Tabletop automatic sampler for high frequency phytoplankton culture studies sampling Outline

Introduction

* The need to sample at high frequencies
  + growth rates higher resolution
  + synchronity of culture populations
* existing systems available
  + cost
  + size
  + predecessor (1998) outdated

Problem statements

1. Samples to be collected at regular time intervals
2. Samples collected to be stored in a dark environment at 4 degrees celcius
3. No cross contamination between samples (purging)

Sampler Design and implementation

* What it does, How it works and How much it cost.
* 4 systems
  + Brain
  + Sample collection (Pump)
  + Sample management (Motor)
  + Sample storage (temperature control)

test of sample preservation

* run a 12hr test

test of loss of significant seed culture

* run a 12hr test to compare

limitations of the sampler

* can only store up to 10 samples at a time
* does not work for triplicates (only 1 machine)
* purging results in significant drop in stock culture

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Introduction

Many ecological processes involve dynamic systems that often fluctuate on small time scales from days to hours or even minutes. In order to capture these changes, sampling and consequently measurement of these systems needs to occur at similarly small time scales. The issue faced by many researchers is the intensity of the sampling, in which many man-hours are dedicated to sampling at small time intervals over a period of days or even weeks.

In studies regarding phytoplankton growth rates in culture…

While there are existing systems available such as … and …, these commercial machines are often expensive, unwieldly, and not programmable to the exact needs of experiment. Other existing DIY solutions such as (Stephan jacquet) are outdated, given the availability of new technologies and cheaper components.

In this paper we document the process of building and testing a cheap easy to build tabletop automatic sampler alternative.

Problem statements

1. Samples to be collected at regular time intervals
2. Samples collected to be stored in a dark environment at 4 degrees celcius
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Sampler Design and Implementation

In order to accomplish these objectives, the sampler can be broken down into 4 main sub-systems that enable the automatic sampler to function.

*Sample Collection*

The first sub-system is the sample collection mechanism. This consists of a 3V peristaltic pump, 2\*4mm silicon tubing, and other basic materials such as silicon for water sealing and pneumatic valves to connect tubes.

*Sample Management System*

This was by far the most complicated subsystem as the design of this is based on a number of factors such as collection tube sizes available and the size of the metal container available. Essentially, the purpose of this system is to organize and manage the position of the collection tubes within the storage component of the machine. This was done by 3D printing a tube holding rack on which 10 tubes were placed (Figure 1). This rack is rotated below the output of the sample collection system by a XV DC motor. There is a larger flask to hold the waste sample generated by the purging of volumes between each sampling effort.

*Sample Storage Environment*

Proper storage of the samples after collection is critical to obtaining accurate results from the sampling. At 4 degrees celcius, samples can be kept for up to 10hrs with little noticeable changes in their xxx (cite vaulot). In order to maintain samples at 4 degrees in the dark, the storage environment occupied the largest portion of the entire sampler. It consists of a large Styrofoam box with a hole cut out at the base. Through this hole, a 180W peltier chip lies in contact with a metal pot. This pot serves as a water bath to ensure that the samples are immersed in a 4 degree celcius environment.