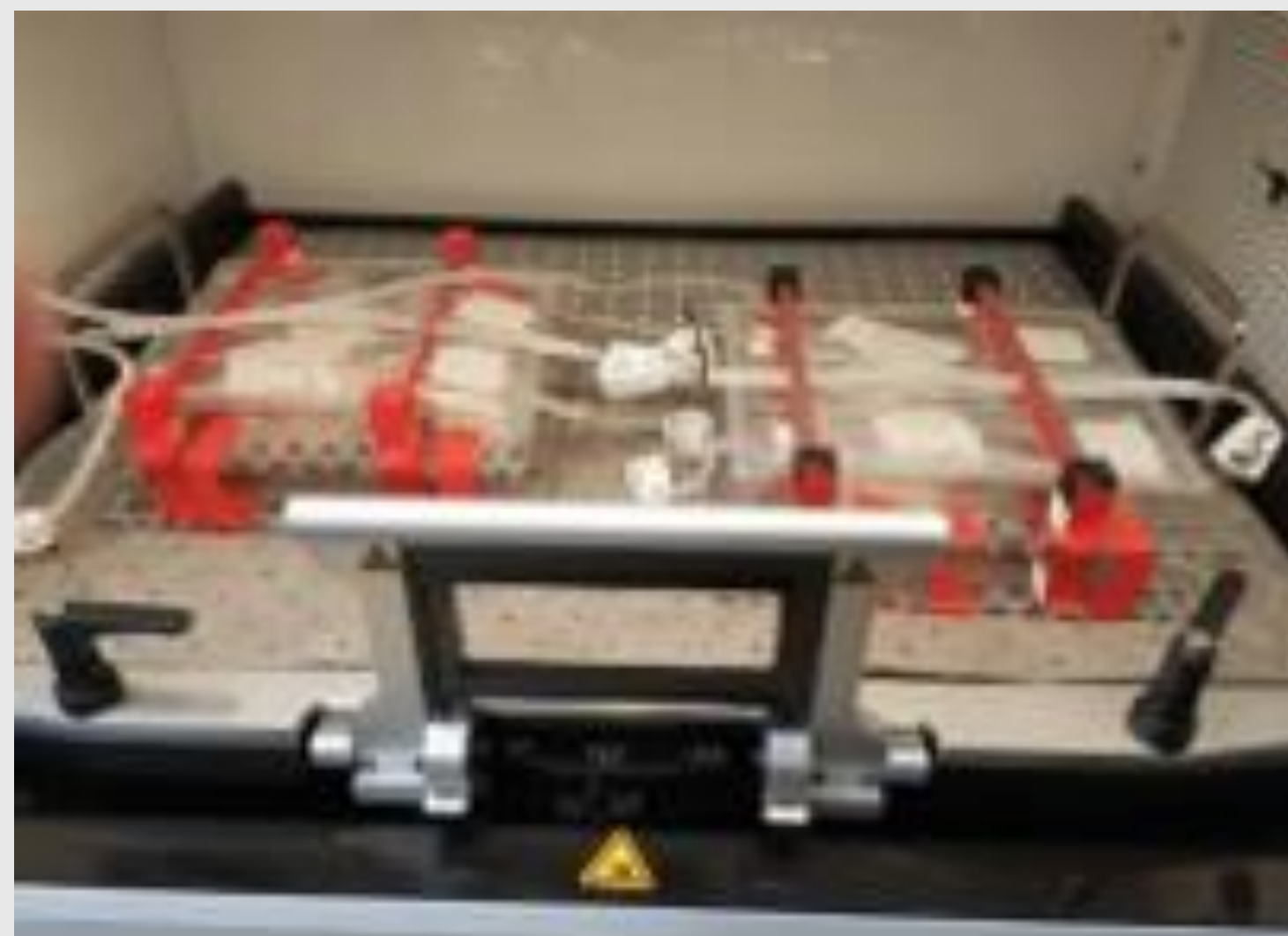


Automated Decellularization Production System

BACKGROUND

DeCell Technologies is a biomedical technology innovation company that have developed an innovative process for the decellularization of skin which allows for a lower rejection rate in skin grafts. DeCell aims to upscale production and improve consistency in results.

