



**Pacific Organics Residual Symposium,  
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# **Urban Biomass Conversion Technologies Deployment in California – An Update**

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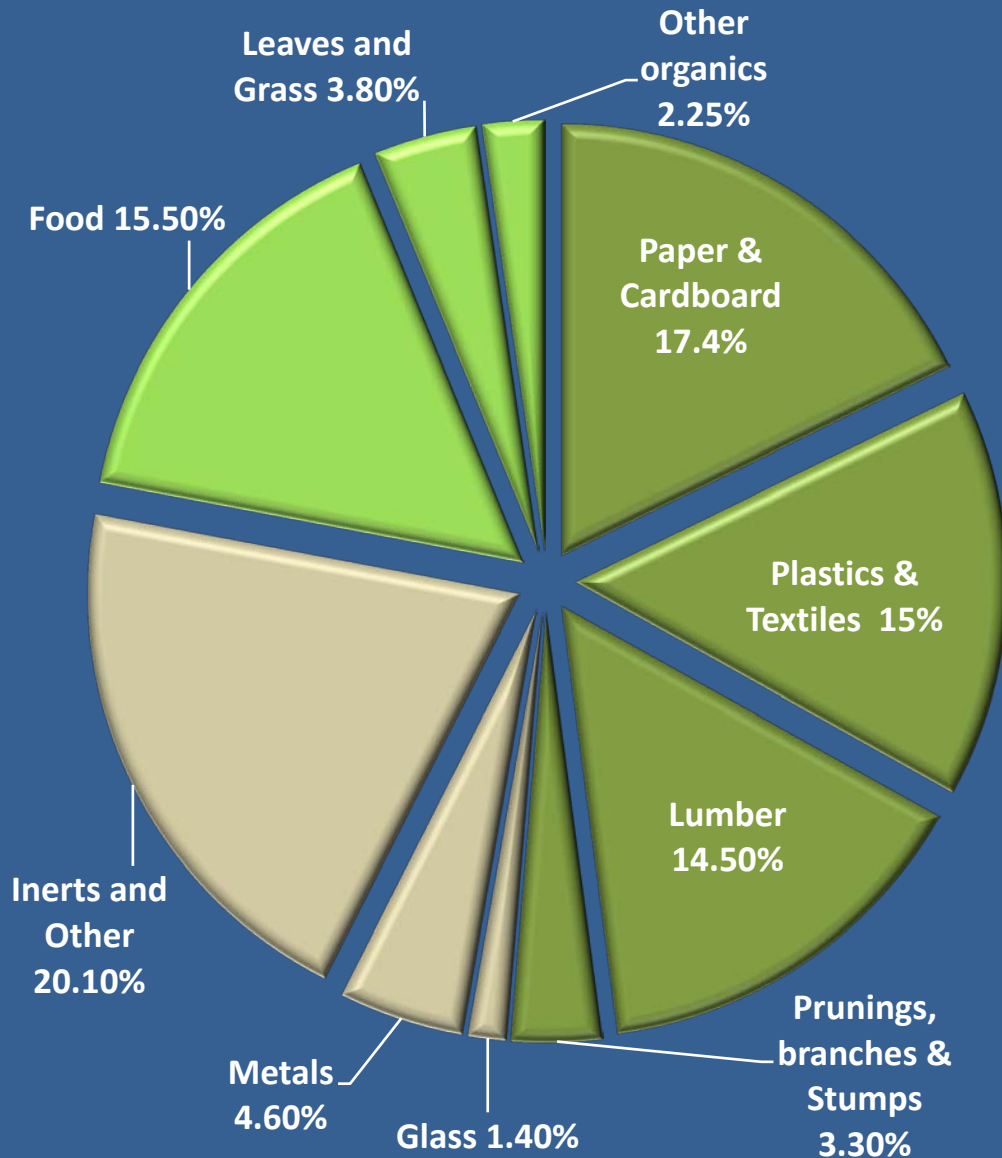




