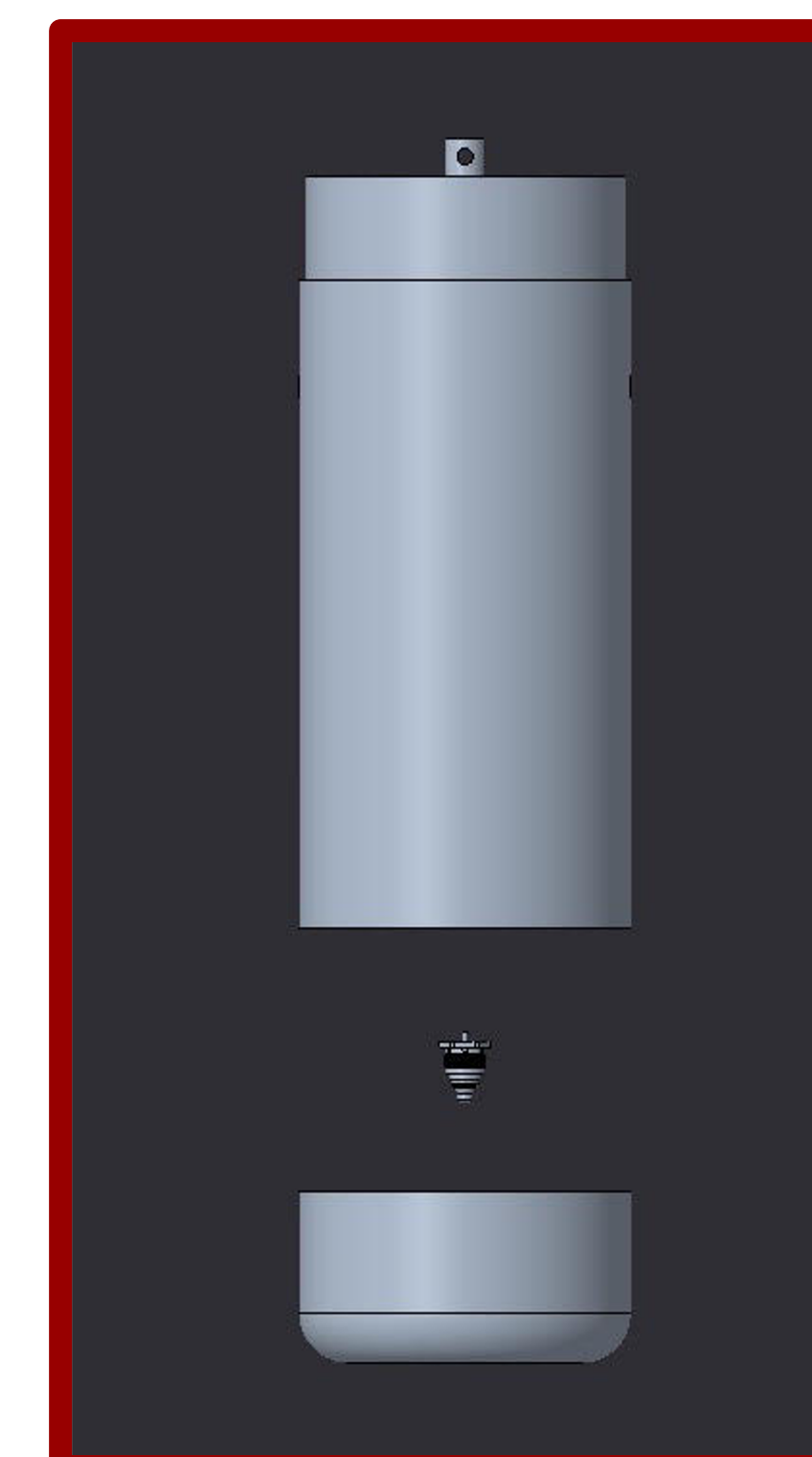
118 hours increase
in productive time



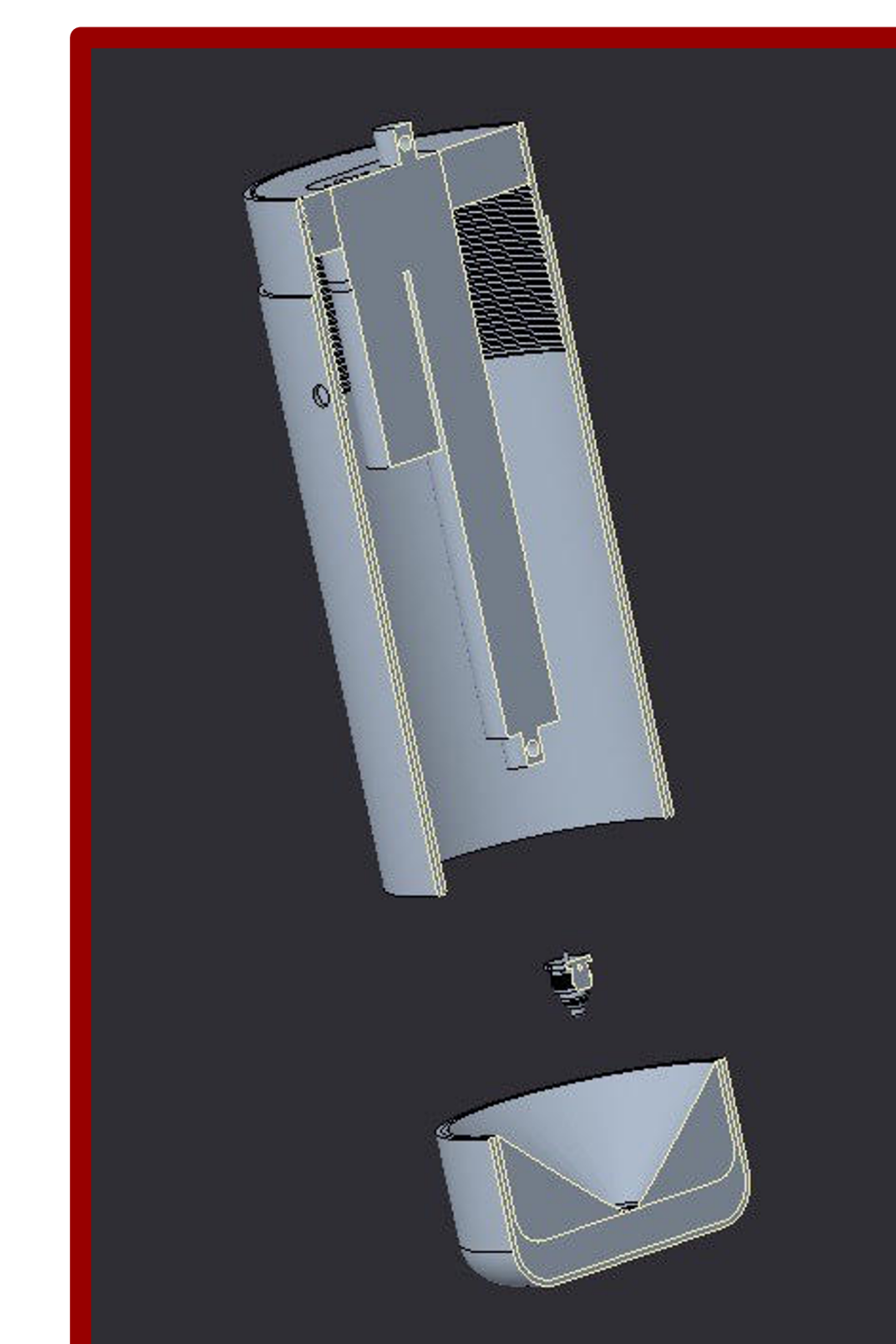
Decreased
Cost of \$9850
per year



Robotic Arm with Pincher End-Effector



Testing Chamber



Testing Chamber Cross
Section

Step 1

Robotic arm picks up the assembled ESA part and places it in the testing chamber

Step 2

The chamber is closed and the actuator in the chamber compresses the pin.

Step 3

Gas flows through the bottom to the top chamber until it reaches a pressure equilibrium.

Step 4

The transducers take pressure/temperature readings and determine if the part is acceptable.



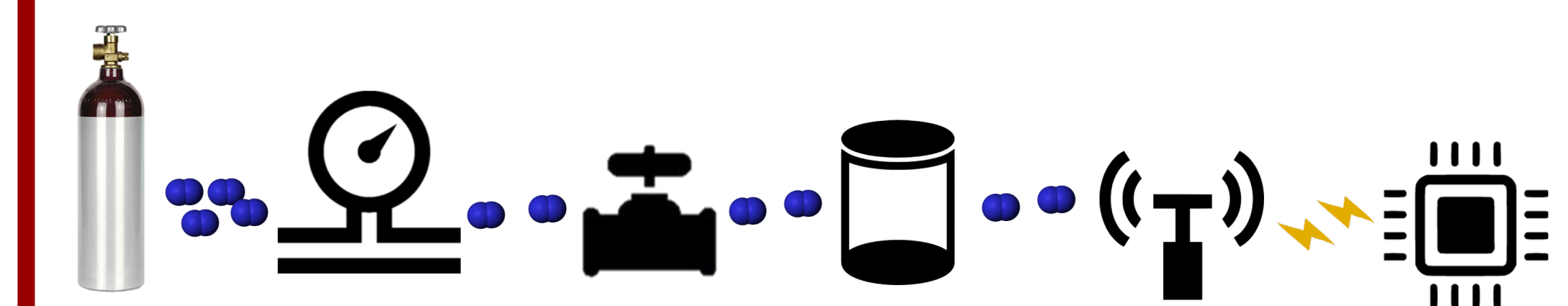
Cross section of ESA

Solution Approach

Because the ESA is the part that is most often found to be malfunctioning in the regulator assembly, a separate test that is conducted on it before the regulator is assembled will catch the ESAs that leak.

Implementation

Our solution was to create a system that tests the ESA before it reaches the regulator assembly to ensure that the part is functioning properly.



This system is comprised of nitrogen gas source, a regulator, solenoid valve, a specially designed testing chamber, two transducers, and a controller.

Result

Due to the response to covid-19, our team had to make accommodations. Therefore, we designed a pressure testing chamber in CAD, which is easily fabricatable in a 3D printer, for ease of testing purposes. The rest of the parts Concoa either has currently or can acquire at low cost. This will allow flexibility in how Concoa wishes to proceed with the project.