



Understanding On-site Food Waste Reduction Technologies: Commercial Dehydrators and Liquefiers



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Overview

■ Food Waste Dehydrators and Liquefiers

- Technology Descriptions
- Technology Examples
- Case Studies
- Claims Made by Vendors
- Places Within the Food Cycle

■ Food Recovery Hierarchy

■ Conclusions and Implications



Above: Non-hazardous waste management hierarchy, U.S. EPA:

<http://www.epa.gov/waste/nonhaz/municipal/hierarchy.htm>

Food Waste Dehydrators

Technology Description

- Water removed from heat and turning; “dry system”
- Volume & mass reduced 70-90%; batch system⁽¹⁰⁾
- Can be coupled with pulping or dewatering prior to dehydration⁽⁴⁾
- Residual Materials = Dehydrated Food Waste and Condensate Water
- Dehydrated Food Waste is NOT compost⁽¹⁾



LOS ANGELES
MISSION COLLEGE

Left: Los Angeles
Mission College, 2010.

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Food Waste Dehydrators

Technology Description



Above: Dehydrated Food Waste from Loyola Marymount University, 2010.

Food Waste Dehydrators

Technology Example

Somat eCorect® DH-100w

- Capacity = 220 lbs. daily/18-hour cycle⁽⁹⁾
- Electricity Usage = Daily estimate - 3 kW⁽⁴⁾
- Temperature = Up to 180° F⁽⁹⁾
- Unit Cost = Approximately \$32,000⁽⁴⁾



Right: Costco in Irvine, CA, 2008.



Food Waste Dehydrators

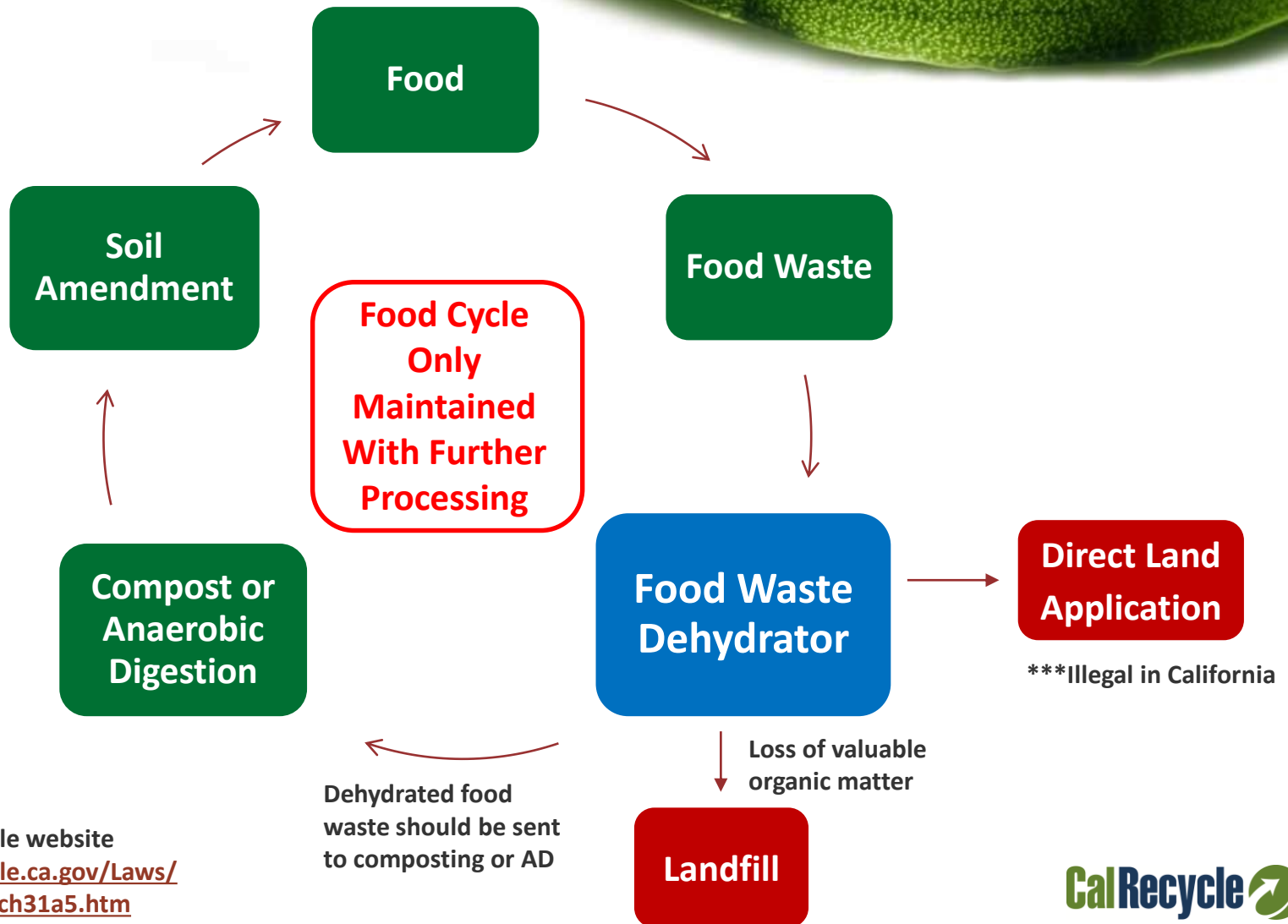
Claims made by vendors:

- *“The end product is a material ideal for use as soil amendment.”*
- *“Decomposes compostable waste without using microorganisms, enzymes or additives.”*
- Condensate water is “sterile water for landscaping or other recoverable use.”
- *“Reduces carbon footprint.”*
- *“Zero environmental impact.”*



Food Waste Dehydrators

The Food Cycle



*** Source: CalRecycle website
<http://www.calrecycle.ca.gov/Laws/Regulations/Title14/ch31a5.htm>

Food Waste Dehydrators

New CalRecycle Webpage

Food Waste Dehydrators x

www.calrecycle.ca.gov/organics/food/dehydrators.htm

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Food Scraps Management
Technologies: Food Waste Dehydrators

Green highlighted words indicate definitions and links to the glossary section.

Commercial vendors are promoting food waste dehydrators to California businesses and institutions that generate large quantities of food waste, such as restaurants, hotels, grocery stores, universities, and prisons. This webpage provides information that may be helpful when evaluating whether this type of technology is appropriate for your facility.

Background

- Food waste dehydrators operate with electricity and are typically installed in commercial settings where food waste can be separated from other waste and placed into a dehydrator located near the food preparation area.
- Commercial food waste dehydrators should not be confused with home dehydrators, which are used for drying fruits, vegetables, and meat for consumption.
- Food waste dehydrators shred food waste and use heat to evaporate moisture. The residual is dried food waste, which is a pulpy mass dry to the touch.
- Dried food waste is not **compost** or a compost product. Food waste dehydrators do not use a biological process to reduce pathogens and decompose food waste into a stable substance.
- If it becomes wet again, the dried food waste can re-absorb water. At this point it will have similar characteristics to unprocessed food waste, meaning it can attract vectors and create odor.

Proper Handling of Dehydrated Food Waste

State regulations do not define dehydrated food waste any differently than unprocessed food waste; it is considered a solid waste and must be handled as such. State regulations require solid waste to be removed from business and residences at least once each week and taken to a facility designed and permitted to handle the waste. In addition to state requirements, solid waste handling may also be subject to local ordinances. Anyone using a food dehydrator should check with their local (city or county) government to determine whether there are local rules regarding solid waste handling and transport that must be considered.

Compost that has been pathogen reduced and tested, as required by [state regulations](#), can be used as a soil amendment. Incorporating uncomposted food waste into soil, or using it as mulch, is disposal. Only operations that meet all local and state requirements can legally dispose of solid waste.

Food waste—including dehydrated food waste—can be a feedstock at a compost facility. In small amounts it can also be composted where it is produced. For specific requirements for on-site composting that does not require a permit, see [California Code of Regulations, Title 14, section 17855](#).

Dehydrated food waste may potentially have value as an ingredient for animal feed or fertilizer. [The California Department of Food and Agriculture](#) (CDFA) regulates the manufacture and distribution of [effective and safe animal feed](#) and fertilizer. Anyone proposing to sell dehydrated food waste [as a feed](#) or [as a fertilizer](#) must first get approval from CDFA.

Other Considerations

Dehydrating food waste reduces weight and volume, which can lead to reduced hauling and disposal costs. If the material is kept dry, dehydrators may also help reduce odors and vectors associated with handling and storing food waste.