# Overview

- Resource base and policy drivers
- Conversion Technologies in a nutshell
- Sample Projects
- CalRecycle Projects & Resources

# California landfilled waste stream



- 39 million tons MSW landfilled per year
- 70% carbon based
- About 25% suitable for Anaerobic Digestion
- Energy potential 15,000 GWh/year
- 8% of State electricity

Source: CalRecycle



# Conversion Technology Drivers

(a partial list)

**1- Lack of new landfill space close to population centers**

**2- AB 32 - Global Warming Solutions Act of 2006**

Anaerobic Digestion measure

**3- Renewable Portfolio Standard - 33% by 2020**

**4- Low Carbon Fuel Standard:** Deliver automotive energy by 2020

with 10% less greenhouse gases than 2010

**5- CalRecycle Strategic directives 6.1 & 9.2 – Organics diversion and Bioenergy & Biofuels R&D**

## Feedstocks

MSW \*

Green waste

Food waste

Paper

Wood waste

Fats Oil Grease

MRF residuals \*\*

## Technologies

Anaerobic Digestion

Fermentation

Gasification

Pyrolysis

Hybrid

## Products

Electricity

Biogas

Biodiesel

Ethanol

Hydrogen

Heat

Chemicals

Syngas

Liquid Fuels

Compost

\* MSW: Municipal Solid Waste

\*\* MRF: Material Recovery Facility



# Evaluation of Conversion Technologies for Municipal Waste Management

## Jurisdiction Sponsored Evaluations (a partial list)

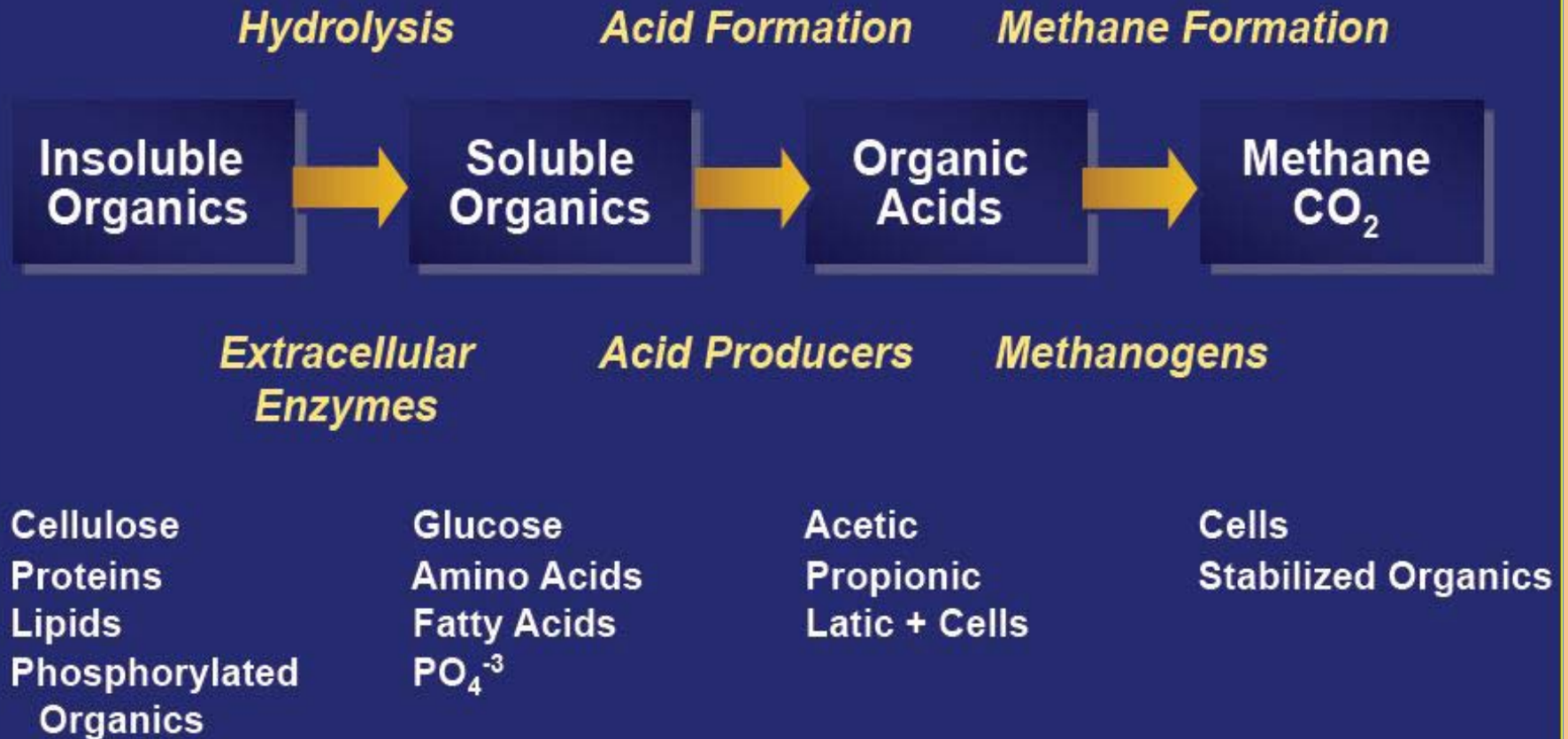
- City of Los Angeles
- County of Los Angeles
- City & County of Santa Barbara
- Salinas Valley Solid Waste Authority
- Cities of San Jose, Tulare, San Diego & Santa Cruz



