

Handheld Sample Prep Device for Rapid Dispense of a Defined Volume

Summary

A blue chip biotech customer specializing in life sciences and diagnostics, tasked Gener8 with the development of a novel disposable, low-cost, handheld consumable that simplified a sample prep protocol for dispensing defined volumes of a resuspended sample. The developed consumable reduced a complex bench protocol to three easy steps that reduced contamination issues and processing time compared to the current procedure.

Methods Employed

A considerable amount of CAD work and volume calculations were performed before arriving at the final design. Several concepts were developed before prototyping. The selected design was a custom handheld device composed of two syringes, one large, the other small. A ratchet mechanism was developed that allowed for a measure volume of buffered sample to be repeatedly dispensed. A mechanism had to be designed that would allow a specific volume of sample to be pushed out of the syringe barrel repeatedly. This was achieved by designing a snap latch such that the molded component design could deliver desired volume of sample.

To prevent contamination, a Sephacryl gel filtration media was loaded into the large syringe barrel. This prevented clogging of the smaller syringe when the plunger was depressed. The device was fabricated using polypropylene which was compatible with the assay.

At A Glance

Customer

Life Science and Diagnostics Company

Product

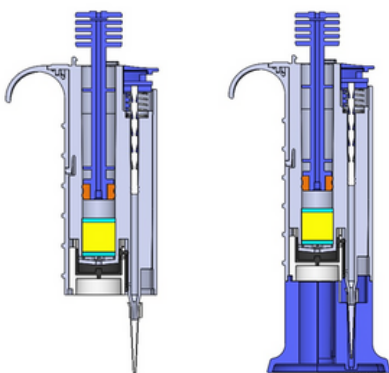
Handheld Sample Prep Device

Services/ Market

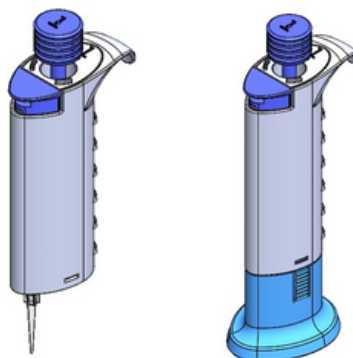
Life Sciences, Diagnostics

Challenges

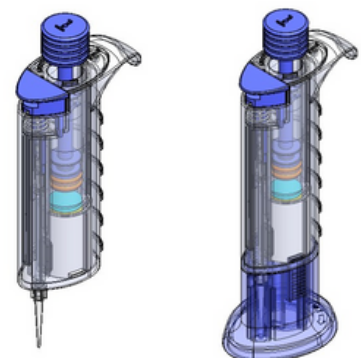
Before designing and developing any consumable, it's important to be sure that a customer's assay/chemistry is fully developed. Three primary objectives in the design of the consumable had to be met: (1) a reduced number of user operations compared to the current test procedure; (2) a shorter turnaround time compared to the current test procedure; and (3) the device must reduce the number of open system manipulations. The primary challenge for this project was in designing a consumable that consolidated a multi-step sample prep protocol into a simple handheld device. Other challenges included being able to mix and move a diluted sample within the device. The design had to accommodate a sample input volume of 500 μL into a column or cartridge and it had to be able to meter a specific volume of a sample repeatedly.



Transparent view without stand, with stand



Solid isometric view without stand, with stand



Transparent isometric view without stand, with stand

Solution

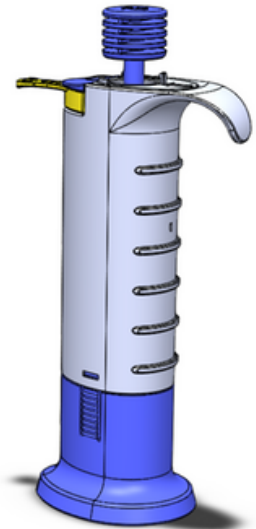
Gener8 met the customer's requirements in designing and developing a simple, easy to use, handheld syringe with plunger containing a ratcheting dispense mechanism to delivery discrete volumes of the diluted sample repeatedly. The sample was loaded into the larger syringe barrel and the plunger inserted. The action of pushing down on the plunger pushed a defined volume of diluted sample into the adjacent smaller barrel. The orange tab was removed allowing the plunger to be pushed down. The ratchet mechanism meant that an accurate, reproducible volume of diluted sample was dispensed every time.

Expertise Employed

- Microfluidics design, fluid handling and testing
- Injection molding and design for manufacture
- Material compatibility (Material Science)
- Reagents
- Ergonomics (Industrial Design)
- Plastic assembly methods
- Intellectual property creation



The final handheld device.



Solid isometric view with stand.



The final product designed to be a handheld device