Research


Few studies have been performed on dehydrated food waste. One such [study conducted at Loyola Marymount University](#) in 2010 concluded the following:

- Unprocessed dehydrated food waste samples were not suitable as a soil amendment on the Loyola Marymount University campus.
- Rehydration produced large quantities of fungus. Although dehydrated, the material was not decomposed to a stable state.
- Further processing of the material is needed before it would be suitable as a soil amendment.

For More Information

- [Food Waste Diversion at an Urban University \(Loyola Marymount University\)](#)

Samples of dehydrated food waste and product from Loyola Marymount University in 2010. Select each image for larger view.



<http://www.calrecycle.ca.gov/organics/food/dehydrators.htm>



Food Waste

Dehydrators

California State Regulation

- Dehydrated food waste is food waste.
- Land application of food waste is disposal.



Title 14, Section 17852 (a)(15)(C)

[http://www.calrecycle.ca.gov/Laws/Regulations/
Title14/ch31.htm](http://www.calrecycle.ca.gov/Laws/Regulations/Title14/ch31.htm)

Food Waste Dehydrators

Case Study:

California State Teachers Retirement System (CalSTRS) West Sacramento, CA

- 13-story building, completed in 2009
- 490,000 sq. ft. of office space
- 2 LEED certifications:
 - Gold - LEED BD+C: New Construction v2.1 (2009)
 - Platinum - LEED O+M: Existing Buildings v2009 (2011)
- Request for LEED Innovation in Design credit for dehydrator was reportedly denied by USGBC



Above: CalSTRS Building,
West Sacramento, CA, 2014.

CALSTRS



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Food Waste Dehydrators

Case Study:

CalSTRS Building

West Sacramento, CA

- Somat eCorect® food waste dehydrator
- Leased from WM, Inc. (2009 – 2014)
- Feedstock: **Pre-consumer** food waste
 - **Post-consumer** food waste also diverted, but not put through dehydrator
- Did not attempt to use dehydrated food waste as a soil amendment



Above: Food Waste Dehydrator at CalSTRS building in West Sacramento, CA.

Food Waste Dehydrators

Case Study: CalSTRS Building West Sacramento, CA

Monthly food waste generation:

- 45 cy = post-consumer (sent directly to composting)
- 2 cy = pre-consumer (dehydrated, then composted)
- Both sent to Northern Recycling Compost - Zamora



Left: Compost windrow
at Northern Recycling
Compost – Zamora.

Food Waste Dehydrators

Example:
**CalSTRS Building
West Sacramento, CA**

- Dehydrator needed frequent mechanical repairs
- CalSTRS ended dehydrator lease in 2014
- All food waste diverted now hauled to the Clean World Sacramento Anaerobic Digester



CleanWorld
Alive with possibilities

Left: Clean World
Sacramento Digester,
West Sacramento, CA,
2014.



Food Waste Liquefiers

Technology Description

- Converts food waste into wastewater effluent; “wet system”⁽⁴⁾
- Mechanical turning; continuous feed system
- Potable water continually added; hundreds of gallons/day
- Plastic chips sometimes used; microbe habitat and to aid turning
- Proprietary microbes and/or enzymes may need to be added
- Wastewater effluent byproduct sent to sewer system⁽³⁾



Left: Power Knot LFC-70 liquefier at the Fujitsu campus in Sunnyvale, CA.
Photo credit: [BioCycle, 2014](#).

Food Waste Liquefiers

Technology Example

ORCA Green™ Machine Model OG600

- Capacity: 600 lbs. (every 1 – 2 days)
- Electricity Usage: 0.37 kw⁽⁴⁾
- Unit cost: Rental only - \$1,000 - \$2,000/month⁽⁴⁾
- Food waste processed in 24 – 48 hours
- Water Usage
 - Uses approx. 175 gallons/day⁽⁷⁾
 - Generates approx. 300 gallons/day⁽⁷⁾



Above: ORCA Totally Green unit.

<http://www.totallygreen.com/>

Food Waste Liquefiers

Case Study: Loyola Marymount University, Los Angeles, CA

- ORCA Totally Green liquefier installed at LMU in 2011
- Used primarily for food waste from catered events
- Effluent sent to Hyperion Wastewater Treatment Plant
- ORCA liquefier was utilized for approximately 2 years
- The unit was removed in 2013 after a mechanical failure
- Replaced the ORCA with a Somat food waste dehydrator



Left: Loyola Marymount
University, Los Angeles,
2012.

