

# FOCUSED APPROACH

## on Energy Yields Savings for Wastewater Treatment Plants

After attending a thirteen month training program, including seven daylong workshops that concluded in June of 2011, participating wastewater utilities found that focusing on energy yields savings. For instance:

- The City of Vancouver treatment plants are on track to reduce their energy consumption by 10% this year- - and on target for a savings of nearly 1 megawatt hours for 2011. An aggressive energy conservation program at the plants involved blower shut down, turbo blower installation, UV system adjustments, VFD drive installation, lighting upgrades, and other projects. Lighting upgrades alone will save 525,000 kilowatt hours per year (kwh/year) at the Vancouver wastewater plants.
- Roseburg Urban Sanitary Authority (RUSA) will save \$11,000 per year by limiting blower run time – with no impact on effluent quality.
- Installing turbo blowers is expected to save the City of Troutdale \$22,000 per year. Redmond expects to save \$12,000 per year with its new turbo blower system.
- The City of Gresham has saved \$1.35 million with conservation and renewable energy project investments since October of 2005.
- Adjustments to the filters in the recycled water system at the City of Bend saves \$5,400 per year; a turn-down of the digester pump added an additional \$5,300 savings per year.
- The City of Portland has increased the run time on its co-generation units to 95%, along with crafting an energy policy for the treatment plant, and incorporating energy into its overall capital planning process.
- The City of Lewiston targeted specific energy conservation blower-related projects and is saving 10% or \$27,000 per year for this small, 4 MGD activated sludge system. Adjustments to the UV disinfection system are planned - - that should add an additional savings of \$10,000 per year.

The training followed a **plan/do/check/act** sequence, as outlined by the **EPA's workbook *Ensuring a Sustainable Future: An Energy Management Guidebook for Wastewater and Water Utilities*** – see [http://www.epa.gov/owm/waterinfrastructure/pdfs/guidebook\\_si\\_energymanagement.pdf](http://www.epa.gov/owm/waterinfrastructure/pdfs/guidebook_si_energymanagement.pdf)

Training was provided by a variety of energy experts and trainers including Dorothy Atwood – Zero Waste Alliance, Layne McWilliams – BPA EnergySmartIndustrial, and Walt Mintkeski and Thad Roth – Energy Trust of Oregon. National energy experts from CH2M Hill, Brown & Caldwell, Kennedy/Jenks Consultants, and HDR added technical presentations on a variety of energy issues.



### Wastewater utilities used a process to:

- Set an energy goal
- Get a no-cost energy audit
- Set an energy baseline
- Form an energy team
- Explore opportunities for saving energy, make a plan, test, and measure
- Consider installation of renewable power technologies
- Measure, report, and improve

Specifics include:

### 1. Set an Energy Goal.

The City of Gresham wants to be energy independent. City of Redmond wants to reduce energy use by 5% through efficiency and increase renewable power generated on site by 10% by 2012. The City of Lewiston set (..and met) a goal of reducing power consumption by 10%. McMinnville reduced its load factor by 20%.

Consider involvement by your Council, Commission, or Board in setting the energy policy and energy goals for the wastewater treatment plant.

### 2. Get a NO COST Energy Audit.

Engage technical and energy program resources offered by your utility and their partners.

No cost energy audits will help identify energy efficiency measures and available financing incentives. Wastewater utilities served by public power electric utilities including PUDs, municipal agencies, or co-ops should contact their electric utility, or get additional information at [www.energysmartindustrial.com](http://www.energysmartindustrial.com). Wastewater utilities served by Portland General Electric or Pacific Power should contact the program delivery contractor that serves the area – more information at <http://energytrust.org/industrial-and-ag/program-delivery-contractor/>

Areas to explore include lighting upgrades, thermostat adjustments, and motor and pump replacement.

### 3. Set an Energy Baseline.

Using the past 12 months of energy bills, calculate the amount of energy used per million gallons of wastewater treated (kwh/MGD). Another useful metric is kwh per 1,000 pounds of BOD removed. For example, the kwh/1,000 pounds of BOD removed varied greatly within the participating utility group - - at the high end, one treatment plant used 1,947 kwh/1,000 pounds of BOD removed. At the other end, three treatment plants with biogas generators were between 335 and 680 kwh/1,000 pounds of BOD removed.

It is also useful to calculate your load factor – there can be substantial savings by shifting power uses to off-peak times of the day.

### 4. Form an Energy Team.

The energy team works to gather information and implement energy efficiency measures. Ensure all aspects of the plant staff are included in the team membership – operators, management, lab, and maintenance staff.

“We found that small successes built operator support for energy conservation,” said David Six with the City of Lewiston. Other tips to getting the energy team into action include:

- ~ Reprogramming SCADA to provide direct feedback to operators on energy efficiency issues. “Adding energy feedback into our SCADA system has been a tremendous help in getting operators to incorporate energy issues into their thinking as they are managing for water quality,” said RUSA General Manager Ron Thames.
- ~ Plan and hold an event to share the energy goals and gather suggestions from the entire staff. The City of Vancouver included their electric utility provider in this discussion with the entire treatment plant staff.
- ~ Identify staff as ‘champions’ of the efficiency effort. “Identify the energy champions in your operator group and empower them to improve,” highlighted Aaron Kraft with Veolia Water, contract operator for the City of Vancouver.
- ~ Incorporate energy into routine safety walk-throughs. “We have incorporated the **O & M Energy Efficiency Checklist for Wastewater Treatment Plants** into our routine monthly safety walk-throughs,” said Bob Sprick of the City of Eugene, “Now staff is identifying both safety issues and energy efficiency opportunities.”

