Wastewater Disinfection with Renewable Energy Generation

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Company Overview - PTG

- Leader in heat-based disinfection of wastewater with renewable energy generation
- Eight years in development
- Patented Technology – 22 Countries
- Proprietary Software Control
- Multiple pilot projects over seven years
- Technology vetted by 3rd party consulting engineers
- Independent analysis reveals low cost technology
Technology – “2-for-1”

- Wastewater disinfection & renewable energy

- Waste heat from turbine or engine pasteurizes wastewater

- Eco Friendly
Technology – “2-for-1”

- Robust and non-toxic technology
- Chemical Free

- Title 22 certification for Reuse/Recycle – Unrestricted Use
- **Pilot Plant work at Los Angeles County Sanitation District**,  *Carson Plant*

- **Pilot Plant testing at Santa Rosa, CA** - *Laguna Plant*
  2007-2008 - *Title 22 Certification*.

- **500,000 gallon per day Pilot Plant testing at a So. California Wastewater Treatment Plant**
  2011-2012 – *Demonstration system to design for 10-20MGD system*.

- **EPA Recognizes PTG as Disinfection Technology**

- **First installation of combined Turbine/disinfection system for a No. California Wastewater Treatment Plant**
  2013 - Capacity of 500,000 gallons per day and 30Kw of electricity generation.
WWTP Process

- Disinfection for:
  - Primary
  - Secondary
  - Tertiary

[Diagram of WWTP Process]
Patented Technology

- PTG’s patented systems utilize proprietary software & controls

PTG Integrated System

1. Preheater Unit
   - Wastewater 70°F
   - 73°F Disinfected Water (Title 22)
   - 177°F

2. Waste Heat Recovery Unit
   - 200°F Residual Exhaust (Extra heat source)
   - 180°F

3. Gas Turbine
   - Exhaust 950°F
   - Fuel (Biogas or natural gas)

4. Generator
   - Electricity

Pasteurization Technology Group Overview
PTG Fundamentals

Btu/°F to heat water 1 Btu

<table>
<thead>
<tr>
<th>Water, lbs/gallon</th>
<th>8.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Btu/gallon</td>
<td>8.3</td>
</tr>
<tr>
<td>Entering Water Temp</td>
<td>70°F</td>
</tr>
<tr>
<td>Exit Water Temp</td>
<td>180°F</td>
</tr>
<tr>
<td>Temp Rise</td>
<td>110°F</td>
</tr>
<tr>
<td>Amount of Water Treated</td>
<td>1,000,000 gallons</td>
</tr>
<tr>
<td>Energy Required per °F</td>
<td>8,300,000 Btu</td>
</tr>
<tr>
<td>Total Energy Requirement</td>
<td>913,000,000 Btu’s</td>
</tr>
</tbody>
</table>

With PRE-HEATER, the final temperature rise is only 3°F

<table>
<thead>
<tr>
<th>Temp Rise</th>
<th>3°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of Water Treated</td>
<td>1,000,000 gallons</td>
</tr>
<tr>
<td>Energy Required/°F</td>
<td>8,300,000 Btu</td>
</tr>
<tr>
<td>Total Energy Requirement</td>
<td>24,900,000 Btu’s</td>
</tr>
</tbody>
</table>

Difference in Energy Consumption

888,100,000 Btu’s saved

Energy Use Reduction Factor

36.6 Times less energy
PTG Integrated System

Preheater Unit

Wastewater 70°F

73°F Disinfected Water (Title 22)

177°F

180°F

Waste Heat Recovery Unit

200°F Residual Exhaust (Extra heat source)

Steam or Hot Loop
Process Data
Heat Source & kW Generation

- Turbine
- Micro-Turbine
- Reciprocating
- Duct Burner
- Hot Loop
- Incinerator Heat
Energy/Fuel Options

- Digester Gas
- Nat Gas
- Flare Gas
- Landfill Gas
- LNG
- Diesel Fuel
Product Review

- Capacity
  - 100,000 gallons / day to – 100 MGD and larger.
- Multiple configurations available
- Multiple energy/fuel options
- Industry specific solutions
- Custom engineered and designed for each specific site.
- Non consumptive technology
- Provides a Return on Investment (ROI)
## Annual Operating Costs by Technology - Ventura Water

<table>
<thead>
<tr>
<th>Technology</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPUV</td>
<td>$(400,000)</td>
</tr>
<tr>
<td>UV1</td>
<td>$(200,000)</td>
</tr>
<tr>
<td>UV2</td>
<td></td>
</tr>
<tr>
<td>UV3</td>
<td></td>
</tr>
<tr>
<td>PTG</td>
<td>$(600,000)</td>
</tr>
</tbody>
</table>
Markets Served

- Municipalities
- Industrial markets:
  - Food & beverage
  - Beer
  - Agriculture
  - Meat & Dairy
  - Oil & Gas
Potential Clients

- Plants looking to disinfect wastewater
- Plants flaring digester gas
- Plants with engines that are not fully commissioned
- Plants with old UV systems (high energy and O&M costs)
- Plants replacing toxic chlorine disinfection
- Industrial clients with high water usage
- Industrial facilities with high bio-waste (breweries/dairies/meat/poultry/agriculture)
- Plants seeking to reduce electrical costs or to get off “grid”
- Wastewater plants proximate to landfill or incineration facilities
Summary

- “2-for-1” solution: Wastewater disinfection & renewable energy
- Cost-effective solution
- Patented & proven technology
- California Title 22 certification for water reuse/recycle – Unrestricted use
- Multiple applications: wastewater treatment plants, food & beverage, agriculture, oil & gas
- Various configurations available – Reciprocating, Micro-Turbine, Turbine, Incinerator heat, hot loop and Duct Burner
- Multiple energy options available - Biogas, Landfill gas, LNG, Natural gas and Diesel
Questions?

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