Empowering Organics

Our purpose is to help businesses, governments, and individuals meet zero waste and diversion goals and implement sustainable waste management practices. Using innovative technologies, we create a new path for organics that transforms wastes into valuable resources.
Harvest Power, Inc. Profile

*Founded in 2008, we provide industry recognized expertise, innovative technologies and project development capability to harness the renewable energy and soil-building potential in organic waste.*

### Corporate Profile

- Recognized industry leading experience in organics waste management, plant operations, and odor control; 5 proprietary patents
- Financial investments from Kleiner Perkins Caulfield & Byers, Munich Venture Partners, Waste Management Inc
  - $40MM in debt, equity and grants to date
  - 45 full-time employees to date
- Expanding technology portfolio supported by industry-leading science and technology advisors

### Operating Facilities

- Own and operate Fraser Richmond Soil & Fibre, the largest, most efficient composter of food and yard waste in Canada
- Profitably processing over 200k tons of food and yard waste per year
- Marketing generated end product and selling out yearly
- Planned commencement of high solids anaerobic digestion facility in 2011 to increase capacity and process a greater percent of food waste
Harvest’s Unique Characteristics

- Organics recycling company building next-generation facilities that unlock and optimize the energy and compost value of organic waste streams
- Highly experienced management team with expertise in design, development, finance, construction, renewable energy, and compost marketing
- Financial resources devoted to investing in and acquiring high-value projects along with partners
- Commercialized best-of-breed technologies that extract energy value from organics
- Source separated program development and support, community outreach and education
Processes and Transformations

1. **INPUTS**
   ORGANIC WASTE
   - FOOD SCRAPES, YARD DEBRIS, PAPER FIBERS, CLEAN WOOD WASTE, MANURE, CROP RESIDUALS, BIOSOLIDS

2. **PROCESS**
   TECHNOLOGIES
   - COVERED AERATED STATIC PILE COMPOSTING
   - HIGH SOLIDS ANAEROBIC DIGESTION
   - GASIFICATION

3. **OUTPUTS**
   HIGHER VALUE PRODUCTS
   - COMPOST, MULCH, MANUFACTURED SOILS
   - ENERGY
   - BIOCHAR
Harvest deploys site-specific best-of-breed technologies to maximize project economics:

- **Composting**
  - Proprietary top-tier composting systems and processes to enhance project revenue
  - Highest degree of odor and process control
  - Highly efficient with demonstrated cost leadership

- **High Solids Anaerobic Digestion (HSAD)**
  - Simple, robust, and low cost system to generate and capture methane gas from dry organic residuals
  - Enclosed design for odor control
  - Many facilities operating in Europe → commercially proven technology
  - Harvest specializes in technology transfer

- **Distributed Biomass Gasification**
  - Allothermal gasification produces clean syngas with high heating value → broad range of applications
  - 20 times the heat transfer capability of traditional gasification technologies
  - Small footprint leads to low capital costs and high siting flexibility
  - Earlier stage technology with one plant operating in Europe
Input of Organic Material
- Source separated organic food and yard waste delivered to facility
- Little to no pre-processing required
- Waste placed into hydrolysis percolators using front end loaders

Anaerobic Digestion
- Organic residuals broken down by microorganisms in percolate liquid
- Biogas collected, processed, and sold as electricity and heat (pipeline natural gas or CNG fuel are also possible)

Aerobic Composting
- Digestate aerobically composted, cured, and aged over six weeks
- Finished compost product screened and marketed
30,000 tons per year

Each facility may be completely enclosed, making it suitable for urban and suburban locations.

1. Organic Waste Receiving Hall
2. Hydrolysis Percolator Loading Hall
3. Hydrolysis Percolators
4. Hydrolysate Buffer Tank
5. Methane Digesters
6. Digester Effluent Buffer Tank
7. HSAD Mechanical Room
8. CHP Units
9. UCASP Feedstock Mixing
10. Unturned Covered Aerated Static Pile (UCASP)
11. Ventilation System
12. HSAD and CASP Biofilter
13. Screening, Curing, Finished Product
14. Visitors’ Center
Sample Plant Photos
**HSAD System Specifications**

### Organic Material Input Requirements

<table>
<thead>
<tr>
<th>Minimum Capacity</th>
<th>30,000 tons per year of organic waste, produces approximately 2 MW of power and heat</th>
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<tbody>
<tr>
<td>Preferred material</td>
<td>50%-70% food waste, 30%-50% yard waste, plus additional yard waste for post-anaerobic digestion composting</td>
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<tr>
<td>Bulk density</td>
<td>750 lbs/cubic yard or less</td>
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<tr>
<td>Solids content</td>
<td>Targeting 35%; can handle 25%-50%</td>
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<tr>
<td>Regularity of Supply</td>
<td>Need regular supply of food waste; can handle seasonality of yard waste by storing material from high-volume seasons for use during winter</td>
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### Preferred Site Characteristics

| Size | 3-10 acres (including aerobic composting) |
| Zoning | Heavy industrial and/or solid waste zoning |
| Existing Use | Prefer location permitted to handle solid waste (compost facilities, transfer stations, etc.) or other industrial use |
| Co-location | Co-location with large user of electricity and/or heat is desirable (e.g., greenhouses, wastewater treatment plants, manufacturing plants, etc.) |
| Road access | Good access and excess truck traffic capacity |
| Neighbors | Compatible surrounding land uses, good distance from the nearest sensitive receptor |
HSAD – Environmental Attributes

**Biogas Purity**
Process yields biogas with average methane content of 65% to 80%, considerably higher than many other HSAD technologies. Less biogas cleaning and processing required.

**Residence Time**
Process design allows for a feedstock residence time of approximately two weeks, increasing processing capacity and reducing facility footprint.

**Operational Requirements**
No grinding, slurrying required; only moving part is front-end loader; entire process controlled by computer.
HSAD – Environmental Attributes (2)

**Odor Control**
AD process naturally breaks down many of the volatile compounds that cause odor; system under negative pressure with air ventilated through biofilter, eliminating VOCs; facility totally enclosable.

**Water Usage & Leachate Control**
Large portion of leachate is re-circulated to aid in digestion and gas yield; the remainder may be used in compost process.

**Energy Requirements**
Very low parasitic energy use; requirements can be met completely with energy generated on-site.
Wet vs. High Solids Anaerobic Digestion

**Solids Content**
- Wet: 2% 10%
- High Solids: 25% 50%

**Feedstock**
- Wet: WWTP, manure
- High Solids: Food, yard, wood waste

**Pre-Processing**
- Wet: Grinding, slurrying
- High Solids: None
Conclusion: Partnering with Harvest

Harvest can help communities:

- Become leaders in sustainability through organics recycling
- Control costs and process resources internally
- Increase energy independence and clean the air through local, distributed, low-cost, clean energy
- Revitalize local landscape and agriculture through high-grade organic soil products
- Minimize environmental impacts of waste processing through small-footprint facilities

We do so by:

- Designing, developing, financing, building, and operating organics recycling facilities
- Customizing our state-of-the-art facilities to fit processing plants’ feedstock and infrastructure
- Devoting resources to education and environmental leadership programs
- Obtaining available government credits and incentives