Dorothy Atwood with Zero Waste Alliance provided training on management systems through the program. “It was great to see the energy teams formed at the local wastewater utilities, and the benefits of a systematic approach to reducing energy costs,” she said. “Items such as scheduling routine meetings of the energy team, check-ins with senior management, and providing energy training and awareness for all employees, work to keep these types of programs moving forward.” She added that an organized approach for inventorying all possible projects and setting priorities also helps.





## 5. Explore Opportunities for Saving Energy, Make a Plan, Test, and Measure.



Inventory energy efficiency opportunities at the treatment plant to save energy. Some items that might be included:

- ~ Use the **O & M Energy Efficiency Checklist for Wastewater Treatment Plants** to identify low/no cost areas for energy conservation. The checklist can be incorporated into a 'walk around' for the energy team to identify efficiency opportunities in routine plant operations. A copy is posted on the ACWA web site at <http://www.oracwa.org/files/news/670/WWTP-Energy-Efficiency-OM-Measure-checklist-ACWA-formatted.pdf?PHPS ESSID=bffafe4a793962128239ac647b6a933e>
- ~ Adjust the UV disinfection light banks for maximum effectiveness and minimum power. The City of Vancouver saved 25% of its power for the UV system through adjustments, with no impact on effluent quality.
- ~ Identify the most efficient pumps and use them first.
- ~ Use jockey pumps to increase pump efficiency at lower flows.
- ~ Evaluate installation of turbo blowers.
- ~ Monitor pumps and motors for excessive vibration and amp draw to detect plugging and excessive wear.
- ~ Turn blowers off for a several hours each day. RUSA is saving \$11,000 per year just by adjusting blower run time.

With that information, make a plan for implementing the highest priority energy conservation measures, and for measuring and reporting success to the entire organization.



## 6. Consider Installation of Renewable Power Technologies.

Example renewable technologies in use at the participating plants include:

- ~ Biogas use – The City of Medford found that it could reduce its natural gas purchases and substitute biogas instead. “We reduced our monthly natural gas cost from \$2,500 to less than \$10 a month - - a savings of about \$30,000 per year,” said Tom Suttle with the City of Medford. Treatment plants should also explore using biogas for digester heating and building heating.
- ~ Biogas generators – Portland, Gresham, MWMC/ Eugene, and Medford are each offsetting over 50% of their purchased electricity by installing biogas generators to generate electricity from digester gas. Gas treatment and scrubbing systems have dramatically increased the reliability of these generators.
- ~ Solar P/V – Gresham has installed a solar P/V system at its treatment plant.
- ~ Effluent heat pump – Both the City of Silverton and City of McMinnville have effluent heat pumps. Silverton uses the energy to heat the historic Frank Lloyd Wright-designed Gordon House at the Oregon Gardens; McMinnville uses the energy to heat and cool its administration building, including its laboratory.



## 7. Measure/Report/ Improve.

"Information on energy conservation and the success we have had at the treatment plant has been of top interest for our City Council," said Shannon Taylor with the City of Redmond. "Our Council is very interested in efficiency and in exploring renewable energy technologies for our plant."

Items to consider:

- ~ Incorporating life-cycle cost analysis and energy issues into capital planning decisions. "The initial cost of a pump or piece of equipment is small compared to the energy costs for running it over its lifetime," added Bob Sprick with the City of Eugene.
- ~ Write Standard Operating Practices to promote energy efficient behavior. As part of the workshops, a set of SOPs were drafted and are available to ACWA members. Available example SOPs cover motor replacement, reducing mixing horsepower, load shifting, LED lighting, pump set points, and preparing an energy report.
- ~ Incorporate energy issues into all facility planning and major upgrade Request for Proposals (RFPs) and Request for Qualifications (RFQs). Some example RFP language is posted at [http://energytrust.org/library/reports/100603\\_Energy\\_Efficiency\\_RFP\\_Guidance.pdf](http://energytrust.org/library/reports/100603_Energy_Efficiency_RFP_Guidance.pdf)



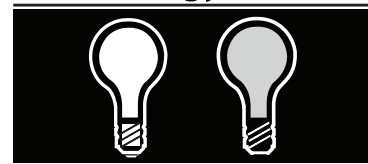
## Participating Utilities

Participating wastewater utilities included:

- |                |  |
|----------------|--|
| • Gresham      | • Metropolitan Wastewater Management Commission/Eugene |
| • Lewiston, ID | • Silverton  |
| • McMinnville  | • Roseburg Urban Sanitary Authority                    |
| • Medford      | • Vancouver, WA  |
| • Newberg      | • Bend   |
| • Portland     | • Troutdale  |
| • Redmond      |  |

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**Save Energy**



**Save Everything**