• Facility Siting Considerations
• Composting Technologies
• Permitting
• Regulatory Compliance
• Process Control
• Compost Quality
• Marketing Compost
FACILITY SITING CONSIDERATIONS

• Location, Location, Location!
  – Regulations
  – Nearby Compost Market
  – Sensitive Receptors

• Public Education/Politics
  – Education Begins Early
  – Keep it Simple
  – Remember the Benefits
    • Diversion
    • Soil Enhancement
    • Erosion Control
  – Don’t ignore the public/politics
COMPOSTING TECHNOLOGIES

• Windrow
• Aerated Static Pile – Negative or Positive
• In-vessel
COMPOSTING TECHNOLOGIES

Windrow Composting
COMPOSTING TECHNOLOGIES

Negative Aerated Static Pile Composting
COMPOSTING TECHNOLOGIES

Negative Aerated Static Pile Composting
COMPOSTING TECHNOLOGIES

Positive Aerated Static Pile Composting
COMPOSTING TECHNOLOGIES

In Vessel Composting

- Compost discharged
- Blowers (one for each aeration zone in every bed)
- Turning machine (moves towards raw materials loading end)
- Carriage to transport the turning machine to the next bed

Air plenum or gravel base with aeration pipe underneath
Raw material loaded
PERMITTING

- Local Use Permit
- Local Air District Permit
- U.S. EPA Registration
REGULATORY

• Inbound Materials Monitoring
  – Biosolids
  – Carbon Feedstocks
• Process Water Management
• Ground Water Monitoring
• Source Testing
• Compost Sampling
  • Metals Concentrations (max)
  • Pathogen Reduction (PFRP)
ESSENTIAL OPERATIONAL MEASURES

• Essential Measures:
  • Odor Control
  • Water Protection Measures
  • Emissions Reduction

• Failure Usually Results in a Loss of Confidence
• A Loss of Confidence Usually Results in Demise
PROCESS CONTROL PARAMETERS

• Control Points
  – Feedstock Handling
  – Mix Ratios
  – Moisture
  – Aeration Rates
  – Temperature/PFRP
COMPOSTING PROCESS

Water  CO₂  Heat  Odors?
Feedstocks
Microorganisms
Oxygen
Water
Compost
Compost Facility Feedstock-Process-Market

Start here or here

Identify and quantify Feedstocks

Develop and adjust recipes

Collect or receive feedstocks

Analyze Markets

Assess

Market and distribute

Compost Process: Grind, Mix, Compost, Cure, Screen, etc.
1. Initial feedstock mix
2. Pile moisture
3. Pile aeration
4. Pile shape and size
5. Pile temperature
6. Composting retention time
FEEDSTOCKS: YOUR RAW MATERIALS

Chemical composition
• Organic Matter, Nutrients, Degradability

Physical characteristics
• Moisture, Bulk density, Heterogeneity

Other
• Contamination, Cost, Availability, Regulations
Each feedstock has certain attributes
The RECIPE is how feedstocks are combined
Composting system designed for feedstocks
Regulations are always partly based on feedstock
INITIAL MIX RATIOS

Rule of thumb for starting mix:
• Below 800 lbs/cubic yard (475 kg/m³)
  – May not hold heat
• Above 1000 (600 kg/m³)
  – Increasing difficult to aerate
• Above 1200 (700 kg/m³)
  – Too dense

Starting Free Air Space: above 50% will assure good airflow
MOISTURE

• Optimum is 45-60% moisture
• Composting consumes water
  – Better to start on high end
  – Adding water is difficult
  – 25 gallons per ton raises moisture content ~10%
AERATION

• Supplies oxygen
• Ambient air is 21% oxygen
• Below 16% bacteria start switching to anaerobic respiration
• \( \text{O}_2 \) consumption increases with temperature
AERATION TYPES

• Forced aeration – Negative or Positive

• Mechanical – Windrow turner
TEMPERATURE

• Higher temps result in faster breakdown, up to 140°F
• At temps > 160°F lose microbial diversity, composting actually slows
• Most weeds and pathogens killed at temps > 130°F (55°C)
  – PFRP=Process to Further Reduce Pathogens
• Moisture moderates temperature fluctuation
PFRP - PROCESS TO FURTHER REDUCE PATHOGENS

• Time and Temperature requirements to assure pathogen reduction
  • Aerated Static Pile and In-vessel:
    • 55°C for 3 days
  • Turned windrow:
    • 55°C for 15 days with 5 turnings
WHEN IS IT DONE?

• AFTER CURING!
• Stability vs maturity
  • Stable: activity diminished
  • Mature: will grow plants
• Testing for completeness
  • Lab tests
  • Facility test
### SUMMARY - KEY INITIAL PARAMETERS FOR THERMOPHILIC COMPOSTING

