H41J-0819: The OPEnSampler: A Low-Cost, Low-Weight, Customizable and Modular Open Source 24-Unit Automatic Water Sampler

Thursday, 14 December 2017
08:00 - 12:20
📍 *New Orleans Ernest N. Morial Convention Center - Poster Hall D-F*

Reliable automatic water samplers allow repetitive sampling of various water sources over long periods of time without requiring a researcher on site, reducing human error as well as the monetary and time costs of traveling to the field, particularly when the scale of the sample period is hours or days. The high fixed cost of buying a commercial sampler with little customizability can be a barrier to research requiring repetitive samples, such as the analysis of septic water pre- and post-treatment. DIY automatic samplers proposed in the past sacrifice maximum volume, customizability, or scope of applications, among other features, in exchange for a lower net cost. The purpose of this project was to develop a low-cost, highly customizable, robust water sampler that is capable of sampling many sources of water for various analytes. A lightweight aluminum-extrusion frame was designed and assembled, chosen for its mounting system, strength, and low cost. Water is drawn from two peristaltic pumps through silicone tubing and directed into 24 foil-lined 250mL bags using solenoid valves. A programmable Arduino Uno microcontroller connected to a circuit board communicates with a battery operated real-time clock, initiating sampling stages. Period and volume settings are programmable in-field by the user via serial commands.

The OPEnSampler is an open design, allowing the user to decide what components to use and the modular theme of the frame allows fast mounting of new manufactured or 3D printed components. The 24-bag system weighs less than 10kg and the material cost is under $450. Up to 6L of sample water can be drawn at a rate of 100mL/minute in either direction. Faster flowrates are achieved by using more powerful peristaltic pumps. Future design changes could allow a greater maximum volume by filling the unused space with more containers and adding GSM communications to send real time status information.

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