Making the Grade

THE CITY OF ANACORTES TRANSITIONED FROM TWO PRIMARY PLANTS TO A NEW SECONDARY PLANT, MEETING PERMIT SPECIFICATIONS AND WINNING SIX AWARDS

By Truda Wilham

WHEN THE REQUIREMENT FOR SECONDARY TREATMENT WENT INTO EFFECT IN 1992, primary treatment plants in Anacortes, Wash., could not meet the permit limits. Just three operators ran the two plants, one built in 1951 and a smaller one built in the 1960s. In 1992, Anacortes upgraded to secondary treatment with a single plant to treat the entire flow. The city also built three new pump stations to bring wastewater to the plant, and added a few more pump stations as the city grew.

Today, the plant has nine operators, and the collection system has 23 pump stations. The plant easily meets its CDB, TSS and residual chlorine specifications.

The plant was initially permitted for an average daily flow of 5.2 mgd; a new permit in 2005 authorized 4.5 mgd. The average daily flow is 2.0 mgd.

Although there is more equipment to maintain now, there are more operators to do the work. “The operators transitioned from two very old primary plants to a new process with a modern control system,” says plant manager Jon Franz, who has been at the facility for 17 years and holds Group III wastewater and incinerator operator certification.

Most of the operators were hired during the last six months of construction. All were able to see the plant equipment as it was installed. Classroom and hands-on training from design engineer CH2M HILL helped the operators come up to speed, and the plant has since won six Outstanding Wastewater Treatment Plant awards from the Washington Department of Ecology (DOE) for 100 percent compliance.

BEABER PLANT

Situated on Fidalgo Island, between Seattle and Vancouver, B.C., Anacortes has a substantial tourist industry. “People come here for the beautiful scenery, the summer festivals, and boating and fishing. so we see a bump in the amount of waste we treat during the summer months,” says Franz. Plant loading may increase from 2,600 pounds per day of BOD in winter to 3,500 pounds in summer.
The seasonal population doesn’t stress the plant, but winter rains can cause inflow and infiltration (I&I) issues. “During heavy rainfall, the plant can pump 10 mgd, which is the maximum capacity, for hours, if not days,” says Franz. “We’ve focused our efforts to reduce inflow on identifiable direct connections, and infiltration reduction in particular drainage basins.”

The new plant meets the more stringent permit levels for CBOD (25 mg/l), SS (30 mg/l), and residual chlorine. “With the old plant, the CBOD and SS removal wasn’t very good,” says Franz. “With the new plant, our annual average CBOD is 6.2 and SS is 9.4. We didn’t used to have chlorine limits, but now our monthly residual chlorine limit is 189 micrograms per liter. At a monthly average of 9, we easily meet that.”

Two influent screw pumps (Lakeside Equipment) lift sewage from 13 feet below grade to 12 feet above grade. The wastewater flows through three bar screens (FMG), and the flow is measured in Farshall flumes before traveling to grit removal and two primary clarifiers (ThyssenKrupp).

EXPERIENCED TEAM

The Anacortes Westwater Treatment Plant is staffed 10 hours a day, seven days a week. A sophisticated SCADA system alerts the operator on call to any problems.

“We do most of our own design work, including determining the force main size and pump size,” says John Franz, plant manager. “This has led to a dramatic improvement in reliability. Well-designed pump stations don’t break down or chew up impellers and seals.

“Since we’re considered a major discharger to Puget Sound, we test daily for temperature, pH, dissolved oxygen, TSS, chlorine residuals and ammonia. We test CBOD and fecal coliform four times a week, and BOD once a week.” Tests are done on thickened and dried sludge every day the incinerator is run.

The operators work in three rotating three-person shifts. Each shift works a 10-hour day. The team members besides Franz are:

- Sylvia Cooper, secretary I, four years at the plant
- Steve Doehl, plant supervisor, maintenance, Group III certified, four years
- Becky Fox, plant supervisor, lab, Group III, 19 years
- Bob Hendrix, plant supervisor, operations, Group III and incinerator certified, 19 years
- Wayne Davis, operator, Group III and incinerator certified, 19 years
- Odilon Flores Jr., operator, Group IV and incinerator certified, 12 years
- Katy Wynn, operator, Group II, one year
- Van Dean Johnson, operator, Group III and incinerator certified, 16 years
- Adam Veal, operator, Group III, two years
- Harry Whyte, operator, Group III and incinerator certified, 12 years
- Alan Bower, operator, Group III and incinerator certified, 19 years
- Allen Lindbo, operator, Group III and incinerator certified, 19 years
- Lou Zurcher, operator, Group III and incinerator certified, 19 years
"The operators have been very proactive in implementing new guidelines and taking pride in running the incinerator with less and less fuel. The changes really start with understanding how to run the activated sludge process to produce sludge that is conducive to good dewatering."

JOHN FRANZ

Secondary treatment is provided by conventional plug-flow activated sludge followed by two Envirex clarifiers (Siemens). Aeration is provided by two 150 hp blowers (Hoffman & Linson) and one 75 hp hybrid blower (Aerzen), along with Sanitaire (Xylem) diffusers in one basin and AeroSTRIp (Ovivo) fine-bubble diffusers in the other.

The waste solids are sent to a gravity thickener, and the thickened material is conditioned with polymer and dewatered with a belt filter press. The solids are sent to a Zimpro (Siemens) incinerator, and the ash is dewatered on a vacuum filter before landfilling. The plant is controlled by Allen-Bradley (Rockwell Automation) programmable logic controllers and a SCADA system with Rockwell software.