# Evaluation of Conversion Technologies for Municipal Waste Management

- **Jurisdiction Sponsored Evaluations** (partial list)
  - City of New York
  - Taunton, Massachusetts
  - Toronto, Ontario, Canada
  - San Lucie County, Florida
  - Delaware Solid Waste Management Authority
  - Connecticut Resources Recovery Authority

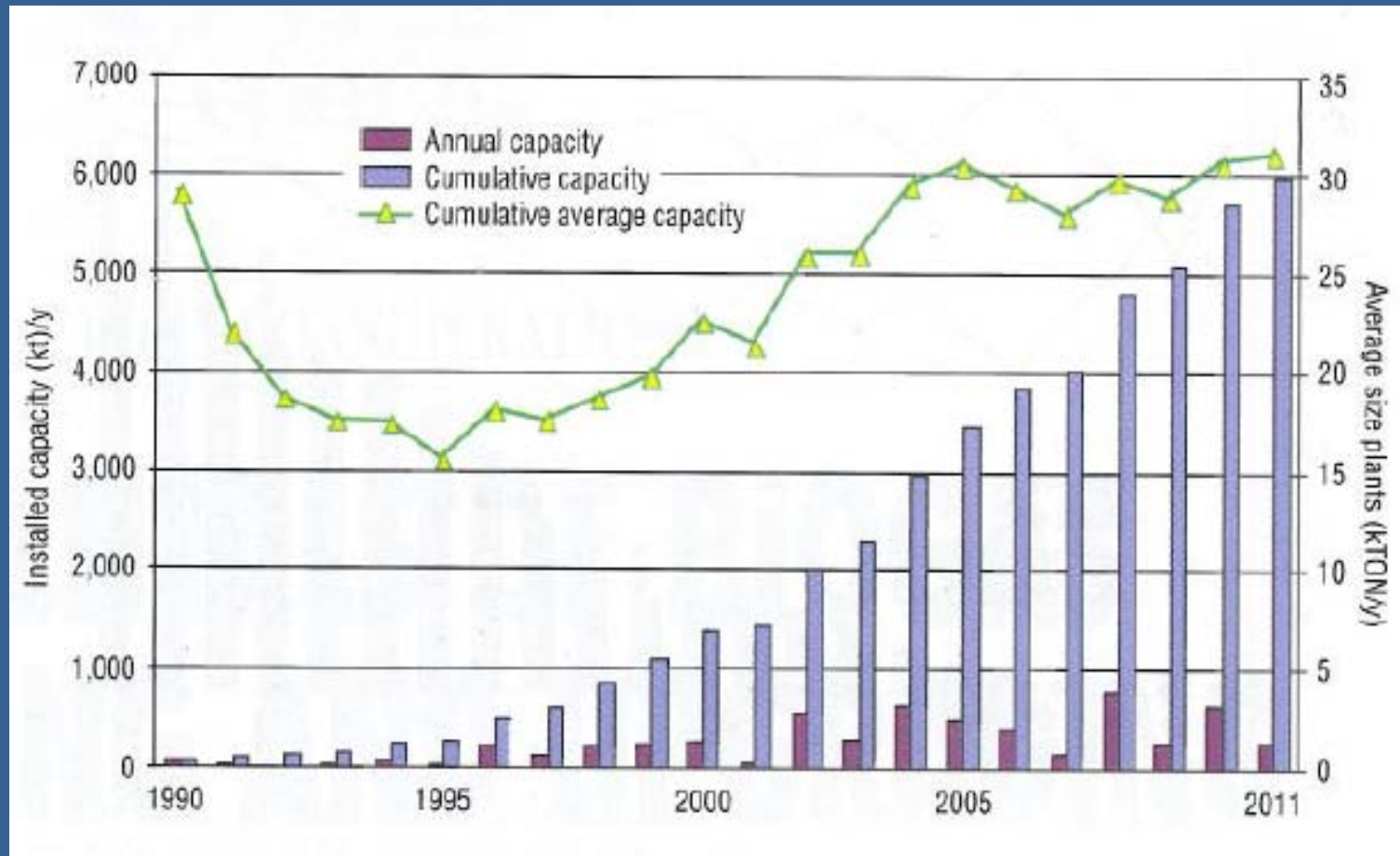
# Anaerobic Digestion



Credit: Bob Gillete, Carollo Engineers



# European Installed Anaerobic Digestion Capacity



Source: De Baere & Mattheeuws, Biocycle – Feb '10

# Anaerobic Digestion of Food Waste in Waste Water Treatment plants

(A partial list)

- East Bay Municipal Utility District
- Sacramento Co. Regional WWTP – SMUD
- City of San Rafael – Central Marin Sanitation
- City of Riverside
- Humboldt Co. Waste Authority



Photo: J. Franco – City of San Jose WWTP

# East Bay Municipal Utility District Food waste digestion project



*Photos by EBMUD*

# Planned California AD projects (partial list)

Inland Empire Utility Agency (IEUA), Chino

- Food Waste
- Phase 1: 200 tpd (up to 500 tpd)

Zero Waste Energy, San Jose

- Post MRF organics, 150,000 tpy



# Planned California AD projects (partial list)

- Sacramento Transfer Station

Throughput : Around 120 tpd (Two phases)

Source separated black bin (46% organics)

Partnership with SMUD & US DOE funding

Developer: Real Energy (Napa)

Technology Vendor: Ros Roca (Spain/Germany)



