Managing Biosolids and Generating Green Energy

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Take-Aways

- Introduction to VRSD
- The challenge and our solution
- Project highlights and benefits
- Technology overview
- Virtual facility tour
Who is VRSD?

- Enterprise public agency
- Organized in 1970
- Eight charter cities and eight special districts
- Serves sanitation needs of 600,000 people:
  - Solid waste disposal / landfill management
  - Wastewater collection and treatment
  - Recycled and potable water service
- Nine-member Board, 65 employees
What are Biosolids?

- Organic materials resulting from highly processed WWTP operations
- Ventura County produces 8,000 tons every month
- Prior to this project, 90% were exported out of Ventura County
The Challenge

- Restrictions limiting export options
  - Measure E in Kern County
- Increasing costs
- Need for a local solution
The Solution

- Regional facility to process biosolids
- Powered by landfill gas
- Batch drying – 160 tons/day
- Multi-use end product
- Green energy – self-sustained system
- Additional electricity exported to grid
Project Location
Toland Road Landfill
Project Highlights

- 2.2-acre facility in a 343-acre landfill site
- Two 80-ton-per-day Fenton batch dryers
- Nine 250 kW Ingersoll Rand microturbines
- Green energy (no power from grid)
- AB 939 recyclable material
- Competitive & stable costs
- Local solution with local public governance
Project Cost - $19M

- Permits, engineering, project management $1.0M
- Site Work $7.0M
- Dryers (2) $5.4M
- Trailers (11) .5M
- Microturbines (9) $2.8M
- Gas conveyance system $2.0M
Funding

■ Capital
  ■ Combination cash & debt
  ■ $1 million SGIP grant

■ Operations: $42/ton
  ■ 10-year contracts with cities of Fillmore, Oxnard, Ventura, and Thousand Oaks
    • Trucking costs add approximately $10/ton

■ Rate factors:
  ■ 3.5% annual increase first five years
  ■ 10-year SCE contract for energy sales ($.10 per kWh)
Environmental Benefits

- Pathogen Destruction (pasteurization)
- Air Quality
  - Reduced truck traffic (est. 1 million miles per year)
  - 1,800 ton / yr. CO₂ reduction
- Recycling
  - Dried solids (ADC, fertilizer, fuel)
  - Reclaimed water (dust control)
  - Renewable power from landfill gas
  - No energy from grid – added power for the grid
The Process at a Glance

- Landfill Gas Treatment
- Electric Power Generation (2.32 MW)
  - Export to SCE Grid (1.57 MW)
  - Use as ADC, Fertilizer, or Fuel
- Air Treatment
- Steam Condensation
- Water Reclamation
- Biosolids Drying (750 kW)
- Biosolids Drying Export to SCE Grid (1.57 MW)
- Use as ADC, Fertilizer, or Fuel
LANDFILL GAS TREATMENT

- Liquid Removal
- Sulfur Reduction
- Siloxane Removal
- Dew point Suppression

Compression

To Process Heaters and Microturbines
ELECTRIC POWER GENERATION

IR 250kW System Cycle Diagram

- 400/480 Volts
- 50/60 Hz
- 3 Phase

Heat Exchanger

Recuperator

245°C/473°F Typical

1500/1800 rpm

45,000 rpm
BIOSOLIDS DRYING

RECEIVING HOPPER

INCOMING BIOSOLIDS

ODORS

AUXILIARY CARBON FILTER

TO ATMOSPHERE

WET BIOSOLIDS

STORAGE HOPPER

WET BIOSOLIDS

ODORS

3-BAY TRUCK LOADING AREA

LANDFILL GAS

THERMAL FLUID HEATER

HOT OIL

STEAM EXHAUST

BATCH DRYER

WET BIOSOLIDS

DRIED BIOSOLIDS

3-BAY TRUCK LOADING AREA

CLEAN AIR

TO ATMOSPHERE

ODORS
STEAM CONDENSATION

- STEAM EXHAUST FROM BATCH DRYERS
- EXHAUST TO BIOFILTER SYSTEM
- STEAM CONDENSER
- CONDENSATE TO RECLAIMED WATER SYSTEM
- COOL WATER
- WARM WATER
- TO ATMOSPHERE
- COOLING TOWERS
- POTABLE WATER
TO ATMOSPHERE

AMBIENT AIR

EXHAUST FROM CONDENSER AND CONDENSATE TREATMENT

BIOFILTER SYSTEM

HEPA FILTER

CARBON FILTER

CLEAN AIR

PHOSPHORIC ACID

AIR TREATMENT
WATER RECLAMATION

CONDENSATE FROM STEAM CONDENSER SYSTEM

CHILLED CONDENSATE TANK

POLYMER INJECTION

CLARIFIER / SEPARATOR TANK

RECLAIMED WATER

RECLAIMED WATER TANK
(Dust Control / Irrigation)

WASTEWATER TANK

FOG / SEDIMENT TO DISPOSAL

RECYCLED WATER TANK
(Dust Control / Irrigation)
Landfill Gas Treatment

Biosolids Drying

Steam Condensation
Water Reclamation
Air Treatment

Electric Power Generation

Virtual Tour
Landslide Removal and Slope Grading
Benching and Filling
Landfill Gas Treatment
LFG Liquid Removal
Sulfur Removal System
Blower Unit (incl. moisture & siloxane removal)
Compressor Unit (incl. moisture & siloxane removal)
Electric Power Generation
Microturbines
Microturbines
Biosolids Drying
Process Heaters
Batch Dryer
Dryer Mechanism
Air Treatment
Steam Condensation
Water Reclamation
Biofilter System
Reclaimed Water Tanks
Dried Product Receiving Station
Dried Biosolids

Approx. 70% Solids, 30% water
Start-Up Issues - Biosolids

- Air pollution permitting – modifications to standard burners caused problems:
  - High heat caused refractory/insulation burn-through
  - Multiple retrofits required

- Biofilter for air treatment – sensitive to:
  - Temperature
  - Air velocity over filter media
  - Food mass ratio

- Remedial measures in place
Start-Up Issues - Microturbines

- Unanticipated siloxane-related fouling
- Power spikes from Southern California Edison
- Uptime has exceeded 85%
Project Notables

- Biosolids: 160 tons per day; expandable to 320
- 9 microturbines (2.32 MW) - expandable to 15 (3.75 MW)
- Green, sustainable, low-emission power
- Major cooperative effort between member cities and county
- Regional biosolids drying solution – first in the nation

Awards:
- Technological Innovation – California Association of Sanitation Agencies
- Gold Award for Landfill Gas Utilization – Solid Waste Association of North America
- Project of the Year – American Public Works Association (Ventura County)
- Project of the Year – American Society of Civil Engineers (Santa Barbara/Ventura)
- Project of the Year – American Council of Engineering Companies California
Q & A

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