EnerTech Environmental, Inc.

Converting Biosolids to a Usable Fuel: The Emerging Technology of Biosolids Carbonization – The Rialto Regional Biosolids Facility

SCAP Workshop - Perris, California

September 28, 2004

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Today's Agenda

- SlurryCarb™ Process Overview
- Current SlurryCarb™ Facilities
- Performance of the SlurryCarb™ Process
- Utilization of E-Fuel
- The Rialto Regional Facility
- Advantages for the Region

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The SlurryCarb™ Process

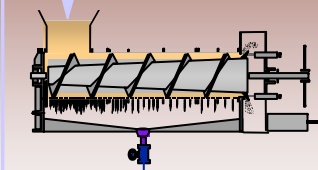
Step 1: Slurry Preparation

Biosolids are received, and if required, dewatered to 20% solids. This becomes the feed slurry for the process.

Biosolids at 20% Solids

Step 5: Dewatering

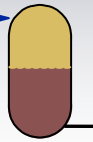
Excess moisture is removed from the carbonized products to form a slurry fuel and dewatered mechancially to 50%. Also, carbonized products may be washed to remove trace pollutants.



Step 6: Filtrate Recycle

Trace contaminants like chlorides, Dissolved solids, BOD, COD, are removed from filtrate utilizing a high-shear membrane technology. Sludge from the pretreatment is added to the fuel product.

Sludge



Pre-Treated Excess Water to WWTP

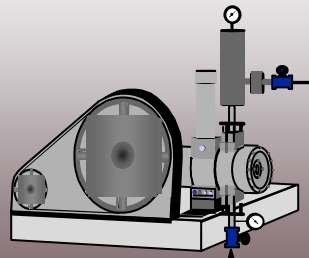
Step 7: Combustion

The carbonized slurry fuel is dried, pelletized or kept in slurry form and transported and transported to the customer to be utilized off-site

Pellet or Slurry Fuel

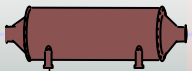
Step 2: Slurry Pressurization

Feed slurry is continuously pressurized with a pump to maintain liquid conditions when heated.



Step 3: Slurry Heating

The pressurized slurry is brought to reaction temperature through heat exchange with reaction products and an external heat source.

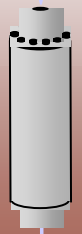


H_2O, CO_2

Heat Source

Step 4: Reaction

In reactor, oxygen groups from the solid slurry are removed as carbon dioxide gas and chlorinated organics are decomposed to soluble salts.



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Current SlurryCarb Facilities

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Process Performance

- Viscosity of biosolids – 30% biosolids pumpable
- Reaction time less than 12 minutes
- Reacted product dewatered to greater than 50% solids
- Produced 6,500 Btu/lb E-Fuel using digested biosolids
- Pellet form preferred by market at 90% dry
- Combustion characteristics similar to coal and an excellent feedstock for the cement industry
- No residual remains at the end of the process

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SlurryCarb Mass & Energy Balance

Assume 100 wet tons per day @ 20% solids

⇒ Drying

80 H_2O

100 wet tons
80 H_2O
20 Solids

→ 20 Product

Energy

@ 1000 Btu/lb
= 160,000,000 Btus

⇒ SlurryCarb-*Utilizes 65% less energy than drying*

100 wet tons
80 H_2O
20 Solids

94 reacted tons
80 H_2O
14 Solids

Dewatering Step 5 of Process

14 Solids
14 H_2O

Pelletizing Portion

Energy

66 H_2O

SlurryCarb @ 175 Btu/lb = 28,000,000 Btus
Pelletization @1,000 Btu/lb = 28,000,000 Btus
56,000,000 Btus

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Utilization of E-Fuel

- **The final product (a renewable fuel) reduces the volume of 20% biosolids by 84%**

- **Product fuel has ~6,500 Btu/lb (as pellet) and has economic value of lignite coal**

- **Fuel can be utilized in multiple scenarios:**
  - cement kiln
  - gasifier
  - pulverized coal boiler
  - fluid bed
  - waste boiler - other boilers
  - incinerator
  - in the process heater for internal energy needs

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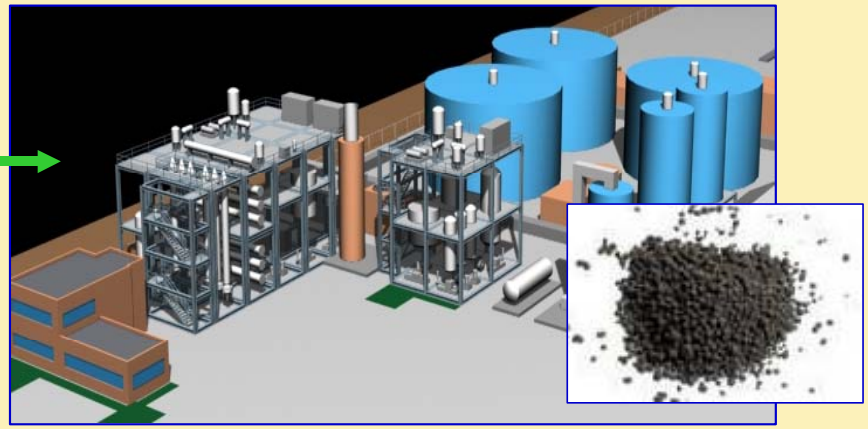
The California Regional Project

