

OPERATORS FRIEND, STREAMING CURRENT DETECTOR



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ABSTRACT

The Innisfail Water Treatment Plant (WTP) is a conventional water treatment plant comprising chemical dosing, clarifiers, media filters, and disinfection before pumping to reservoirs and to the community.

The raw water is sourced from the Johnstone River and the raw water quality can vary, particularly in times of Rain events, Cyclones and flooding. Turbidities range from 2NTU in dry times and can increase up to ranges of 150, 300, 500 NTU and can last for a couple of weeks depending on the weather.

This puts extra strain on the treatment plant to continually provide good quality treated Potable water.

This paper covers the investigation into the use of a Streaming Current Detector on raw water that the plant draws from. It discusses the trial which confirmed the benefits of installing and outlines the cost savings in both chemical and labour resulting from this work.

1.0 INTRODUCTION

The Innisfail Water Treatment Plant was built in 1934, some upgrades made to the original plant in 1975, 1982 and 1993 to accommodate increased population in the town, but no major works have been undertaken until last year with another upgrade to plant which incorporates a new process. (Media Strained Upflow Clarifier, Media Filters, a new 4.5ML Treated Water Reservoir) commissioning 2013.

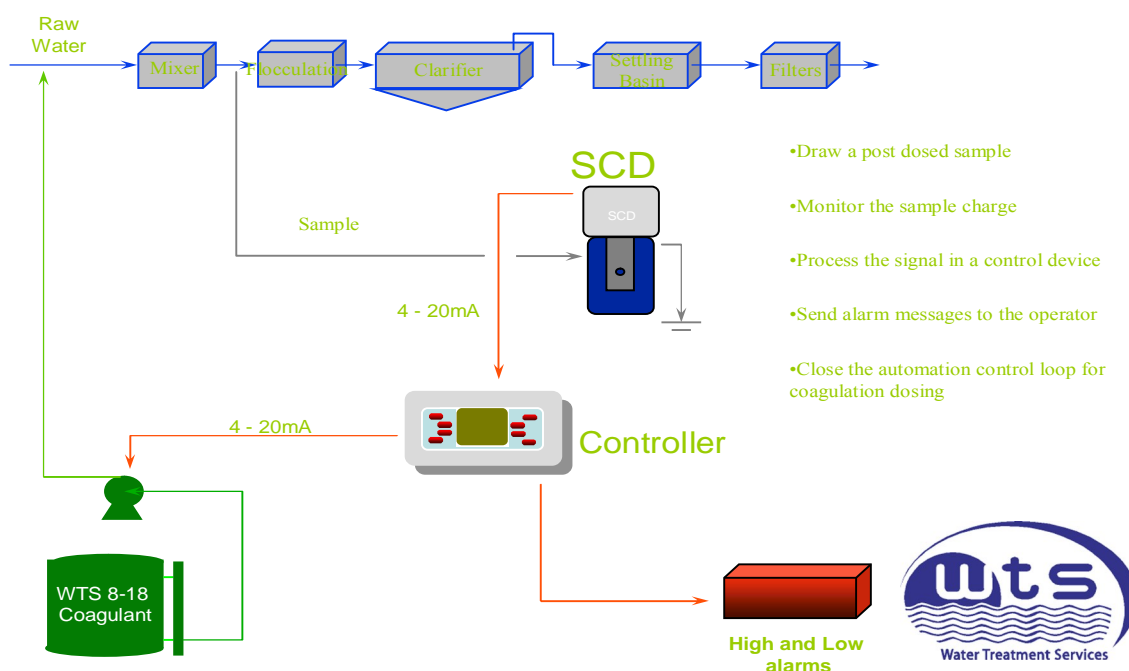


Figure 1: Basic Plant Layout

The Innisfail Water Treatment Plant (WTP) treats water from the Johnstone River and supplies it to the Innisfail Township as well as surrounding suburbs. The plant treats a population of about 15500.

The Water Treatment Plant consists of a Flash mixing tank, 4 x cell upflow Candy Patterson Clarifiers, 3 x multi media Filters – (Gravel, Sand, and Anthracite Coal), Sodium Hypochlorite for disinfection.

The chemical part of the treatment process consists of main Coagulant WTS 8-88S Treats High Turbidity ranges 100NTU – 500+NTU and WTS 8-18S treat Low Turbidity ranges 1NTU – 100NTU. Main Coagulant is a blend made up of Aluminium Chlorohydrate and polyDADMAC. The coagulant is injected into the main at the start of the plant (better mixing)

Also a filter-aid WTS 8-CC20H polyDADMAC is used to charge the filter beds.

