# Foam Filtration Summer 2014

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**Abstract**

The Summer 2014 Foam Filtration team will continuing to improve the water treatment system, aiming to send the progress so far to Honduras in July 2014. The goal of the summer is to verify the safety of the foam filter itself and to improve and evaluate the design of the filtration system for better performance and easiler fabrication and transportation. Keeping the core designs from Spring 2014 team, some modifications will be made. The foam filter will be tested in Honduras.

## Detailed Task List:

## 1 Foam Leaching - Ji Young Kim By:6/18/14

Review literature concerning harmful plastics leaching from the foam into the effluent. Also, contact manufacturers about the foam leaching.

## 2 Chemical Dose Controller -Skyler Erickson

### 2.1 Build and add the Linear Flow Orifice Meter (LFOM)

#### 2.1.1 Ask Casey how to build the LFOM

- linear relationship with the holes and flow velocities

#### 2.1.2 Integrate automated chemical dose controlled by the flow rate. By: 6/26/14 (progress report due today)

1. Make calculations to design LFOM
2. Find or purchase materials to build LFOM
3. Construct LFOM

## 2.2 Determining flow rates for the chemical dose controller based on turbidity and influent flow rate. By: 7/10/14

### 2.2.1 Determine flow rate to use to calculate head loss.

Look into the MathCAD file from Fall 2013

### 2.2.2 Find head loss through the CDC system.

**Expecting to find minimum 10 cm based on previous calculations.**

### 2.2.3 Compare the MathCAD formula and real measurement.

## 2.3 Integrate the LFOM intothe filter structure with a concise design. By: 6/26/14

working on it on the white board

Casey: lever arm (single-armed): 20 in

where would the mixing take place? drip it into the LFOM directly

requirement for controller? density? material - PVC? should be heavy enough to keep tension in the line. look for past report for CDC (depth of submergence)

## 2.4 Discuss venting the constant head tank with Casey. By: 6/18/14

## 2.5 Evaluate required PACl dosing for successful filter operation based on varied influent turbidities. 7/10/14

# 3 Compression System - Ethan Keller

## 3.1 Verify Clean Out Cycle (COC) efficiency. Done

### 3.1.1 Test siphon

The siphon system is already set up yesterday with Tim and Paul's help. Past semesters, while deciding among several design proposals, teams found siphon system would be unnecessary and difficult to implement for many of the designs because the siphon in the design was an unfixed tubing required the operators to put their hands into the dirty water. They decided to substitiute it with a side drain from the filter drum in the midheight of the uncompressed foam stack. However, we, Summer 2014 team, found the outlet was not effective enough for our pulley system design. The water level was keep changing. After adjusting the pulley system's height higher, we could compress the foam stack even lower, and, thus, we were not able to drain any of the dirty water containing all the filtered particles below the outlet built in spring 2014. So, in order to drain the dirty water right away for varying water level while compressing and draining is happening simultaneously, we found usage of siphon is inevitable. The siphon,

spin-welded on the upperside of the drum, is working well, draining the clean out water right away.

### 3.2 Propose alternative compression methods.By: 6/18/14 depending on their availability

#### 3.2.1 Considering light, compact, easy to use, alternative systems. Discuss on the ground issues with Antonio Elvir and Drew Hart.

Ask the settings– how does the water get to the tank (hose maybe)

### 3.3 Designing final compression system for the straight drum. 6/20/14

#### 3.3.1 It would be good to consult Paul and Tim about design and potential alternative compression methods (hydraulic compression methods).

#### 3.3.2 Decide on materials and compile final materials list

#### 3.3.3 Evaluate theoretical load strength of the designed system...(this would be good to do before you start thinking about alternatives so you'll have an idea of what is required to compress the foam) confirm this is adequate for sufficient compression

## 4 Experiment - Abby Brown By: After CDC testing, before sent to Honduras

### 4.1 Understand the relationship between turbidity and head loss.

#### 4.1.1 Measure head loss at 500 NTU raw water & head loss at breakthrough effluent turbidity

- look into MathCAD file from spring 2014 (under spring 2014 MathCAD files folder) & ppt's from CEE 4540 website (under summer 2014 reference folder)

**Here there could be more about reducing the headloss in the system or extending the length of the filter. (addressed in the Challenges document)**

## 5 Documentation By: after filter is sent to Honduras

### 5.1 Create a user guide

#### 5.1.1 Both construction and operation

## Literature Review

### Previous Semesters

### Chemical Leaching and Potential Risks

Polyurethane, the main component of the foam used for filtration, decomposes and emits toxic chemicals including () when it experiences heat above 250$^{o}$C. (Flexible Polyurethane Foam. 1998)

Thermal decomposition/rearrangement (+Burning/ smoking)
urea group decomposes the foam but not so significant
Flame Retardants :Polybrominated Diphenyl Ethers

# Introduction

We installed a siphon pipe for better draining for changing water level inside the drum during the compression for clean out cycle.

# Bibliography