STILL IMPROVING

The plant has seen some upgrades since it was built. Disinfection changed from gas-phase chlorine to sodium hypochlorite with sodium bisulfite decolorization in 1999. Changes were also made to solids conditioning and dewatering to improve efficiency and reduce incinerator auxiliary fuel use. "We've done as much as we can to keep the 20-year-old plant operating as efficiently as possible," says Franz.

Operators were trained on the new equipment once the plant went online. "Besides training from GHM HILL, we contacted one of the best trainers around, Paul Klopping (of Callan and Brooks in Corvallis, Or.), who is an expert on activated sludge plants, and asked him to train our operators," Franz says.

Klopping has trained operators at the plant and at regional training sessions held throughout the Pacific Northwest. Training classes are scheduled every year to keep operators up to date on technologies and to maintain their certifications.

"With today's tight budgets, training is almost always provided in-house with trainers brought in, so that all operators can benefit from the class," says Franz. "This also allows as much one-on-one, hands-on training as possible, at a lower cost than traveling to a seminar."

Even with the excellent training, operators found the plant's odor-control system challenging. The plant's three packed scrubbing towers formerly used hydrogen peroxide as an oxidant, but when that proved ineffective, operators switched to chlorine.

"The chlorine system had to be retrofitted in, and we also improved the controls for the odor-control system," says Franz. "But before we were able to make the system work, there were many difficult months with unhappy neighbors."

About the same time, the city started up three new pump stations. "One of the force mains is about two miles long, and the time the wastewater spends in the force main also creates odor problems," says Franz. "It took us a while to learn how to control the odors both at the plant and the pump stations."

OPERATING CHALLENGES

Although the plant has seen some issues with industrial wastewater, it has won the DOE awards in 1996, 1997, 2001, 2002, 2008 and 2009 for full
City of Anacortes Wastewater Treatment Plant
PERMIT AND PERFORMANCE (monthly averages)

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<th>PERMIT</th>
<th>EFFLUENT</th>
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<tr>
<td>CBOD₅</td>
<td>25 mg/l</td>
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<td>TSS</td>
<td>30 mg/l</td>
<td>9.4 mg/l</td>
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<td>Fecal coliform</td>
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<td>pH</td>
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<tr>
<td>Total residual chlorine</td>
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Meanwhile, operating the plant itself takes a great deal of communication. “We talk through everything we do,” says Franz. “Before we do a project, we get operator input and incorporate their suggestions. First thing every day, I meet with the staff to discuss projects and any issues.”

What’s unique about the Anacortes team is versatility, says Franz: “Everyone does everything. Operators rotate through the various job responsibilities, including the lab and operating the incinerator. We have upgraded the pump stations up to and including complete pump station replacements, removing the wet well and force main almost entirely with just our operating staff.”

ENERGY EFFICIENCY

The plant team has been working on energy efficiency upgrades to reduce costs. “We will save $30,000 in annual electricity costs with the current process aeration system upgrade, which includes a new blower and diffusers, and by providing channel aeration with excess air from the process blowers,” says Franz.

The plant incinerates its biosolids and since 2007 the staff has been working to reduce the use of diesel fuel. The incinerator is permitted by the Northwest Clean Air Agency, and the plant received the Agency’s Partners for Clean Air Platinum Award in 2010 and the Gold Award in 2011.

The mayor of Anacortes and the public works director presented the plant with an award of excellence in March 2010 for outstanding efforts to

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save energy and costs by reducing incinerator diesel fuel consumption, which dropped from 2,850 gallons per month in January 2006 to 310 gallons in January 2011. The savings were achieved mostly through operational changes.

“The operators have been very proactive in implementing new guidelines and taking pride in running the incinerator with less and less fuel,” says Franz. “The changes really start with understanding how to run the activated sludge process to produce sludge that is conducive to good dewatering.”

Operators discovered that making some operational changes to the gravity thickeners helped produce a drier material. They experimented with polymers and ultimately changed to a new polymer, adjusted polymer handling and application, and experimented with polymer/sludge mixers.

They also changed the way the incinerator is operated. “Anacortes is a relatively small community, so the incinerator is shut down every day,” says Franz. “We implemented operational changes for startup and shutdown and also made adjustments to how the incinerator is operated while it is actually
Plant operator Wayne Davis services a dissolved oxygen probe in the aeration basin.

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burning material. It took all these things to accomplish the remarkable reduction in fuel use.

The reduction in diesel fuel use also contributed to a decrease in CO2 emissions, from a high of 78 tons in January 2008 to about 43 tons in January 2011.

LOOKING AHEAD

The plant may need to upgrade to future regulations. “There is pressure to improve the ecosystem of Puget Sound, the receiving water for our effluent,” says Franz. “I suspect the first step will be nitrogen removal. We have room on our property to add these processes if we have to.” Until then, the plant is in fine shape.

In his spare time, Franz supports wastewater treatment education. He is a guest speaker at the Anacortes High School advanced placement environmental science class. “The teacher noticed that the students were missing the wastewater questions on a standardized test, so I started speaking in the classroom, and then they would tour the plant,” Franz says.

He also advises the students on what it takes to succeed in the working world. “Sometimes high school seniors will ask how I got my job,” he says. “I tell them to get their feet in the door, work hard, and make sure they’re valuable employees.”

With 30 years in the water and wastewater business, Franz started out with the City of Anacortes painting fire hydrants. He worked as a water plant operator for three years and then transferred to the wastewater plant, working up from operator to manager.

Franz offers some advice for other operators and managers: “Evaluate your system and make sure you’re working on the most important things. But don’t be afraid to fix things that don’t work. Get a plan together and do it.”