

Delta Spirit Lodge

Kitimat, BC, April, 2014

A water treatment plant was required to supply potable water to a floating hotel docked in Kitimat. BI Pure Water was contracted to supply that system. The big challenge was the need for delivery in only four weeks. It was delivered on time. Construction workers in northern B.C. will make themselves at home on the cruise ship as they complete \$3.3 billion in

upgrades to an aluminum smelter. The Silja Festival, which was built by Estonian company Tallink, is a ship that once carried passengers across the Baltic Sea from Stockholm, Sweden to Riga, Latvia.



The upgraded Delta Spirit Lodge provides luxury temporary accommodation, to relieve the local housing shortage in Kitimat for construction workers

The 171-metre ship leased by Bridgemans Services and the Haisla Nation to provide temporary housing as Rio Tinto's current work camp is already full and there's a shortage of rental homes in Kitimat. The ship will be re-branded as the Delta Spirit Lodge while it houses the Rio Tinto Alcan workers for nine months. The community is booming with growth in resource industries, and the population could explode if several proposed liquefied natural gas projects are approved.

A local stream will provide 96.4 Liters/min of raw water for the treatment plant. The WTP has systems for media filtration, ultra-violet disinfection and chlorination.

This BIPW plant has been designed to filter and disinfect creek water in order to supply potable water meeting Canadian standards to the Kitimat floating hotel. In more detail, the truckfill plant utilizes:

- Entrapment of larger particles and reduction of turbidity by a basket strainer followed by two parallel NextSand media filters.
- pH reduction from 9.0 - 9.8 to around 7 by addition of sulfuric acid.
- 5-micron cartridge filter for removal of finer particles.
- 1-micron absolute cartridge filters (NSF-certified for 3-log [99.9 %] removal of Cryptosporidium and Giardia cysts).
- Further reduction of cysts, pathogenic bacteria and viruses by use of an ultraviolet microbiological disinfection system, meeting the requirements of the NSF 55 Class A protocol.

- Further removal/inactivation of viruses and bacteria by injection of chlorine in order to maintain a minimum chlorine residual of 0.2 mg/L, corresponding to 0.2 parts per million (ppm), in the distribution system.



A view of the chlorination system (left), media filters and control panel

Raw water is pumped at 96.4 Liters/min to a basket strainer prior to pH adjustment by the sulfuric acid dosing system. The raw water pump's start/stop signal is based on the withdrawal of treated water from the tank. When the water falls below a predetermined level, as sensed by a level switch, the raw water pump is started.

After the strainer, the water passes through two parallel NextSand media filters for removal of finer particles and turbidity reduction. Particles larger than 5 micron are then separated when the water passes through the 5-micron filter. Smaller particles and micro-organisms such as Cryptosporidium and Giardia are removed by the subsequent 1-micron absolute cartridge filter.

The filters are followed by the two parallel ultraviolet disinfection units, applying UV radiation to the filtered water to reduce biological contaminants. These UV units are preceded by solenoid valves allowing the units to shut down when not in use to conserve energy and prevent water bypass. The operation is monitored by a controller on the units.

The water next moves to the chlorination stage where a chlorine solution is injected from a sodium hypochlorite system. A static mixer is used to make the water-chlorine solution homogeneously mixed. The chlorinated water moves to the treated water tank. The chlorine level is monitored by chlorine analyzer. Chlorine target at this stage should be close to 1 mg/L, requiring a flow of 0.76 mL/min from the dosing pump. From the treated water tank, the water is pumped to the 800,000 Liter reservoir on the ship. If the demand is low, there is a risk that the Chlorine residual has dropped below the critical level of 0.2 mg/L. It is imperative that the residual at the outlet of the ship reservoir is regularly checked with a hand-held analyzer.

If below 0.2 mg/L, sodium hypochlorite must be added directly to the reservoir to increase the Chlorine level.

Prior to entering the treated water tank, a sodium carbonate injection system can be used to restore the pH to the target of 7.5 as measured by a sensor and transmitted to the PLC.

The plant operation can be manual or fully automatic, in the latter case controlled by the PLC based on HMI touch screen input.



Dual ultraviolet disinfection units



Dual booster pumps

CASE STUDY

The control system provides alarm reporting and data monitoring as well as trending of important parameters such as chlorine level, pressure differentials, pump speeds, flow, alarms and outputs from the turbidity and chlorine analyzer instruments. This information is available on remote computer screens in to assist operators. Ongoing training is the result, with BI Pure staff available to help the operator diagnose problems in real time.

BI Pure Water (BIPW) specializes in reviewing water quality test results and prescribing the most cost-effective solution. BIPW engineers pilot, design, manufacture, install, start-up and commission package water treatment plants. The operators are then trained and the plants can be serviced on a regular basis. BIPW provides small and medium-sized water treatment plants for federal, provincial and municipal government, industry, remote camps, private water systems, resorts and First Nations communities.

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