“Most people think of sewage as a turd on a beach blanket with a Mai Tai, floating down toward the treatment plant,” says Lynn Mueller. “I think of it as a tremendous opportunity.”

Mueller is an industry veteran, the former president of Waterfurnace Canada Inc., who has overseen more than one million feet of drilling on geothermal projects, from the Shangri La Hotel to heritage homes in downtown Vancouver. But he is now heading in a different direction. He’s decided that the future is in wastewater.

“People in North America each use an average of about 100 gallons of water a day for showers, cooking, cleaning, laundry and toilets,” says Mueller. “One day I started thinking about how I pay about $20 a day to heat water and then watch the energy swirl down the drain. That’s perfectly good heat. That’s when I decided to take the world sewage tour.”

In 2010 he sold his geothermal business and started travelling through France, Norway, Sweden, China and elsewhere, touring wastewater heat recapture facilities. Afterwards, he designed his own recovery technology and opened a company to sell, install and service the “SHARC” system in some new markets. Since then his company, International Wastewater Systems of Burnaby, B.C., has completed a handful of installations and has about 30 projects under development in North America, the UK and Australia.

Wastewater heat recovery at the municipal level with large-scale district energy plants is also growing, as discussed later in this article.

Maintenance critical

Mueller’s system uses direct heat exchange with filtered, but otherwise untreated, wastewater with a plate and frame heat exchanger. It employs a “clog proof” filtration system, described as trouble-free, but not maintenance free.

The company will only sell the system accompanied by a maintenance contract, because it needs to be checked quarterly and opened up annually for servicing. It is building a network of certified dealers who must be properly trained and must commit to being associated with each installation for the life of the unit, of about 40 years.

“With geothermal I never knew for sure how well the entire system was performing and there was no one accountable for long-term operation supervision… Now
we have a continuing flow of data. And there is a lot less costly digging, “ says Mueller.

The control system monitors amperage, temperature and pressure; and notifies the dealer and the Building Management System if anything goes awry. In most cases a simple back flush can prevent downtime. The service plan for annual checkups is clever and efficient, with a hook on the ceiling to lift the top off the unit, a quick change-out of internal parts which can be refurbished, and a high speed fan to blow out odour during servicing, as part of the system package.

**Hold your nose!**

Except during service calls, there is no odour. It’s a closed loop system. Mueller knew that odour would be a concern in North America, despite the fact that it seemed less important with some of the overseas operations he reviewed.

The system is usually combined with natural gas boilers, but the recaptured heat provides an impressive share of the load and significant savings for the owner. In one project half the building heat is provided for 172 residential suites.

In another 65-suite townhouse project, two years of data showed that the heat pumps used an average of 81.03 kWh per day, pumps 10.08 kWh per day, and boiler top-up 114.64 kWh.

By comparison, Stantec Engineering reported that a total of 829.86 kWh would be the average usage per day of domestic hot water heating if conventional 90 percent efficient equipment had been used. In other words, they are saving 75 percent. Mueller says the payback on a 300-unit condo development would be 4-7 years, depending on gas and electric rates. In a hospital it could be as low as 2-3 years.

For the smaller townhouse project mentioned, two FHP water-to-water heat pumps extract heat from the wastewater leaving the building, then preheat incoming DHW to 52°C (125°F) and store 480 gallons in storage tanks. This flows as needed into two booster tanks that are heated to 60°C (140°F) by natural gas. Meters and sensors monitor everything.

**Municipal district heating**

While Mueller’s system is being used in multi-unit residential projects, hospitals, and office buildings; wastewater heat recovery is also generating interest among municipal engineers.

In January, ASHRAE recognized the City of Vancouver and Cameron Lowry, engineer and industrial markets leader for Trane Canada, for an innovative district heating plant based on wastewater heat recovery, with the Milton W. Garland Commemorative Refrigeration Award for Project Excellence.

The South East False Creek (SEFC) Energy Centre was built to heat the Olympic Village in Vancouver and two other buildings, totaling about 140,000 square metres (1.5 million sq. ft.)

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“Since then we’ve expanded to 3.5 million square feet,” says Chris Baber, manager of the ‘Neighborhood Energy Unit.’ In 2012, a heat pump system measuring about 13x5 metres provided about one megawatt of power; equivalent to 78 percent of the annual space heating and domestic water heating needs of the SEFC neighborhood. It reduced greenhouse gas emissions by more than 2000 tons. “We are forecasting a total of 7.2 million square feet by 2022 with the same plant,” he reported.

While this project was being completed, Plumbing & HVAC reported another Olympic wastewater energy recovery system built in Whistler for the training centre and an athletes’ village for 2,200 people. In that system wastewater heat recapture provides 80 percent of heating in winter.

With sewage being 18 to 20°C it doesn’t make sense to burn natural gas for most of our heating load,” says Lowry. “Why not take advantage of what we already know. The plant is something like a big refrigerator…Still, there were some challenges and we had to do some testing on-site.” Lowry and Trane custom-designed the project with help from Donald Hay of Tecnología en Sistemas de Refrigeración S.A. de C.V. in Mexico.

They used a positive displacement screw compressor, innovating for the extreme conditions demanded by the project, with a cast steel housing, to permit the re-rating of the compressor to 500 PSIG instead of the standard 350 PSIG. They made several modifications to the balance piston, oil flow, and used additional heat exchangers to increase the design oil temperature from 54°C to 60°C. They also created a double contained oil system to eliminate the risk of cross contamination.

B.C. at the forefront

“It’s great that ASHRAE also named Vancouver with the award because it required a bit of risk-taking and vision for everyone concerned,” says Lowry. “The City is a good partner with the resources to build, own, and operate the plant as a utility.” Lowry, Baber and Mueller all told Plumbing & HVAC that wastewater recapture is being seriously reviewed worldwide for district plants and development projects providing space heating, DHW and cooling. They all agreed that British Columbia is among the leading jurisdictions in terms of installed systems and expertise.

Reporting on B.C. and other municipal systems, the website InformedInfrastructure.com said in 2012: “The technology is simple and proven…more than 500 wastewater heat pumps are in operation worldwide. Large scale implementation would not require any additional scientific research…the risk is minimal compared to other geospatial projects.” Whether for a single building or a district energy plant, wastewater energy recovery offers savings that are easy to prove, and established systems that are easy to install and maintain.

The future just might be in sewage! ✨

Bruce Nagy is a Toronto-based freelance writer that reports on green technologies and solutions. He can be reached at bruce.nagy@rogers.com.

Engineered Systems

Keeping the athletes warm

Continued from page 13

Wastewater Systems’ Brett Stewart makes adjustments on the SHARC system.

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March 2014 – Plumbing & HVAC 15