The chemical part of the process changed over from powdered chemicals (25Kg bag alum and 25K Bag Dense Soda Ash) back in 2001 because of Operational issues.

The coagulant is mixed in a 10,000 litre tank at a 2% solution and is filled when the level is at the 5000 litre mark. 100 litres of coagulant is mixed with 5000 litres of water. During periods of low turbidity the amount of the coagulant solution dosed is 0.05 ml/L. During periods of high turbidity the dose can increase to 6.0 ml/L and this may require the operator to refill the tank every day.

2.0 OPERATING ISSUES BEFORE INTRODUCTION OF THE STREAMING CURRENT DETECTOR

The Innisfail WTP operates manually; the plant has a treated set point from the filters of 3NTU. In rain events when turbidity increases above 3NTU the plant shuts down and calls an operator out to address the problem.

The operator at arriving at the plant sets the Coagulant pump to a required dose from a guide that was setup to assist when Turbidities increased.

The operator utilizes 2 filters to waste water from the clarifiers to the sludge ponds. Jar testing is then started to confirm the correct dose rate to clean the water up in the clarifiers before sending the water to the filters to be backwashed and pumped from the clear water basin to the main reservoir.

Jar testing normally takes approximately 30 minutes to complete and at times during fluctuating turbidity several jar tests may be required during a 24 hour period. This requires the operator to be available constantly during this period and considering the lack of trained competent operators this puts pressure on the person that is operating the WTP.

The Innisfail water reticulation only has approximately 24 hours supply of water available in case of problems associated with any breakdowns or process problems so maintaining constant plant operation is a priority.

2.1 Issues:

- The time it takes to clean the clarifiers is approximately 4 hours
- Main reservoir possibly running out of water
- Fluctuating Turbidities – problems with chemical dosing
- Overdosing or under dosing with chemicals when turbidity decreases or increases.

“In other words chasing a dog’s tail”
Very frustrating for the Operator



3.0 STREAMING CURRENT DETECTOR (Lechintech SCD 3000)

A device for detecting and monitoring the charge condition of finely divided solid charged particles in a fluid-flow is so devised as to accept the continuous and full volumetric flow of the fluid and to automatically and repeatedly sample and measure the charge condition. The full flow is accommodated without restriction in a passageway which intersects a bore wherein a streaming current detector (SCD), located below the passageway, is caused to sample and measure the charged-particle content of the flow; and at a passageway location downstream from the point of cyclical sampling a head-creating formation assures that the fluid level will be raised to maintain a filled condition of the sampling bore. The device is further illustratively disclosed in use in a fluid-treatment system, wherein the SCD produces a signal to control flocculant added to the full flow of the fluid.



Figure 1: *Lechintech SCD 3000 meter*

The Streaming Current Detector is used to measure coagulated particle stability for the feedback control of coagulant dosing.

The charge of the raw water entering the plant is normally about -5 and coagulant is dosed into the raw water main several metres before the flash mixer. The feedback water pipe is

a 20mm poly pipe that takes the dosed water from the flash mixer chamber back to the Streaming Current Detector this is gravity fed and during the first week of operation it was necessary to lower the suction point far enough below the water surface to prevent the siphon flow from being interrupted when the plant is stopped.

The benefit of the Streaming Current Detector is its ability to automatically control the rate of coagulant added to the raw water to provide the best possible flocculation. After an initial trial period and then from trials during changes of turbidity it was found that a Set Point of -1.5 works best in the Innisfail Water Treatment Plant.

4.0 STREAMING CURRENT TRIAL

The trial started back in 2008 – 2009 in conjunction with the CCRC's chemical supplier Mr John Hallows, WTS – Water Treatment Services, Townsville.

OBJECTIVE:

- Streaming Current linked to Coagulant dose pump to control turbidity
- Quality of Treated water to the community at a consistent rate
- Decrease in the cost of chemical
- Ease of Operating the Innisfail plant for the operators in weather events
- Eliminating the need for the operator to be called out regarding turbidity issues
- Optimising coagulant dosing
- To give the operator more time to complete other tasks

5.0 CONCLUSION

The introduction and use of the Streaming Current Detector has been positive with very few issues in its initial and ongoing operation.

It has exceeded the expectations of the operators and has met all of the above objectives. It requires very little maintenance and only requires calibrating once per month.

The average amount of chemical saved is approximately 200 litres per month which equates to approximately \$9000 per annum.

The saving in overtime payments is approximately \$5000 per annum.

The operator gets more sleep.

6.0 ACKNOWLEDGMENTS

Mr John Hallows (Water Treatment Services) for his initial and ongoing service.

Cassowary Coast Regional Council, Water and Sewerage Treatment Personnel
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