Commercial Gas from Wastewater: King County’s 20-year Commitment to Renewable Energy

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King County’s South Treatment Plant

The County’s South Wastewater Treatment Plant:
- 1 of 2 plants serving the Seattle metro area
- Population Served = ~ 700,000
- Flow (avg) = 75 million gallons/day
- Liquid/Secondary Treatment – since 1965
- Solids Treatment & Biogas Scrubbing – since 1987
Commercial natural gas from wastewater – how does that work?
… Basically, we just “wash out” the impurities

“Binax” Gas Scrubbing System

- **Anaerobic Digester**: 97°F
- **Biogas**: 60% CH₄, 38% CO₂
- **Gas Compressor**: 300 psi
- **Dessicant Drier**: Activated Alumina, Heat regenerated
- **Final Effluent**
- **Water Pump**
- **QC Monitoring**:
  - Methane > 980 BTU/ft³
  - Sp. Gravity < 0.585 (H₂O = 1.0)
  - Dew Point < 14°F (usually -40°F)
  - Pressure > 200 psi
- **Diversion Valve**: 250-psi
- **PSE Gas Meter**
- **Odor Agent**: Methyl Mercaptan
- **Carbonated Scrubber Water**
- **Waste Gas Burner**
- **Return to Treatment Plant**
Practically, a bit more complicated than that

- Anaerobic Digesters – produce biogas
- Mix Biogas & Water under Pressure
  - Gas Compressors: 300-psi
  - Water Pumps/Turbines: 0.7-gal/ft³-Biogas
  - Contact Tower: Packed Bed
- Drier
- Quality Control Monitoring
- Diversion Valves/Waste Gas Burners
- Sales Meter
South Plant Economics

- **Gas Sales Price:** 75.95-¢/Therm
  - PSE Schedule 101 – “Cost of Gas”

- **Electricity Cost:** 14-¢/Therm
  - PSE Electricity Cost - $0.065/kwh

- **Parts & Supply Costs:** assume 6-¢/Therm

- **Labor Costs:** assume 10-¢/Therm

- **Capital Costs:** $5-10 million replacement cost
Plant Statistics – A Valuable Resource

- Operating since 1987
  - Predates “Carbon Markets” – so no GHG offset credits or renewable energy certificates (RECs) can be produced (though renewables)

- 2007 Gas Sales: $1.25 million
  - 1.8 million Therms (180 million ft³ NG)
  - 3000 homes (~50 Therms/month/house)

- 2007 Production Costs: $0.5-0.7 million estimate
  - Electricity used: 4-million kWh (7% of South Plant’s total)

- 2007 Biogas Recovery & Use
  - 89% recovery (11% was flared)
  - 57% sold to PSE
  - 16% used on-site to produce heat (boiler)
  - 16% used on-site to produce electricity (cogen)
South Plant’s Keys to Success

- **Steady Supply of Biogas**
  - 6000-8000 Therms/day (700,000 population)
  - Wastewater Rule of thumb: 1.25-Therms per 100-people

- **Ready Supply of Water (effluent)**
  - 0.8-1.0 million gpd (75-mgd plant flow)

- **Equipment Reliability: 24-hr O&M**

- **Proximity to Major PSE gas pipeline**

- **Commodity prices: Electricity vs. Natural Gas**
  - 6.5 ¢/kwh vs. 75 ¢/Therm
Some Other King County Projects

- **Cedar Hills landfill gas project**
  - Gas purifying-compressing-sale plant under construction
  - Estimated production of 4.5 million ft³ per day
  - Again, proximity to major gas transmission pipeline is key
  - King County expects to be able to produce GHG offset credits

- **West Point Cogeneration Plant (electric generation)**
  - At another wastewater treatment plant – in planning / design to generate ~ 2.3 average megawatts electricity, and heat for plant
  - County expects to be able to generate renewable energy credits
Thanks for your interest…

Questions?

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