<table>
<thead>
<tr>
<th>Condition</th>
<th>Reasonable range</th>
<th>Preferred range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture %</td>
<td>40 — 65</td>
<td>50 — 60</td>
</tr>
<tr>
<td>C:N</td>
<td>20:1 — 60:1</td>
<td>25:1 — 40:1</td>
</tr>
<tr>
<td>Oxygen %</td>
<td>Greater than 5</td>
<td>Greater than 10</td>
</tr>
<tr>
<td>Temperature °F</td>
<td>113 — 160</td>
<td>120 — 150</td>
</tr>
<tr>
<td>°C</td>
<td>45 -- 71</td>
<td>49 -- 66</td>
</tr>
<tr>
<td>pH</td>
<td>5.5 — 9.0</td>
<td>6.5 — 8.0</td>
</tr>
<tr>
<td>Particle size</td>
<td>1/8 to 2 inches</td>
<td>Depends on feedstocks</td>
</tr>
<tr>
<td></td>
<td>.3-5 cm</td>
<td>and use for compost</td>
</tr>
<tr>
<td>Porosity:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bulk density lbs/ yd³ (kg/l)</td>
<td>Less than 1200 (.7)</td>
<td>800-1000 (.45-.6)</td>
</tr>
<tr>
<td>Free Air Space %</td>
<td>40-60</td>
<td>50-60</td>
</tr>
</tbody>
</table>
WHY DO WE TEST COMPOST?

• Environmental health and safety
  – Pathogens and metals
• Degree of completion
  – Stability
  – Maturity
• Characteristics for End Use
  – Physical attributes
  – Chemical composition
HEALTH AND SAFETY

• Pathogens - Fecal Coliforms and Salmonella are the species of bacteria tested to determine if both human and plant pathogens have been reduced to safe levels.
  – Fecal Coliforms < 1000 MPN/g
  – Salmonella < 3 MPN/4g
  – Metals
HOW DO WE TEST FOR QUALITY?

- Take a representative sample
  - Analysis only as good as the sample!
- Send to a reputable laboratory for testing

List of compost labs: http://compostingcouncil.org

<table>
<thead>
<tr>
<th>Amounts of Biosolids* (metric tons per 365-day period)</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater than zero but less than 290</td>
<td>Once per year</td>
</tr>
<tr>
<td>Equal to or greater than 290 but less than 1,500</td>
<td>Once per quarter (four times per year)</td>
</tr>
<tr>
<td>Equal to or greater than 1,500 but less than 15,000</td>
<td>Once per 60 days (six times per year)</td>
</tr>
<tr>
<td>Equal to or greater than 15,000</td>
<td>Once per month (twelve times per year)</td>
</tr>
</tbody>
</table>

* Amount of biosolids (other than domestic sewage) land applied, placed on an active biosolids unit, or treated in an incinerator—dry-weight basis.
CREATING FINISHED COMPOST FOR MARKET
MARKETING COMPOST

- Marketing Planning and Plans
- Marketing Strategy
- Product Branding
- Market Segments
- Public Relations
• **Marketing planning** – a systematic approach to the development of marketing strategy and the achievement of goals

• **Marketing plan** – a specification of an organization’s marketing intentions and objectives
ADVANTAGES OF MARKETING PLANS

• Ensures continual evaluation of objectives and strategies
• Improves decision making
• Encourages a rational and integrated approach to decision making
• Improves efficiency of resource allocation
• Involves people in discussion and increases commitment
• Ensures the organization is better prepared for change
• Greater coordination
• Helps to highlight areas that might otherwise be missed
METHODS FOR CONTROLLING THE MARKETING PLAN

- Performance appraisal of employees/contractors
- Variance analysis
- Budget control
- Benchmarking
- Competitor performance
COMPONENTS OF A MARKETING STRATEGY

• Target market
• Positioning
• Marketing mix – the right product, the right promotion, the right price and the right distribution to satisfy customers
• Competitive advantage – gives the firm an edge over its rivals
EXTERNAL VARIABLES

- Outside the control of the business
  - Political
  - Competition
  - Economic
  - Social
  - Technological
  - Market characteristics
  - Industry structure
PRODUCT BRANDING

• Branding is NOT designing fancy logos and spending hours coming up with catchy slogans.

• Branding is NOT a term, symbol, name, color, or sign.

• Branding is NOT the messaging work a company does to encourage consumers to feel a certain way about their product.

• And branding is NOT some process by which you transform a commodity into a customer experience.
BRANDING BASICS

• Brand image is a mental or emotional association in the customer's mind. It is initiated by the images you use in your advertising, and the by words you use to describe your products. After sufficient impressions, the customer remembers these associations. Thus, your brand is born.

• **What is image?** It's the public perception, not what the company, product or service is, but how it is perceived. It lives, or doesn't, in the mind of your public.

• **What creates this image?** Everything from packaging to identity-these being the messengers affecting the marketplace's perception. PR and word-of-mouth are also soldiers in this battlefield.
A great Brand does all of your consumers thinking for them!

- Branding is not differentiating between your products and your competitors.
- Its making your consumers think that there is only one product in the market worth any money: YOURS!
MARKET SEGMENTS

- Fertilizer blending
- Direct agricultural application
- Bagged retail sales
- Landscape contractors
- Nurseries
USING PUBLIC RELATIONS TO BUILD YOUR BRAND

• Promoting products and services through media publicity rather than paid advertising
• Enhancing public awareness
• Projecting the organization as a source of opportunities
• Obtaining favorable comments in the media
MARKETING SUMMARY

• Understand what your customers need and expect
• Product branding and market strategy are key to a successful organics marketing program
• Product branding makes your consumers think that there is only one product in the market worth any money: YOURS
USMC Camp Pendleton Pipeline Restoration Project with Biosolids Compost

Before, Sept 2001  After, May 2002
Questions?

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