125 DTPD of Biosolids from the Region:

Biosolids Production from Region



~110 tons E-Fuel

Current Stakeholders Include three municipalities

Renewable E-Fuel to Cement Kiln

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The Site

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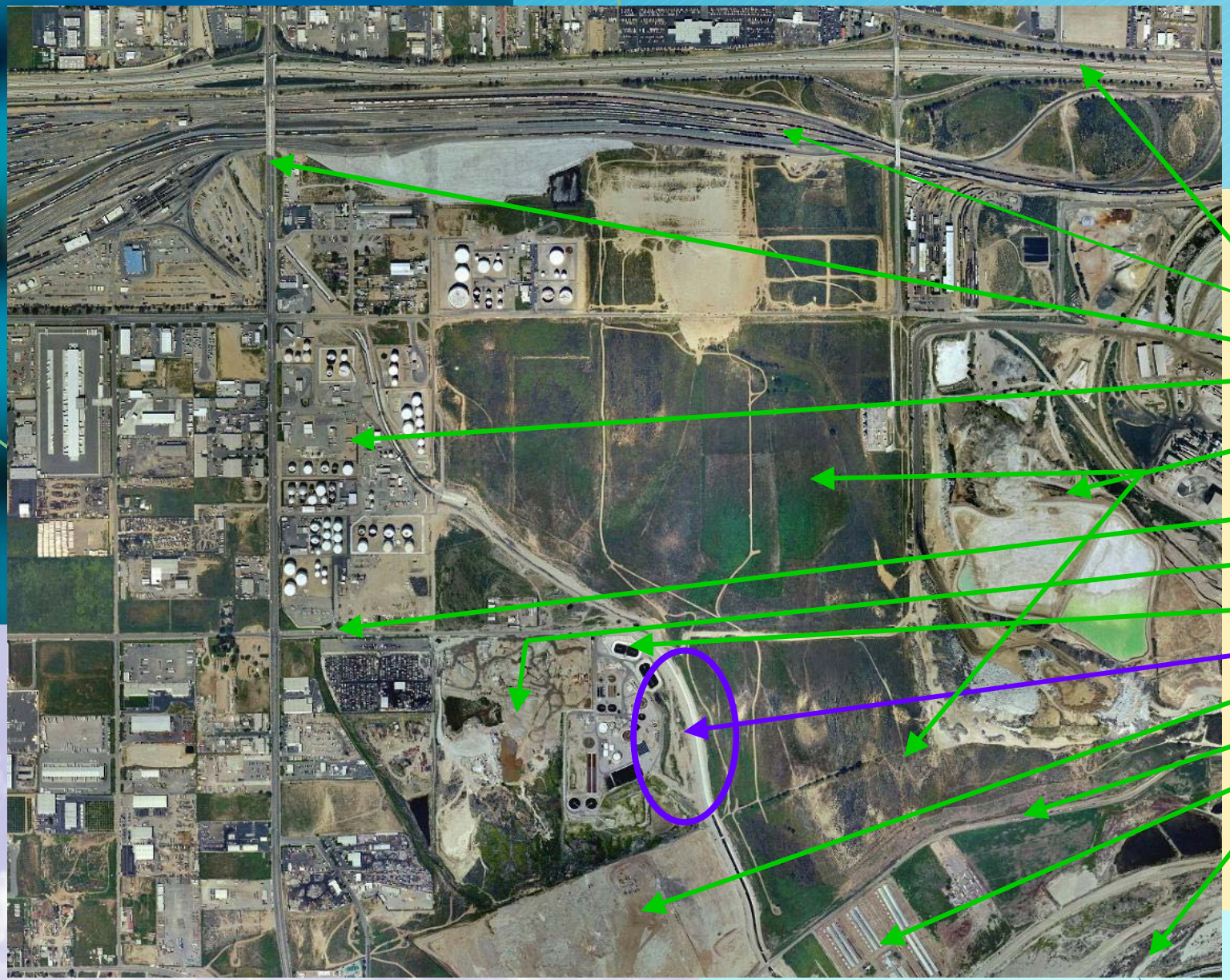
Project Location



- I – 10
- Railroad Yard
- Riverside Ave.
- Tank Farm
- Calif. Portland Cement
- Santa Ana Ave.
- Holiday Rock
- Rialto WWTP
- Regional Facility
- Yeager Landfill
- Aqua Mansa Rd
- Duck Farms
- Santa Ana River

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California Project Status

- Finding Stakeholders - biosolids commitments
- EIR in progress; air permit done (*pending EIR*)
- Fuel Users Located – back-up is included
- Partners Secured
- Financing Structure (CPCFA and equity)
- Engineering has begun
- Begin operations in 2nd – 3rd Q 2006

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California Project Economics

1) Long-term, predictable cost
2) Avoided capital cost for digesters, dewatering, and/or dryers
3) Reduced chemical costs
4) Reduced operating costs
5) Reclaim land utilized for disposal issues
6) Reduced trucking costs with regional facility
7) Reduced energy costs

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