Elements of Biosolids Management Program

- Biosolids Treatment
- Biosolids Processing/Product Technologies
- Markets
## Product Markets and Product Technologies Integration

<table>
<thead>
<tr>
<th></th>
<th>Composting</th>
<th>Heat Drying</th>
<th>Organo-Mineral Fertilizer</th>
<th>Vitrification</th>
<th>Pyrolysis</th>
<th>Combustion</th>
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<tr>
<td>Retail Outlets</td>
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</table>
Product Manufacturing Technologies

Products for Cropping Markets

Products for Energy Markets

Products for Construction Markets

Products for Energy Markets
Product Technologies to serve Cropping markets

- Class A Anaerobic Digestion
- Solar Drying
- Composting
- Chemical Stabilization
- Heat Drying (Pellets)
- Organo-Mineral Fertilizer Production
- Bactericidies
Composting Process

Biosolids

Feedstock Preparation

Composting

Screening

Curing

Makeup Amendments

Recycle Amendments

Market

Amendments
Composting Technologies

- **Biosolids**
  - Feedstock Preparation
- **Makeup Amendments**
  - Recycling Amendments
- **Market**
- **Screening**
- **Curing**

Technologies Vary in Composting Method Only
Composting Technologies

- Windrow
- Aerated Static Pile
- In-Vessel (IPS, Longwood, HotRot, American Biotec)
- Vermiculture
Open-air Windrow Composting

Windrow Piles

Turning Machine
Aerated Static Pile Composting
Agitated Bin In-vessel Composting
HotRot In-Vessel Composting
Mixing, Screening, Curing & Storage

Mixing Equipment

Screening

Curing

Storage
Chemical Stabilization

- Neat Alkali Stabilization (RDP, Bioset)
- Fly Ash Stabilization (N-Viro)
- Neutralization
RDP Lime Stabilization Process

Diagram showing the process:
- DEWATERED CAKE DELIVERY
- LIME STORAGE SILO
- THERMO FEEDER
- HEATED THERMO BLENDER
- TIME-TEMPERATURE REACTOR
- VECTOR ATTRACTION REDUCTION REACTOR
- CONDENSATE
- AIR POLLUTION CONTROL
- PRODUCT STORAGE SILO
- TRUCK LOADING OR TO FURTHER DRYING
Lime Stabilization Processes

RDP Process

N-Viro Process
Heat Drying

- Direct Drying (Rotary Drum, Belt, Flash & Fluidized Bed Dryers)
- Indirect Drying (Disk, Paddle, Multiple Heart, Rotary Drum & Fluidized Bed Dryers)
Direct Rotary Drum Dryer System

Heat Source → Hot Air → Rotary Drum Dryer → Air/Solids Separator → Recycled Hot Air → Air Scrubber

Biosolids → Undersize Pellets → Screen → Pellet Cooling and Storage → Market

Recycled Material → Pellet Grinder

Oversize Pellets
Indirect Dryer System

Indirect Dryer System

Hot Oil, Water or Steam Supply & Return

Heat Exchanger

Indirect Dryer

Air/Solids Separator

Product Cooling/Storage

Air Scrubber

Exhaust

Market

Biosolids
Belt and Paddle Dryers
Product Technologies to Serve Energy Markets

- Heat Drying
- Pyrolysis
- Gasification/Starved Air Combustion
- Thermal Oxidation (Combustion/Co-combustion)
- Super Critical Water Oxidation
- Deep-well Energy Recovery
Pyrolysis

- No Oxygen
- Low-Temperature (<600 °F) - EnerTech
- Mid-Temperature (800 to 1,000 °F) - Enersludge
- High-Temperature (1,200 to 1,800 °F) - IES
- Product - Char, Low Grade Oil and Combustible Gases
Enersludge Process
Deep-Well Energy Recovery Process

- Slurry Prep. & Screening
- Slurry Storage & Injection
- Cake Hopper & Grinder
- Water Tank
- Gas Recovery Well
- Injection Well
Product Technologies to Serve Construction Markets

- Vitrification
- Drying with Heated Soils
- Mixing Class A Cake with Inert Material
Minergy Vitrification

Minergy’s GlassPack Plant
Winneconne, Wisconsin
Long-Term Sustainability = Diversification

- Multiple Technologies
- Multiple Sites
- Multiple Products / Markets
- Failsafe Backup Options
History of Biosolids Management

1980’s

1990’s

2000’s