Checking the secondary clarifier sludge blanket depth. Photo: Mike Crane

INSIDE WHISTLER'S AWARD WINNING WWTP

By David Sivyer and Trish Browning

Since the improvements for the 2010 Olympics, The Resort Municipality of Whistler's wastewater treatment facilities are among the most advanced in Canada. Most noteworthy is that ambient heat extracted from treated effluent is provided to Cheakamus Crossing neighbourhood, reducing its greenhouse gas emissions over 90 percent from traditional methods.

The Whistler WWTP is a Level IV facility that services a population of 10,500 residents, and over two million visitors annually. The plant receives average daily flows of approximately 14,000 cubic metres per day in winter and approximately 11,000 in summer.

Liquid Flow

The wastewater enters the plant and enters the influent pump station, where it is pumped through three 80 HP influent pumps to the headworks. Two mechanical fine screens and a bar screen remove

The plant, located near the Cheakamus Crossing neighbourhood, is a tertiary treatment system, meaning it uses three levels of treatment for the wastewater, and includes a sophisticated odour-control system.

HISTORY

The **Resort Municipality of Whistler** wastewater treatment improvements were first constructed in 1976. By 1984, more stringent provincial standards and increased flow demanded upgrading of the existing liquid handling facilities. In the 1990's due to the explosion of growth in the Whistler area (the highest in Canada in recent census), plant expansion was again mandated to ensure the discharge standards were met.

After an expansion in 1997, the Whistler Wastewater Treatment Plant was equipped with an influent pumping station, headworks, and primary and secondary clarification systems capable of 52,000 bed unit capacity. The biological and solids handling systems were capable of 42,000 bed unit capacity.

The most recent expansion was completed in time for Whistler to host the 2010 Olympics. That expansion saw the addition of two new fine screens, two modified Johannesburg bioreactor trains, a dissolved air floatation system, an anaerobic fermenter, a soda ash system, a fourth secondary clarifier, a UV disinfection system, two centrifuges, an activated carbon odor removal system, a brand new control building and analytical lab, and a an upgraded SCADA system.

At that time there was also a **District Energy System** added to heat a nearby housing development of over 2000 people with heat extracted from the final effluent.

rags, plastics and other debris, and two grit conveyers remove grit that settles out.

The water then flows into the **primary clarifiers**, where the water slows down and the heavy organic materials settle out and are removed. This process removes up to 60% of the organic matter from the wastewater, and the material is raked into sumps and pumped out with sludge pumps. The primary effluent then flows into the bioreactors.

In the bioreactors, microorganisms use the nutrients and carbon to grow and multiply, creating a dense biomass. The bioreactors are constructed in a Modified Johannesburg Process configuration consisting of seven cells; a pre-anoxic, anaerobic, main anoxic, and four aerated cells. This process configuration allows for the simultaneous removal of carbon, phosphorous and nitrogen by the biomass, through nitrification, denitrification, and biological phosphorous removal. Each cell has a controlled amount of oxygen, which dictates what biological functions the selected bacteria will carry out.

After passing through the bioreactors, a fraction of the wastewater and biomass, called waste activated sludge, is wasted to the dissolved air floatation system to separate the solids. The rest of the water flows into the secondary clarifiers.

There are four clarifiers; two capable of handling 5 MLD each, and two capable of handling 10 MLD each. In the secondary clarifiers, the process flow is slowed down enough so the biomass created in the bioreactor can settle out, and be pumped back to the bioreactor as return activated sludge. The clear supernatant then flows over the weirs, and to the UV disinfection stage.

The UV system consists of two banks of 18 ultraviolet bulbs each. The bulbs are submersed in the wastewater channel, and the UV light sterilizes any bacteria remaining in the wastewater. This water is then discharged into the Cheakamus River as final effluent.

Solids Flow

The Whistler WWTP uses a dissolved air flotation system, an anaerobic fermenter, and two state of the art centrifuges to separate the solids from the water, breakdown, and dewater the solids.

The primary sludge is pumped over to a storage tank to be dewatered. The waste activated sludge, or WAS, from the bioreactors is put through the dissolved air floatation system, or DAF. Polymer is introduced to the liquid stream, and the liquid flows through the chamber, while having dissolved air bubbled through it. This thickens the WAS to 3-5 % solids, which are skimmed from the top of the system. The subnatant is returned to headworks for retreatment.

The primary sludge and thickened waste activated sludge, or TWAS, are mixed together and put through the centrifuges for dewatering. Polymer is added before the stream enters the centrifuges, where it is spun at a high rate of speed, separating the water and the solids. The liquid removed is returned to headworks for retreatment; the solids are loaded by an automatic conveyor into a bin, and eventually composted for topsoil production. The solids content of the biosolids produced is 24-26% on average.

District Energy System

The District Energy System (DES) is a system that extracts low-temperature ambient heat from the Whistler WWTP treated effluent and provides it to the approximately 2000 users in the neighborhood of Cheakamus Crossing. Its low-temperature

Primary clarification. Photo: Mike Crane

Solids dewatering. Photo: Mike Crane

Cleaning the **District Energy System** heat exchanger strainers. Photo: Mike Crane

Secondary clarification overview. Photo: Trish Browning

design makes it flexible enough to provide heating to users during the winter months, as well as nominal cooling during the summer months.

A percentage of the WWTP treated effluent is pumped across two heat exchangers which allow for the transfer of latent heat to the water flowing through the closed District Energy System Loop. The DES Loop water is then pumped to the buildings in Cheakamus Crossing, where individual heat pumps in each building use the energy from the DES Loop to heat radiant floors as well as domestic hot water. The "used" water returns to the DES Loop after passing through the heat pumps, and is returned to the DES plant at the WWTP to be reheated and pumped back to the village.