Fall 2010 CDC Reflection Report 2

Chemical Dose Controller Reflection Report

Author: Eva J Romero Luna

AguaClara Reflection Report

Cornell University

School of Civil & Environmental Engineering

Ithaca, NY 14853-3501

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Abstract

After going over summer 2010 Chemical Dose Controller's (CDC) Design Guidelines and their suggestions as to what the CDC design should be upgraded to, the Fall 2010 team is looking at ways of implementing this design. As of now, the CDC group is working towards two immediate goals: 1) To introduce the upgraded design into the Design Tool and 2) To make a database of the materials and parts that would be required for such a design given plant flow ranges. Ultimately, we would like for the user of the Design Tool to input a plant flow rate and to obtain set of components and parameters needed for its Dose Controller.

Keywords : Non-linear Chemical Dose Controller, Float valve.

Introduction

Fall 2010 CDC Team has continued its work on scaling up and improving the current Non-Linear CDC design. Ideally, the final design will consist of 1) an apparatus that will permit easy access to the operator (i.e.: it won't stand on top of the entrance tank), 2) most of its components will be found locally and will not be expensive; 3) the apparatus will also be capable of controlling all chemical feeds to the plant. Past design suggestions have been reviewed by the Fall 2010 Team to determine the mechanics that would be required for its implementation as well as new design parameters. Ultimately, we would like for a user to be able to introduce the input parameters for the treatment plant (mainly flow rate) and for the Design Tool to output the design, other parameters and components needed to implement the design.

Following are important relationships between the input plant flow rate and other parameters in the plant that will need to be adjusted when scaling-up the plant and CDC design.

The input flow rate (Q_{plant}) directly affects the flow rate of the stock tank (Q_{stock}) , for any chemical concentration (C) by:

$$Q_{plant} * C_{plant} = Q_{stock} * C_{stock} \qquad (1)$$

As mentioned in the initial report, knowing the flow rate helps us controlled the head loss across the CDC apparatus. For the dosages we will then use the current non-linear relationship:

$$Q = K_{vc} * Area * \sqrt{2g\Delta H} \qquad (2)$$

Where Q = flow rate

K_{vc} = Vena Contracta coefficient.

H = Head loss

Area = area of orifice

Experimental Design

A design upgrade for the non-linear CDC was studied based on the suggestion from past research teams. An initial rough draft of the ultimate design was drawn (Fig. 1) to have a more precise idea of what we will be working towards (this figure is just a rough draft, dimensions will be determined later). Our team has also started researching on float valves for the float valves database, one of the output components of the system. As mentioned earlier, we would like for the Design Tool to output the design parameters and components depending on the input plant flow rate. Therefore, besides the apparatus design, our team has started working on databases for the different components required for the CDC. We are currently reviewing float valves from the manufacturer Kerick Valve (http://www.floatvalve.com/) and are recording the specifications pertinent to our design for each of the valves (i.e.: orifice diameter, flow rate ranges, maximum pressure tested, size).

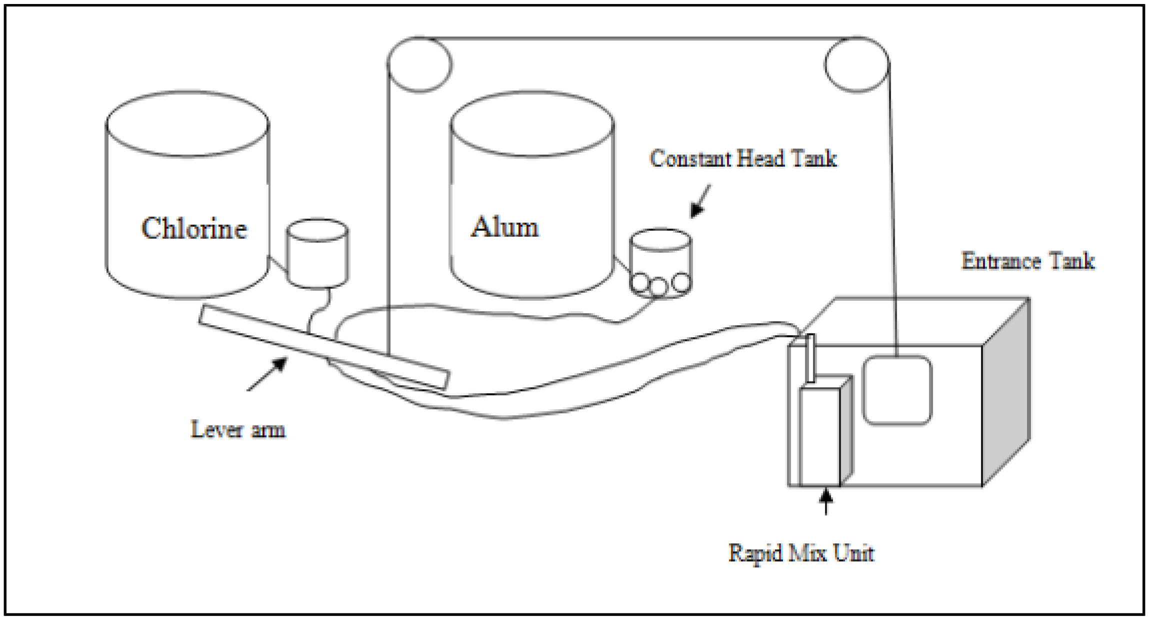

Figure 1 . Rough initial draft of upgraded Non-linear Chemical Dose Controller.

Future Work

Here are the immediate and long-term goals for the Fall 2010 CDC team:

1. Calculate parameters for upgraded design in conjunction with the Design Team.
2. Create databases for different components needed for the apparatus (float valve, tubing, orifices)
3. Construction material research:
   - Local frame material.
   - Establish compatibility between materials and chemicals used (alum, chlorine).