

Automated Pouch Opener/Presenter (APOP)



Project Overview

Problem: Masimo needs to streamline their current process of inserting adhesive sensors into pouches. Presently this process is completed by an operator that prepares an adhesive sensor, manually opens a pouch to insert the sensor, and then places the filled pouch into a bin.

Solution: To increase the production volume, speed, and accuracy Team Bondi has designed an automated pouch opener/presenter for Masimo to implement into their facilities that utilizes pneumatics to grab a pouch from a designated hopper and then opens and presents the pouch to an operator for sensor insert.

Team Members

- Zachary Conte, ME Team Lead
- Hana Julazadeh, Testing/Analysis
- Jessica Grear, Design/Research
- Jocelyn Arias, Manufacturing/Quality
- Chance Fuglseth, Manufacturing/Assembly
- Braden Hooper, ECE Team Lead
- Thomas Trinh, Software Integration
- Brayan Lopez Corona, Electrical Integration
- Ryan Wilson, Power Systems
- Abdulaziz Alali, Hardware

CAD Models

System Assembly

Actuator Subassembly

Hopper Subassembly

System Process

- The hopper is filled with pouches.
- The operator starts APOP system using HMI.
- The linear actuator extends to suction on to pouch.
- The linear actuator extends to the stationary suction cups.
- The rotary actuator rotates the linear actuator assembly 90°.
- The linear actuator retracts to remove pouch from the hopper.
- As suction is applied to both sides of the pouch the linear actuator retracts to open the pouch.
- The operator places a medical sensor in the opened pouch.
- The filled pouch is dropped below into a bin.

Meet the Sponsor

Masimo is a global medical device company headquartered in Irvine, CA that creates over a hundred million adhesive sensors each year.

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Enclosure Diagram

ENCLOSURE LAYOUT

NON-ENCLOSURE COMPONENTS

LEGEND

- 120 VAC Components - YELLOW
- 24 VDC Components - RED
- Control Components - GREEN
- Ethernet Components - BLUE
- Safety Components - ORANGE
- Pneumatic Components - PURPLE
- Sensors - DARK BLUE
- External Interface - PINK

System Level Diagram

External Interface

- HMI Touchscreen Display
 - Number of pouches processed successfully
 - Dimensions of the pouch being processed
 - On-screen buttons for start and stop
 - System Status (idle, operational, warning, error)
 - Status messages
- Foot pedal to release pouch
- LED Tower to display system status
- E-Stop

Controller

- Panasonic AFPOHC32EP PLC Module
- Discrete I/O Terminal Block
- Ethernet Switch
- 6x 24VDC Relays
- Safety Relay

Power System

- 120V AC (Wall)
- Enclosure Disconnect
- Circuit Breaker
- 120VAC to 24VDC Power Supply
- 24VDC Fused Distribution

Hopper System

- Photoelectric sensor to track hopper level
- Vertical, gravity-fed, adjustable pouch hopper

Pouch Grabber System

- Vacuum Gen.
- 3 port/2 way Solenoid Valve
- 2x Vacuum Suction Grippers
- Zebra FS20 Barcode Scanner
- 5 port/3 way Solenoid Valve
- 2x Flow Control Valves
- Double-acting Pneumatic Linear Actuator
- 4x Magnetic Position sensors
- 5 port/3 way Solenoid Valve
- 2x Flow Control Valves
- Pneumatic Rotary Actuator
- 2x Magnetic Position sensors

Pouch Opening/Dispensing System

- Photoelectric sensor to check if pouch is filled
- Safety light curtain
- 3 port/2 way Solenoid Valve
- 2x Vacuum Suction Grippers
- Plastic bin to store filled pouches

Other Components: Air Compressor (100 PSI), Air Prep Unit, Venturi Vacuum Generator

Legend:

- Discrete I/O Signals (Dashed Green)
- Ethernet (Solid Green)
- DC Power (24V) (Solid Red)
- AC Power (120V) (Dashed Red)
- Pneumatic Connection (Dotted Purple)
- Mechanical Connection (Solid Black)

