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
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
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.

**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.

**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.

**Step 5: Dewatering**
Excess moisture is removed from the carbonized products to form a slurry fuel and dewatered mechanically 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.

**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.

Biosolids at 20% Solids

Pre-Treated Excess Water to WWTP

Pellet or Slurry Fuel

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Current SlurryCarb Facilities

Rendering of Regional Facility Plant

Mitsubishi Plant

Process Development Unit (PDU)
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
**SlurryCarb Mass & Energy Balance**

Assume 100 wet tons per day @ 20% solids

⇒ **Drying**

- 100 wet tons
- 80 H₂O
- 20 Solids

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

- 100 wet tons
- 80 H₂O
- 20 Solids

Energy

⇒ 20 Product

- 80 H₂O

⇒ **Pelletizing**

- 14 Solids
- 14 H₂O

⇒ **Dewatering**

- 94 reacted tons
- 80 H₂O
- 14 Solids

Energy

Energy 14 Solids

⇒ 66 H₂O

SlurryCarb @ 175 Btu/lb = 28,000,000 Btus
Pelletization @1,000 Btu/lb = 28,000,000 Btus
56,000,000 Btus
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
The California Regional Project

125 DTPD of Biosolids from the Region:

Biosolids Production from Region

Current Stakeholders Include three municipalities

~110 tons E-Fuel

Renewable E-Fuel to Cement Kiln
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
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 2\textsuperscript{nd} – 3\textsuperscript{rd} Q 2006
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