



COMMERCIAL COAGULATION SYSTEMS

April 2000

Project Background

Coagulation is the process of adding chemicals to water to make dissolved and suspended particles bind together and form larger particles that will settle out of the water as *floc*. It is a safe and effective form of water treatment used by many cities to treat drinking water. Coagulation improves the quality of water by reducing the amount of:

- organic compounds
- iron and manganese
- colour
- suspended particles

Coagulation is usually used as a pre-treatment for domestic water; however, it may also be used to improve water for chemical spraying and livestock watering. Prairie Farm Rehabilitation Administration (PFRA) has investigated several methods for performing coagulation in a rural setting: dugout coagulation, coagulation cells and commercial coagulation systems.

The Floc System 100 has been identified by PFRA as a commercially available in-house coagulation system. The Floc System 100 is a newly developed, compact, commercial water treatment system that is well suited to treat the organic-rich water often found in dugouts, rivers or lakes.



This in-house coagulation system treats 360 L (80 Imp. gallons) of water every 4 hours.

PFRA evaluated the performance of the commercial coagulation system in order to identify its suitability for various agricultural sector applications.

Results of the project determined that commercial coagulation systems can provide a cost effective option for treatment of dugouts and other surface water sources.

Project Details

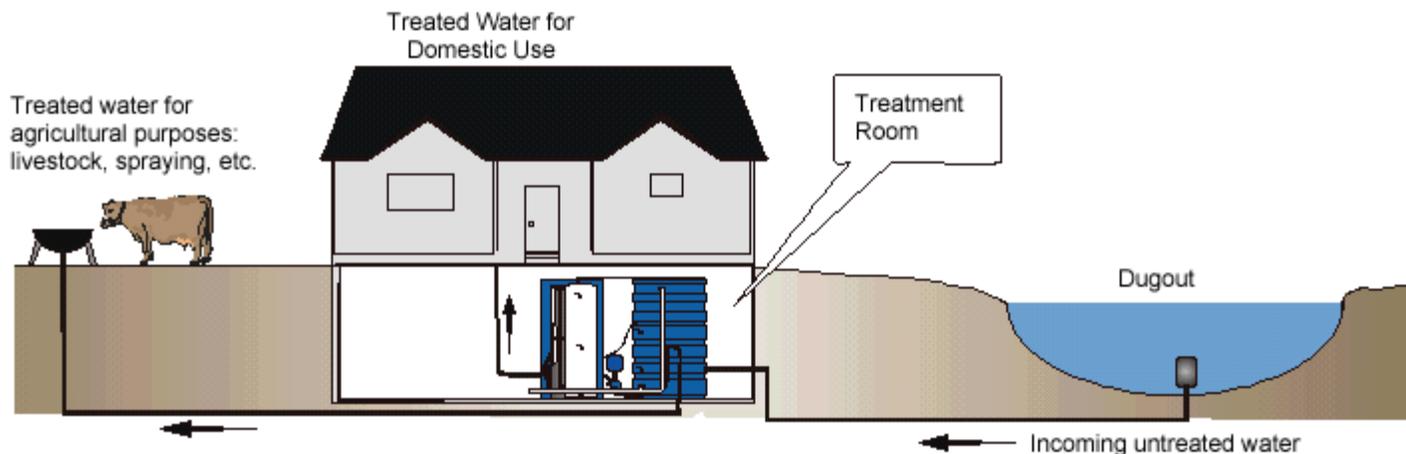
The evaluation of the commercial coagulation system was completed in the spring of 2000. In order to accurately assess the system and meet the objectives of the project, it was divided into four components:

1. Surveys of the three existing users of the system.
 - Users answered questions on operation, maintenance, advantages and limitations of the system
2. Performance monitoring of the three existing systems.
 - PFRA staff observed operation of the unit by the user
 - Samples of raw and treated water were analyzed
3. Performance monitoring of a system installed at a research farm near Melfort.
 - Four different types of water were chosen
 - During each season, water was hauled to the research farm and treated
 - Samples of raw and treated water were analyzed
4. Laboratory testing to compare three coagulant chemicals and determine optimum dosages.
 - Jar tests were performed on each of the four types of water during each season
 - Samples of raw and treated water were analyzed

Results

Results indicate that the commercial coagulation system can be used successfully in the agriculture sector. The system has been shown to remove up to 65 percent of dissolved organic carbon, up to 85 percent of colour, and up to 95 percent of turbidity. Post-treatment filtration should ensure that the aluminum residual remains below 0.2 mg/L.

The system is capable of effectively treating a variety of water



types. By varying the chemical dosage, the system can also cope with seasonal changes in water quality. The system does not work well on water with alkalinity greater than 200 mg/L.

When tests were done to compare three different coagulant chemicals, each of the chemicals performed similarly. However, the polyaluminum chloride currently being used with the system appears to be the best choice. Because this chemical is more forgiving than the other two chemicals, there is less chance of overdosing the water and rendering it unfit for consumption.

Coagulation alone is not enough to make water safe for drinking. Coagulation must be followed by additional treatment, such as disinfection or reverse osmosis if the water will be used for drinking. A granular activated carbon (GAC) filter should also be installed to ensure that all floc is removed from the water following coagulation. A GAC filter will also remove more dissolved organic carbon from the water. Each of the three existing systems monitored in this project had additional treatment following coagulation.

The in-house coagulation system evaluated by PFRA can store up to 1360 Litres (300 Imperial gallons) of treated water and can produce approximately 2300 Litres (500

Imperial gallons) per day. This volume of water is sufficient for domestic purposes. A larger commercial coagulation system is available that can treat water sufficient for livestock watering or chemical spraying.

This compact, commercial coagulation system gives rural users the opportunity to utilize coagulation as a pre-treatment technique for improving water quality. Coagulation is an effective method that is suitable for treating dugouts and other surface water sources. It is capable of producing high quality water for domestic purposes and with the addition of a reverse osmosis or disinfection system it can also produce water for drinking and cooking.

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