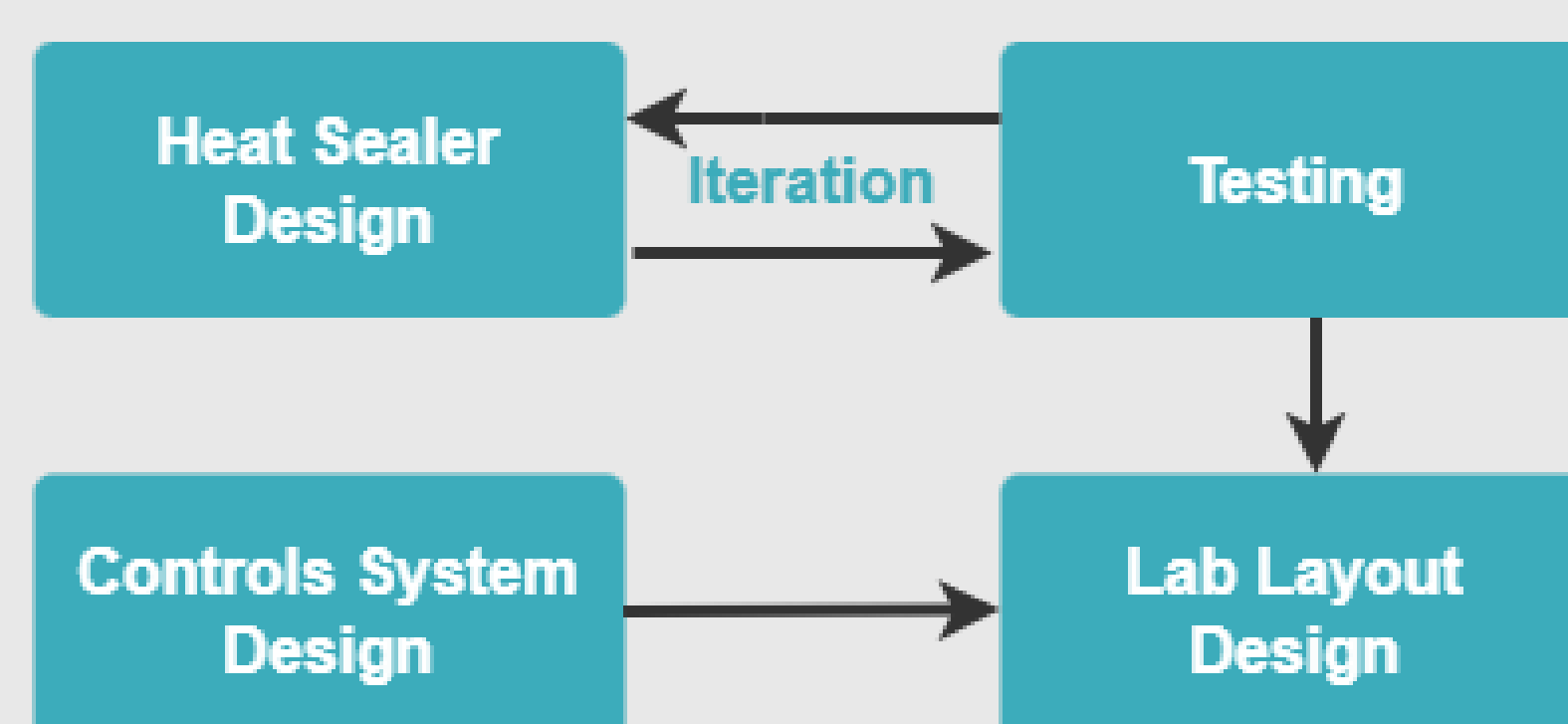


The project scope is split into three areas of development:

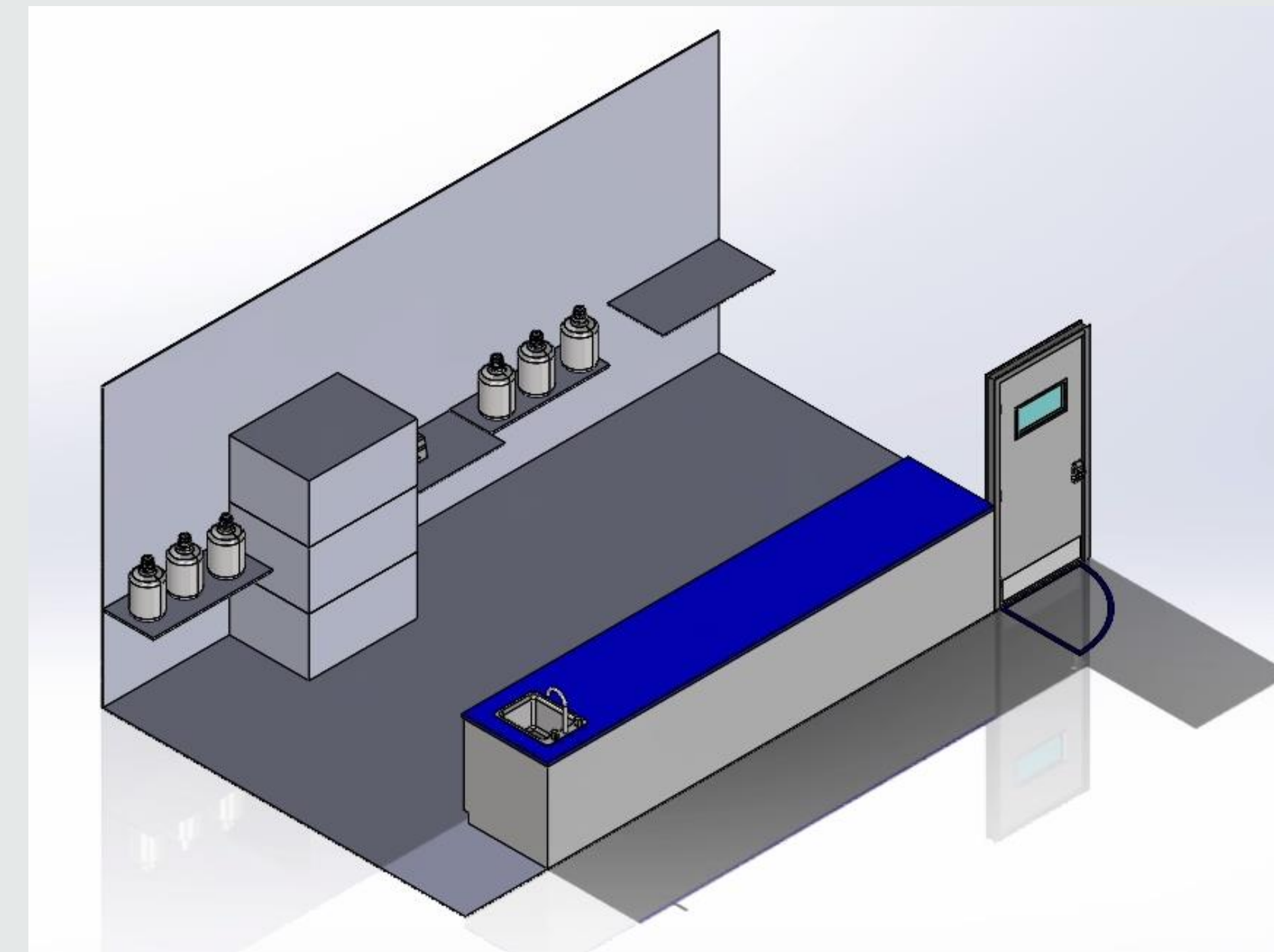
- DeCell would like to replace the current LabView controls with a more direct interface to allow for upscaling and simplified user interface.
- DeCell would like to triple production, so a layout for an upscaled lab layout is required.
- DeCell would like to improve the consistency of product packaging by improving the heat sealer process or detecting blockages in the system

DESIGN PROCESS

- Heat sealer attachment is designed to make packaging more uniform
- Heat sealer is tested in the lab and design is adjusted
- Controls system hardware is planned, and space requirement determined.
- Lab layout is planned based on heat sealer and controls requirements