Food Waste Liquefiers

Case Study: Loyola Marymount University, Los Angeles, CA

- LMU partnered with CSU, Northridge to study the liquefier
- CSUN [Master's Thesis](#) studied ORCA - Ms. Maryam DeHaghin
- Results: ORCA effluent much "stronger" than raw sewage
- High levels of fecal indicator bacteria (pathogen indicator)
- High levels of BOD, FOG, TSS, Nitrates and Phosphates⁽³⁾



California State University
Northridge

LMU | **LA**
Loyola Marymount
University

Left: Faculty and students in the environmental science laboratory at Loyola Marymount University, Los Angeles, 2012.

Food Waste Liquefiers

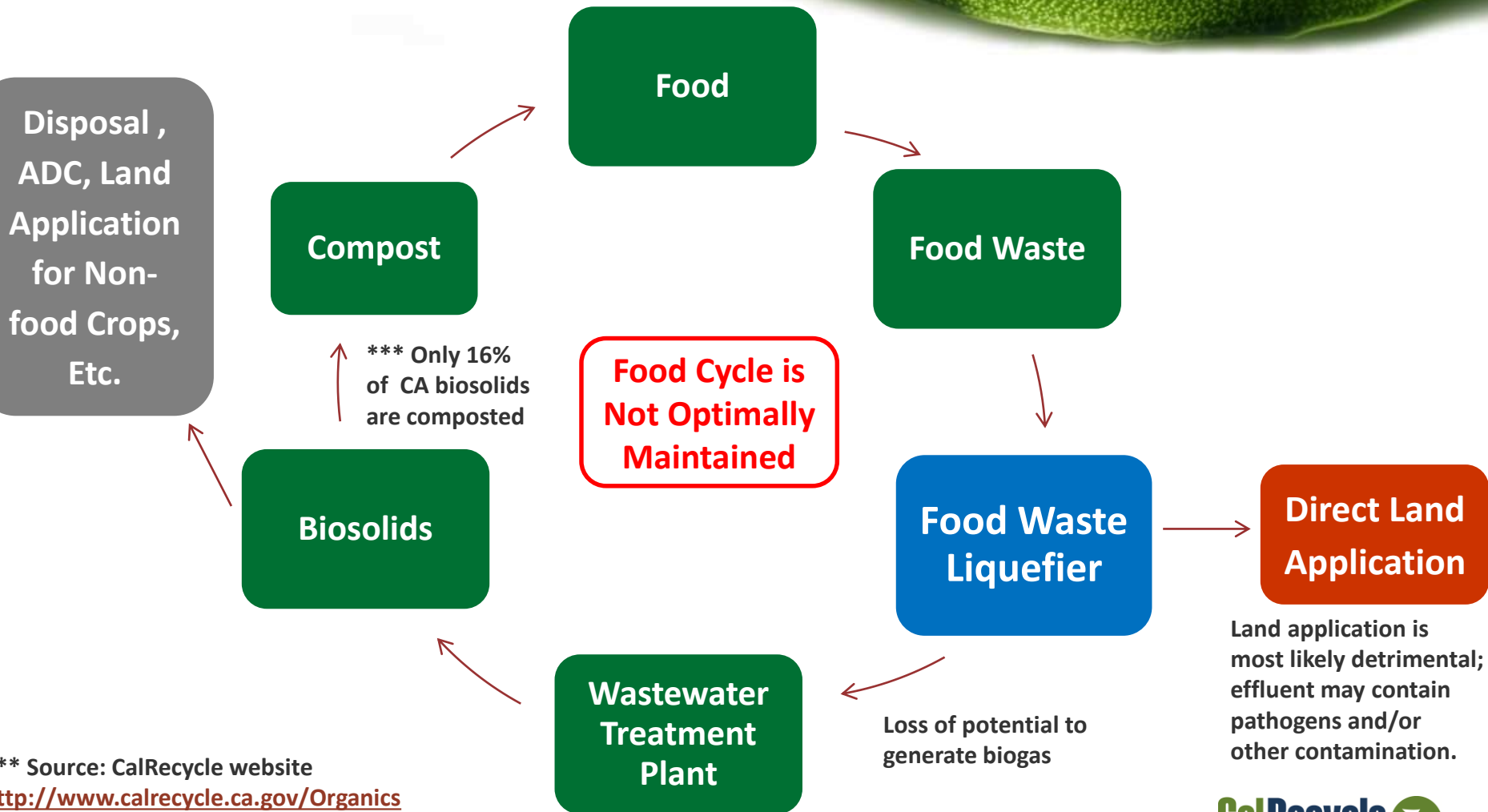
Claims made by vendors:

- *“Effluent can be re-used for irrigation and agricultural applications.”*
- *“There are no by-products, this water can go down the drain or gets recycled for gardening.”*
- *“The liquid compost is channeled through the sewer system or can be returned to the soil as nourishment.”*



Food Cycle

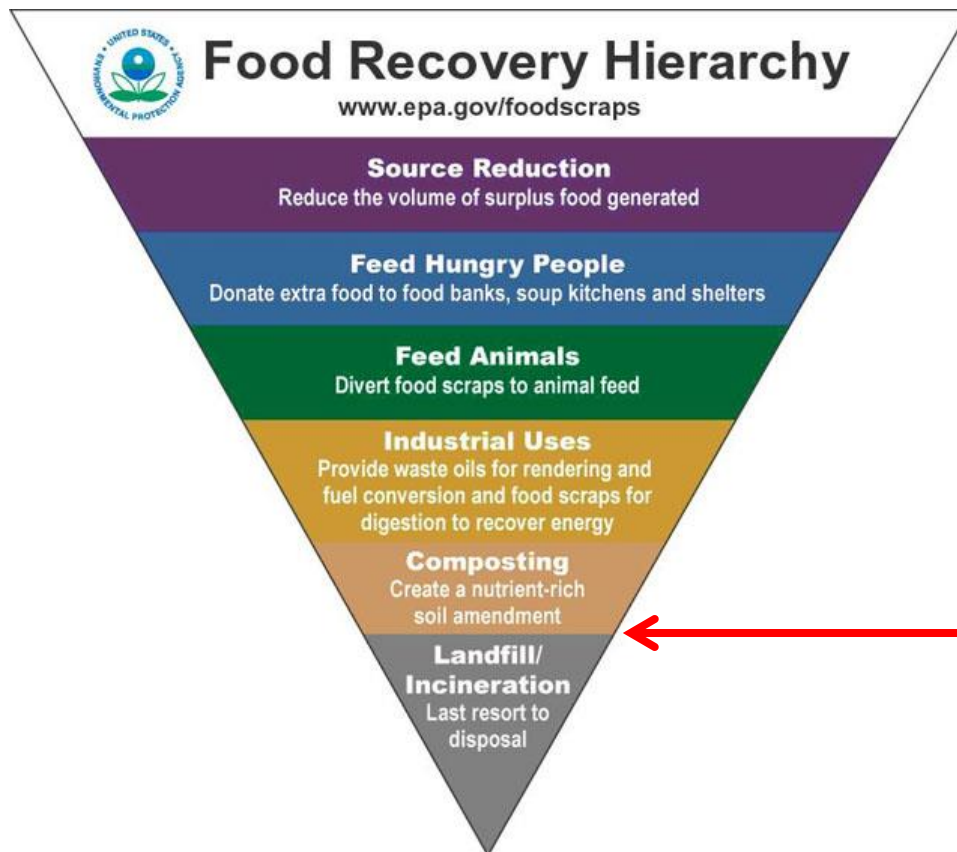
Food Waste Liquefiers



*** Source: CalRecycle website
<http://www.calrecycle.ca.gov/Organics/Biosolids/#Application>

Food Waste Dehydrators and Liquefiers

Food Recovery Hierarchy



- Dehydrated food waste must be disposed or sent to composting and/or AD
- Liquefied food waste is sent to the sewer with little to no beneficial use
- **Without further processing, dehydration and liquefaction are low on the hierarchy**

Conclusions and Implications

Understanding Food Waste Dehydrators and Liquefiers

- Not stand-alone solutions; can be a link in a chain
 - **Dehydrators:** Can be coupled with composting and/or anaerobic digestion for full beneficial use
 - **Liquefiers:** Contact local wastewater treatment authority to understand sewer discharge implications
- Conduct a cost-benefit analysis to determine suitability
- Contact known users of the technologies for testimonials
- Do your homework; read literature to keep up to date



References

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