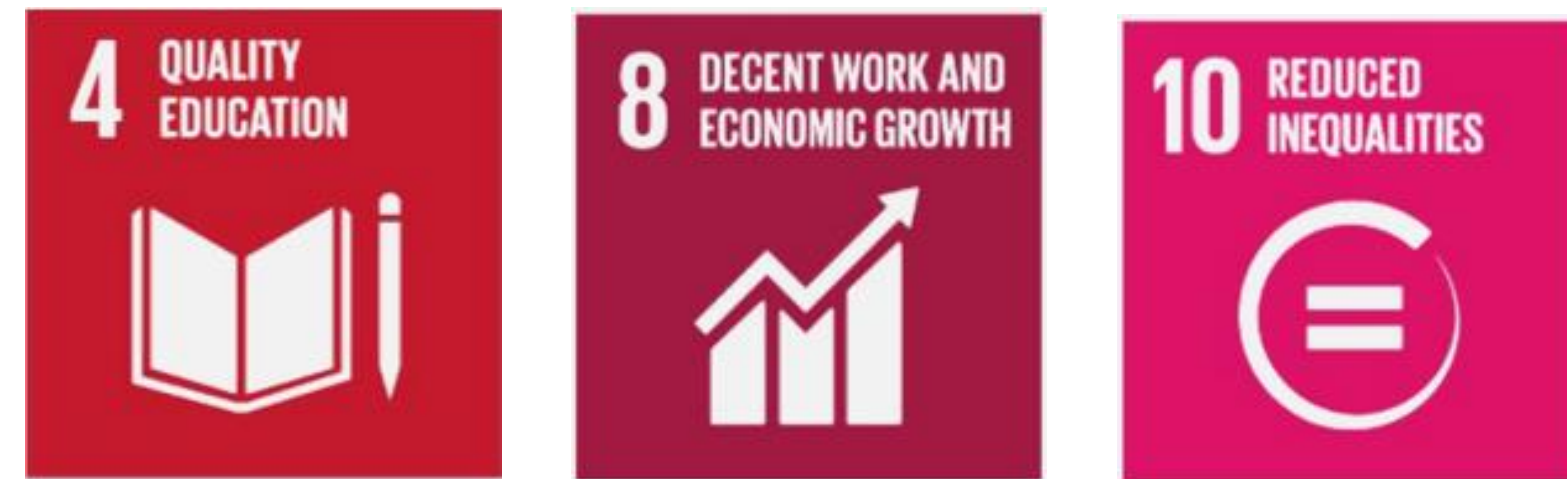




OPTIMIZATION OF THE MIXSTIX PLATFORM

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Background

Nanoracks markets a Mixstix product that allows for contained experiments to be sent into space. The current Mixstix design, however, has minor flaws that need to be improved upon for ease of operation by the crewmembers and customers. The main goal of this project was to decrease the anomaly rate to less than 15% while making the product more cost effective.

Original Mixstix Design



Screw End Cap (Right)
Regular End Cap (Left)



Parylene Coated Silicone Tubing



Clamp



Assembled Original Mixstix Design

The original Mixstix design consist of two end caps, a silicon tube coated in parylene, clamps, zip ties, and screws for the screw end cap. The main source of leakage is through the end caps and clamp of the Mixstix.