DETAILS OF DESIGN

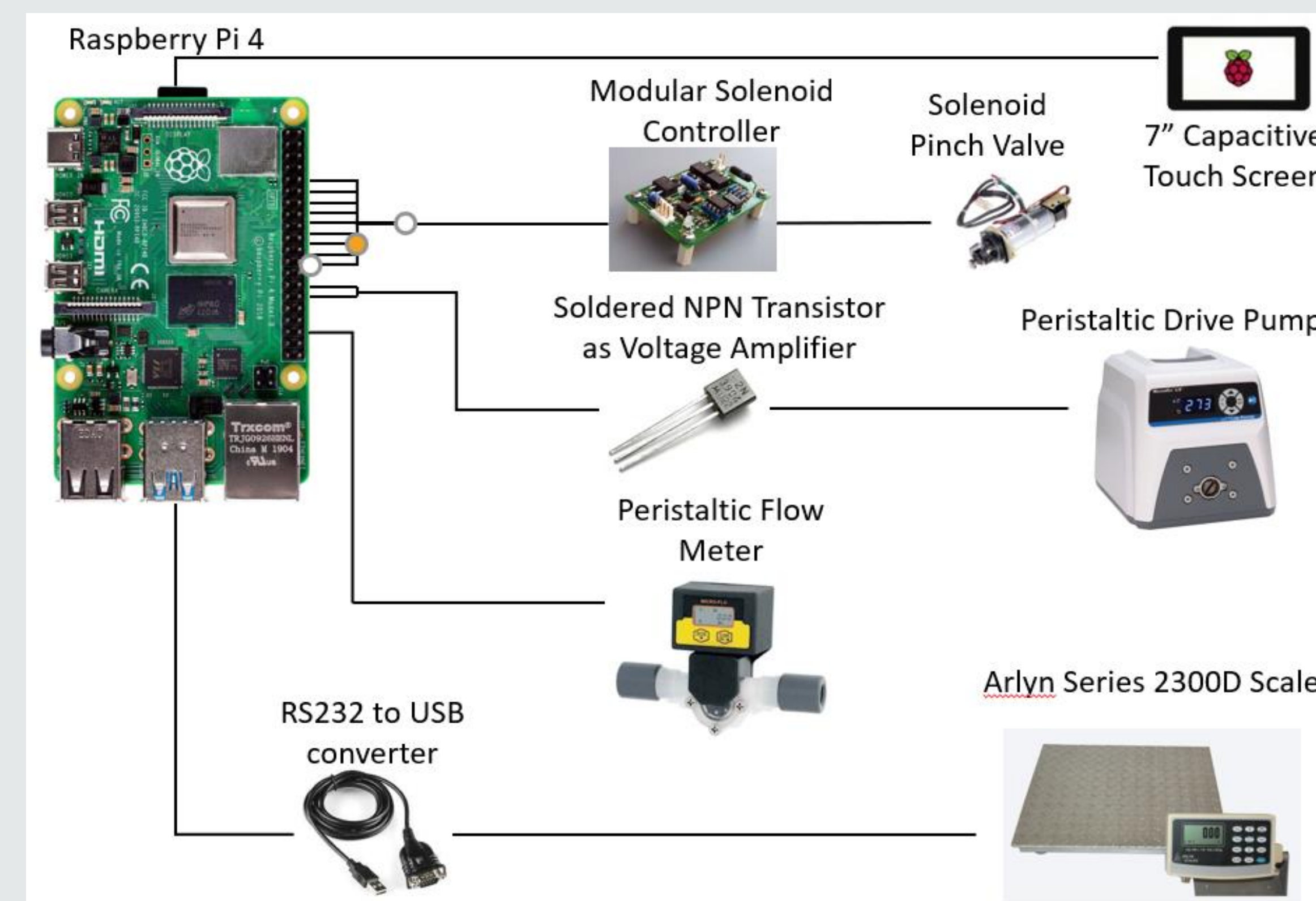