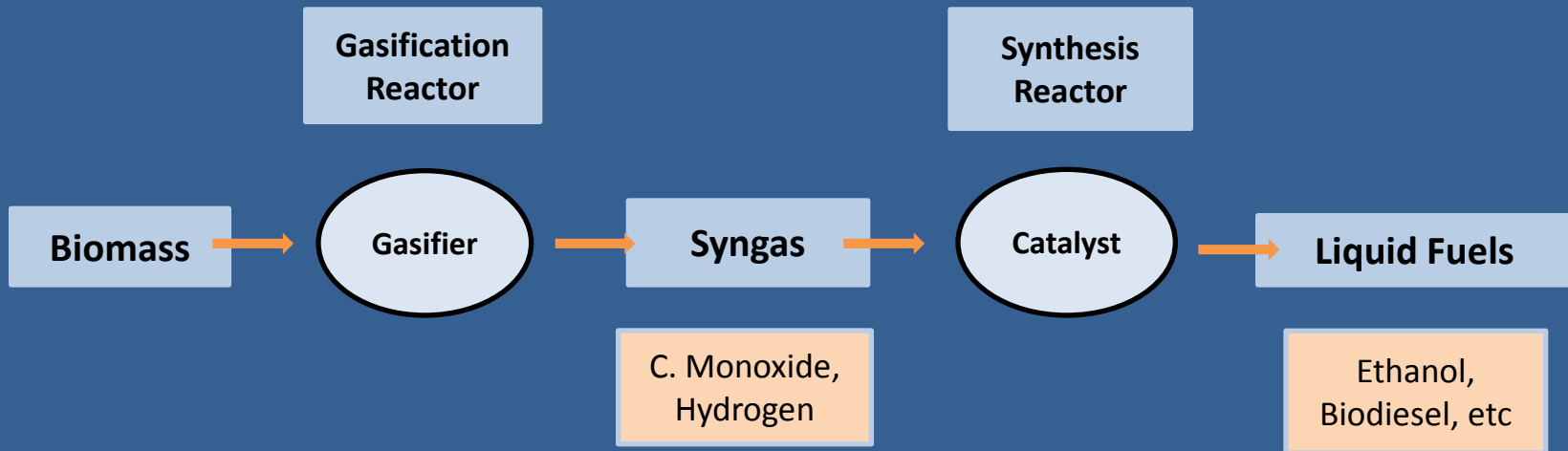


# Proposed CR&R, Perris AD Project (150 tpd)



- Will digest various organic residuals
- In negotiations with City and County of Los Angeles
- ArrowBio technology developed in Israel (facilities in Australia & Israel)

# Simplified conversion of biomass to liquid fuels (Gasification)



# Phoenix Energy LLC., Merced Gasifier



## **Feedstock:**

Waste wood pallets (4,000 tons/year)

## **Generating Capacity:** 750 Kwh

**Power purchase agreement with PG&E in place**

**Funding:** CalRecycle's Recycling Marked Development Zones (RMDZ) loan

## **Loan Info:**

[www.calrecycle.ca.gov/RMDZ/Loans/](http://www.calrecycle.ca.gov/RMDZ/Loans/)



# Dixon Ridge Farms Walnut Shell Gasifier, Yolo Co.



**Project Funding: CA Energy  
Commission & others**

# UC – West Biofuels Biomass to Power & Ethanol pilot project, Woodland, CA

- Dual Bed Gasifier design
- Capacity: 5 tons per day
- Production Cost Goal:  
Less than \$60 per barrel of  
oil equivalent
- Phase 1: Wood chips
- Phase 2: Post Material  
Recovery Facility residuals



Photo: Jacques Franco



# UC – West Biofuels Biomass to Power & Ethanol project



**Sample Phase II feedstock:** Post Material Recovery Facility Residuals

# Dockside Green - Nexterra Waste Wood Gasifier, Victoria, BC - Canada





# Research Projects and Resources

- UC Davis Biogas Energy Project  
**aka** Anaerobic Phased Solids Digester
- Yolo County Landfill. In-Situ AD compost Project
- Rotary Drum Reactor technology assessment project
- AD Programmatic Environmental Impact Review



