

# Coagulant Management

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## Abstract

Coagulants are an essential part of the water filtration plant as well as a significant operating cost. Therefore, it is very important that they be used as efficiently as possible. The coagulant management team ensures this by working with stock preparation, testing stock concentrations, dosing with the chemical dose controller, and experimenting with the injection of the coagulant into the raw water. Communication should be kept between this team and the plant operators to make sure that the progress of the team's work is headed in the right direction.

- Skills: Fluids, Fabrication, Plumbing Design, Process Controller

## 1 Coagulant Injector Fabrication

Previous coagulant injection methods have been used, but have experienced the following failure modes:

1. Low head loss in the delivery tube allows oscillation flow inside the delivery tube. This causes raw water to mix with coagulant inside the delivery tube, leading to coagulant precipitating on the delivery tube walls. The solution to this problem is to use a delivery tube with a smaller diameter or injection orifice as to provide sufficient head loss to prevent reverse flow.
2. Positioning the injection point at the wall is inefficient from a mixing standpoint and commonly leads to precipitation of coagulant on the walls of the rapid mix pipe. The solution is to inject the coagulant into the center of the flow.

The injection point should be easily serviced. Through Monroe's most recent design, this would entail an access pipe through which the delivery tube would enter the rapid mix pipe. The access pipe might be a thin PVC pipe sealed over a hole in the rapid mix pipe with silicon. The delivery tube should be easily removed by pulling it up out of the access pipe, yet it should only go half way down into the rapid mix pipe so that the coagulant will be injected into the center of the flow. This could be achieved by making the actual hole in the rapid mix pipe smaller than the access pipe and sealing a washer on the delivery tube so that it would

be caught by the hole in the rapid pipe and only allow part of the delivery tube to enter the rapid mix pipe. It is also essential that the delivery tube be rigid so that it doesn't bend with the flow. An orifice plate should be placed in front of the injection point to create a jet that will aid in mixing the coagulant with the water in the pipe. The orifice plate must also be removable so that any clogs can be removed.

## **2 Hydrometer**

A hydrometer must be purchased and sent to Honduras. A few glass hydrometers were purchased from McMaster Carr for lab testing. Unfortunately, one broke in the mail. Glass was originally chosen because of its low cost, but due to the fragility of the glass hydrometers, it is recommended that the team invest in plastic hydrometers. This one from Krackler Scientific Inc. appears to be a good option. Despite the greater cost, plastic hydrometers such as this are more likely to last and should be much easier to send to Honduras. The hydrometers purchased should have a specific gravity range from 1.200 to 1.420.

## **3 Stock Tank Centrifugal Pump Mixing System**

Detailed designs have been made of the centrifugal pump and fabrication on one has already begun. The team should continue working on this pump based on the specifications given in the design. The pump should then be tested for effectiveness and alterations to the design and the pump should be made accordingly.