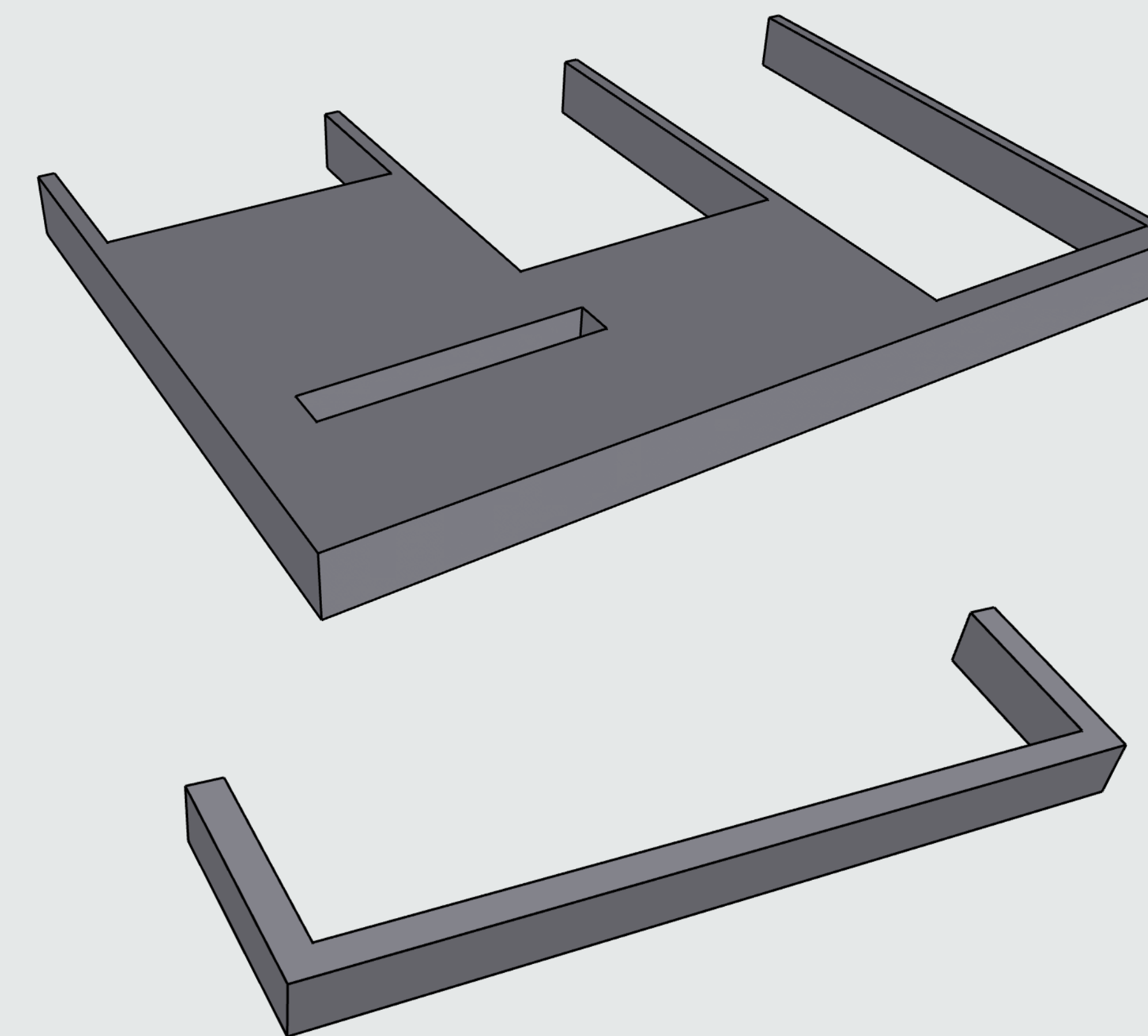