# UC Davis Biogas Energy Pilot Project



*Photo: Ruihong Zhang, UC Davis*

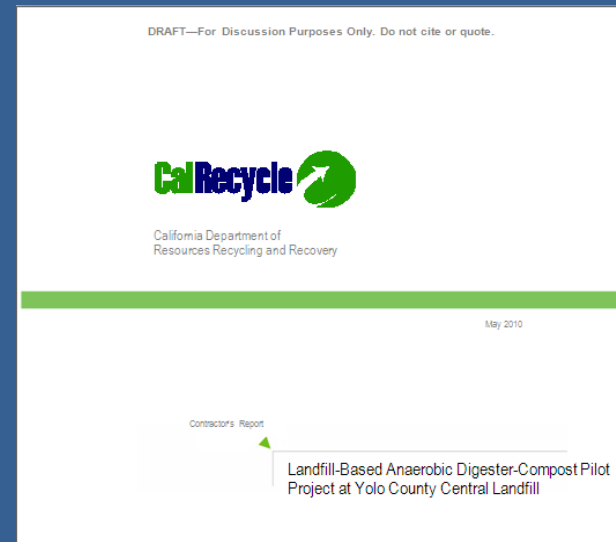
# Yolo County Landfill

## In-Situ AD Compost Pilot Project



*Photo: Ramin Yazdani, Yolo Co.*

**5/10 - Landfill-Based Anaerobic  
Digester-Compost Pilot Project at  
Yolo County Landfill**



# UCD Rotating Drum Reactor Project



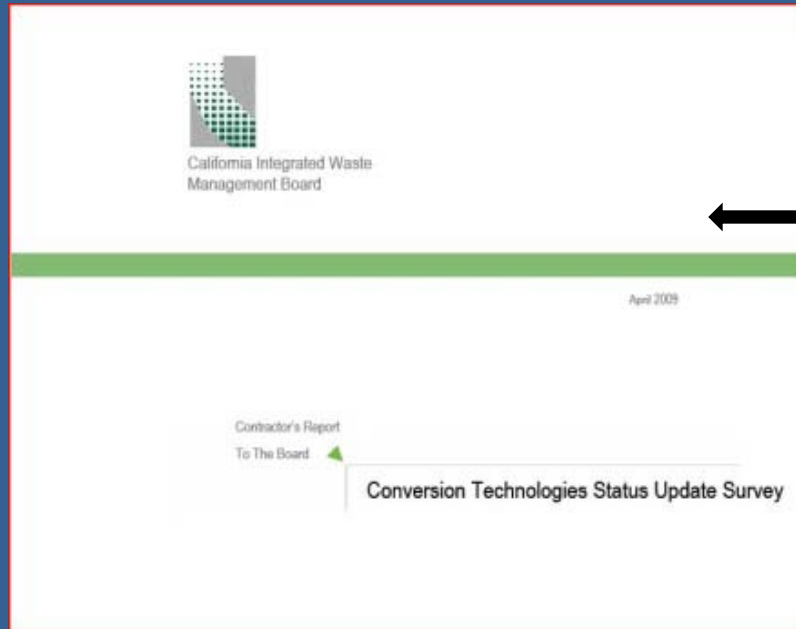
Source: Ruihong Zhang, UC Davis

6/10 – Integration of Rotary Drum Reactor & AD technologies for the treatment of MSW





# Recent CalRecycle Publications



← **Conversion Technologies Status Survey (4/09)**

**Current Anaerobic Digestion Technologies Used for MSW organics treatment (3/08)**



[www.calrecycle.ca.gov/Organics/Conversion/](http://www.calrecycle.ca.gov/Organics/Conversion/)

# Anaerobic Digestion Programmatic EIR

Preparation of an Environmental Impact Report to assess the environmental impact of siting new anaerobic digestion facilities in California.

Draft report due in the Fall

Contact: Ken Decio, 916-341-6313



# Resources

**CA Energy Commission AB 118 funding:**

<http://www.energy.ca.gov/altfuels/index.html>

**Jurisdictions Conversion Technologies Evaluation Reports:**

[www.calrecycle.ca.gov/Organics/Conversion/Events](http://www.calrecycle.ca.gov/Organics/Conversion/Events)



## Resources

- CalRecycle Conversion Technologies (CT) page:  
[www.calrecycle.ca.gov/](http://www.calrecycle.ca.gov/)
- CT mailing list: [www.calrecycle.ca.gov/Listservs/](http://www.calrecycle.ca.gov/Listservs/)
- California Biomass Collaborative Forum  
[biomass.ucdavis.edu/](http://biomass.ucdavis.edu/)

# Questions?

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[www.calrecycle.ca.gov/Organics/Conversion](http://www.calrecycle.ca.gov/Organics/Conversion)

**Mail List:** [www.calrecycle.ca.gov/Listservs/](http://www.calrecycle.ca.gov/Listservs/)