Design Elements Tested



Screw Clamp



Biovalve



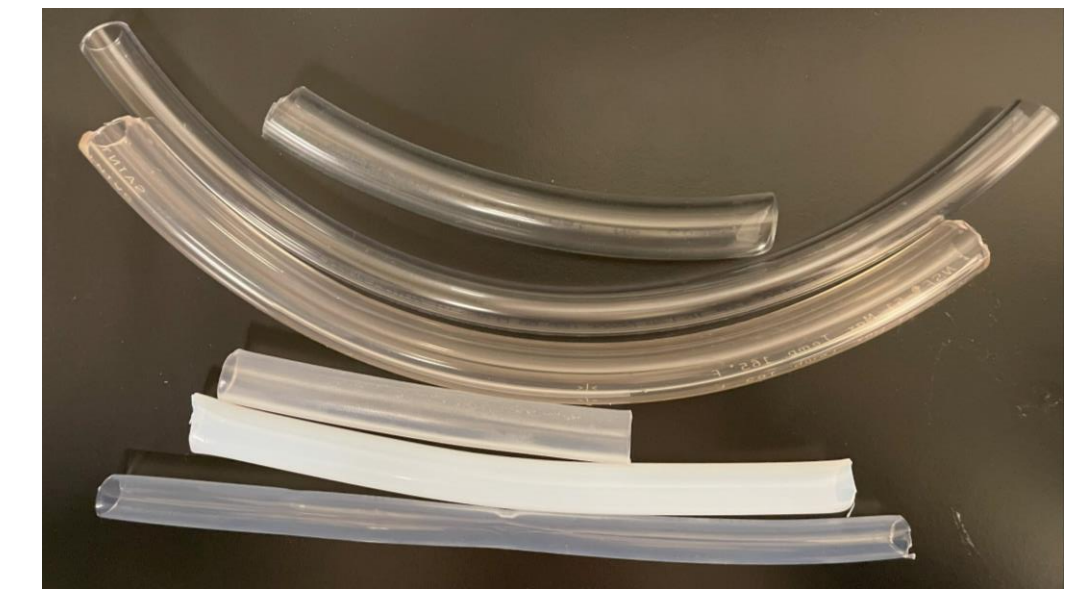
KECK Ramp Clamp



Black Threaded
End Cap



White Threaded
End Cap



430 Tubing Types Evaluated

Testing Results



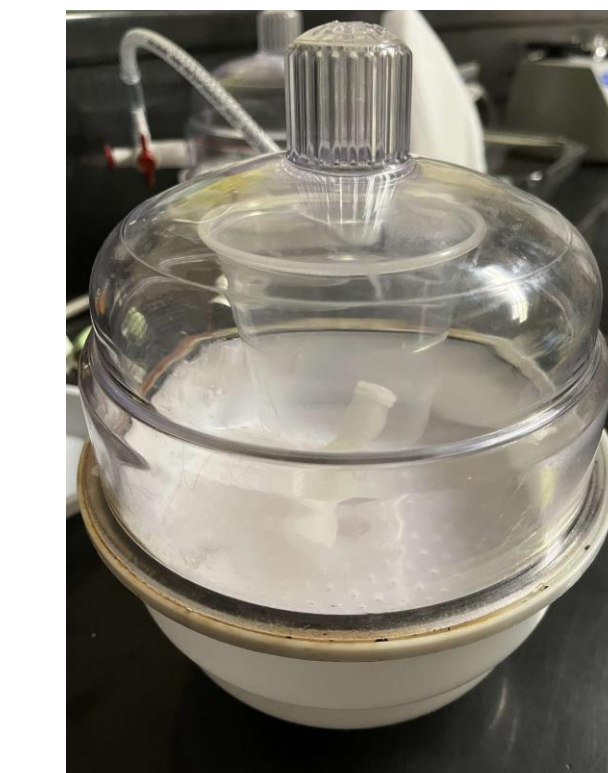
Vortex
(Vibration) Test



Boiling Test



Heat Sealing
Test

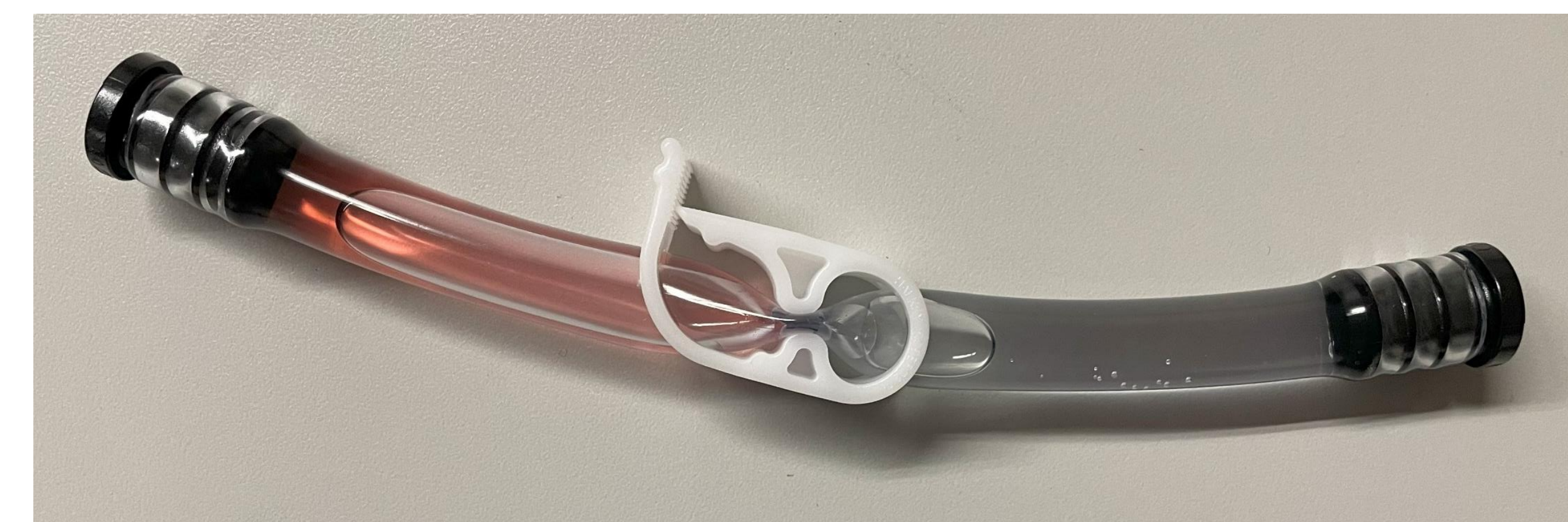


Vacuum Pressure
Test

- The vacuum pressure, vibration, time, and shipping tests were used to determine leakage through the clamps and end caps.
- The boiling test determined whether the tubing material would hold up if a customer were to sterilize via boiling.
- The heat-sealing test was used to determine if heat sealing would be compatible with tubing materials.
- A tubing database was created to summarize chemical compatibility of 430 different tubing options.

Recommended Design

- The recommended product uses a polyvinyl chloride tube along with new black threaded end caps.
- The clamp from the original Mixstix is included in the recommended design based on performance.
- The redesign has eliminated the need for zip ties and the parylene coating.



Assembled Recommended Design

Economics

Recommended Mixstix Design Price Estimation (5 Mixstix)					
PVC	Clamps	End Caps	Color Coding	Pipe Cleaners	Total
\$6 - \$12	\$20	\$9	\$5	\$5	\$45 - \$51
Current Mixstix Kit Cost:					\$120



Nanoracks

Acknowledgements

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University of Idaho
College of Engineering

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