LAB LAYOUT

- In this upscaled layout, three carboys to the right of the stacked shaker tables will pass liquid through the pump into the shaker tables that contain the skin.
- The fluid exits and is disposed into the 3 carboys to the left of the shaker table.
- The electronics and solenoids will be mounted on the shelf beside the shaker tables.

HEAT SEALER ATTACHMENTS

- Two heat sealer attachments are used to provide heat sealing guide
- Each pocket is used in succession, for one cut
- The operator slides the packaging into a pocket, and lowers the heat sealer
- No operator error is possible as long as the heat sealer attachment is in place
- Attachments are 3D-printed ABS, but final iteration will be nylon



CONTROLS

- Two control systems options were designed
- Using a Raspberry Pi, shown left, cut down on costs significantly
- The alternative PLC option is simpler, but higher cost.
- Some software developed for both controls options

RESULTS

Lab Layout

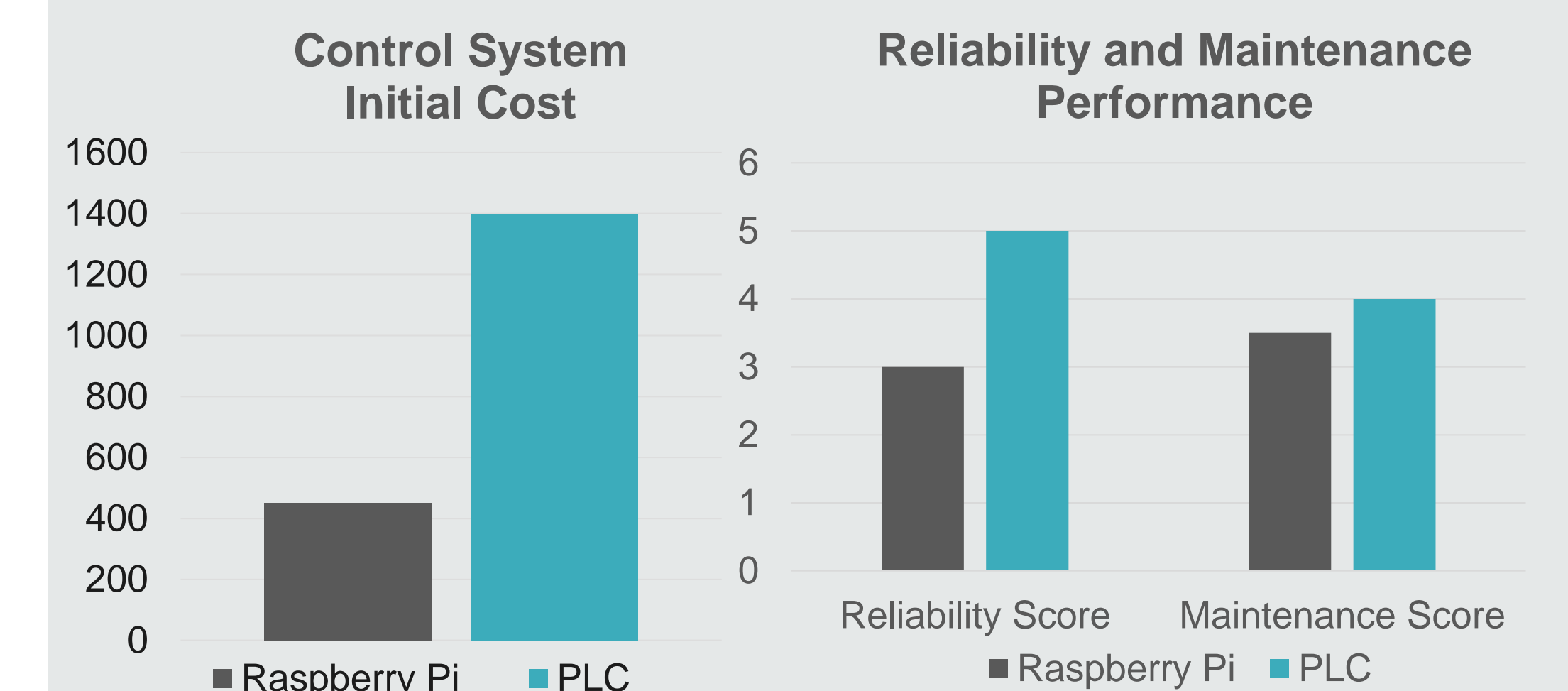
- The best layout was selected out of three possible designs
- The shaker tables are stacked to their maximum height
- Three simultaneous batches are possible with the layout, and the carboy and controls layout is optimized for ease of access.

Heat Sealer Attachment

- Design was iterated and 3D printed
- Concept is proven with lab technicians, but testing on most recent iteration is required
- Design is stable on the heat sealer, and is expected to provide smoother heat sealing, improving shelf life.

Controls System

- Price, reliability, and maintenance are biggest considerations



RECOMMENDATIONS

- Based on the price, reliability, and maintenance requirements, it is recommended the client choose the PLC system for controls
- The 3D-printed heat sealer attachment should be tested once more to ensure dimensions are perfect, and then a nylon attachment should be ordered.

REFERENCES

- Margueratt, S. (2021, October). Personal Client Interview.
- Cole-Parmer Masterflex Paddle Wheel Micro-Flo Rate (2010). Retrieved from: <https://www.masterflex.com/i/masterflex-paddle-wheel-micro-flo-rate-and-total-flowmeter-3-8-od-300-ml-min/3255013>