

US EPA ARCHIVE DOCUMENT

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Urban Biomass Conversion Technologies Deployment in California – An Update

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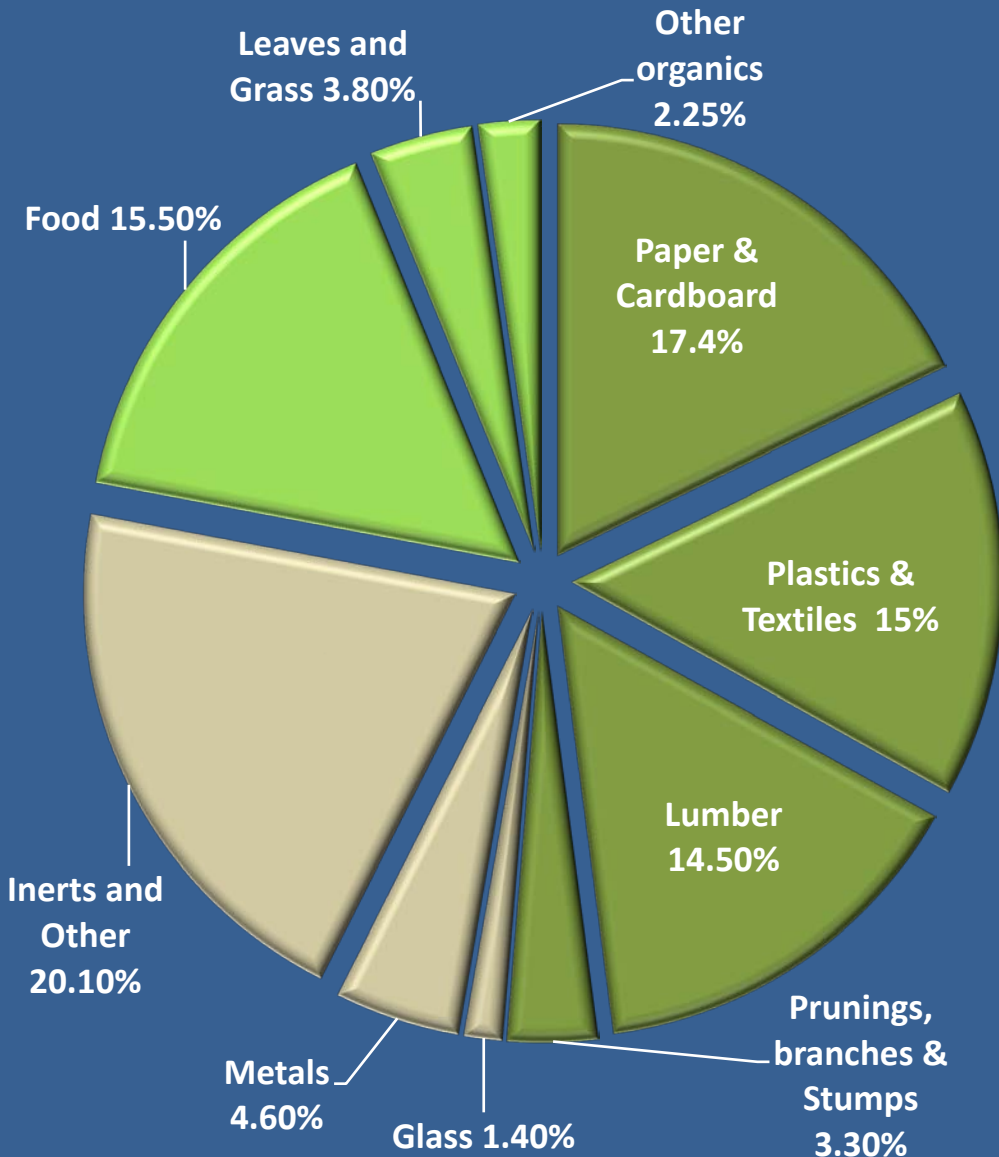




Overview

- 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 **

* MSW: Municipal Solid Waste

** MRF: Material Recovery Facility

Technologies

Anaerobic Digestion

Fermentation

Gasification

Pyrolysis

Hybrid

Products

Electricity

Biogas

Biodiesel

Ethanol

Hydrogen

Heat

Chemicals

Syngas

Liquid Fuels

Compost



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

Hydrolysis

Acid Formation

Methane Formation

**Insoluble
Organics**



**Soluble
Organics**



**Organic
Acids**



**Methane
CO₂**

*Extracellular
Enzymes*

Acid Producers

Methanogens

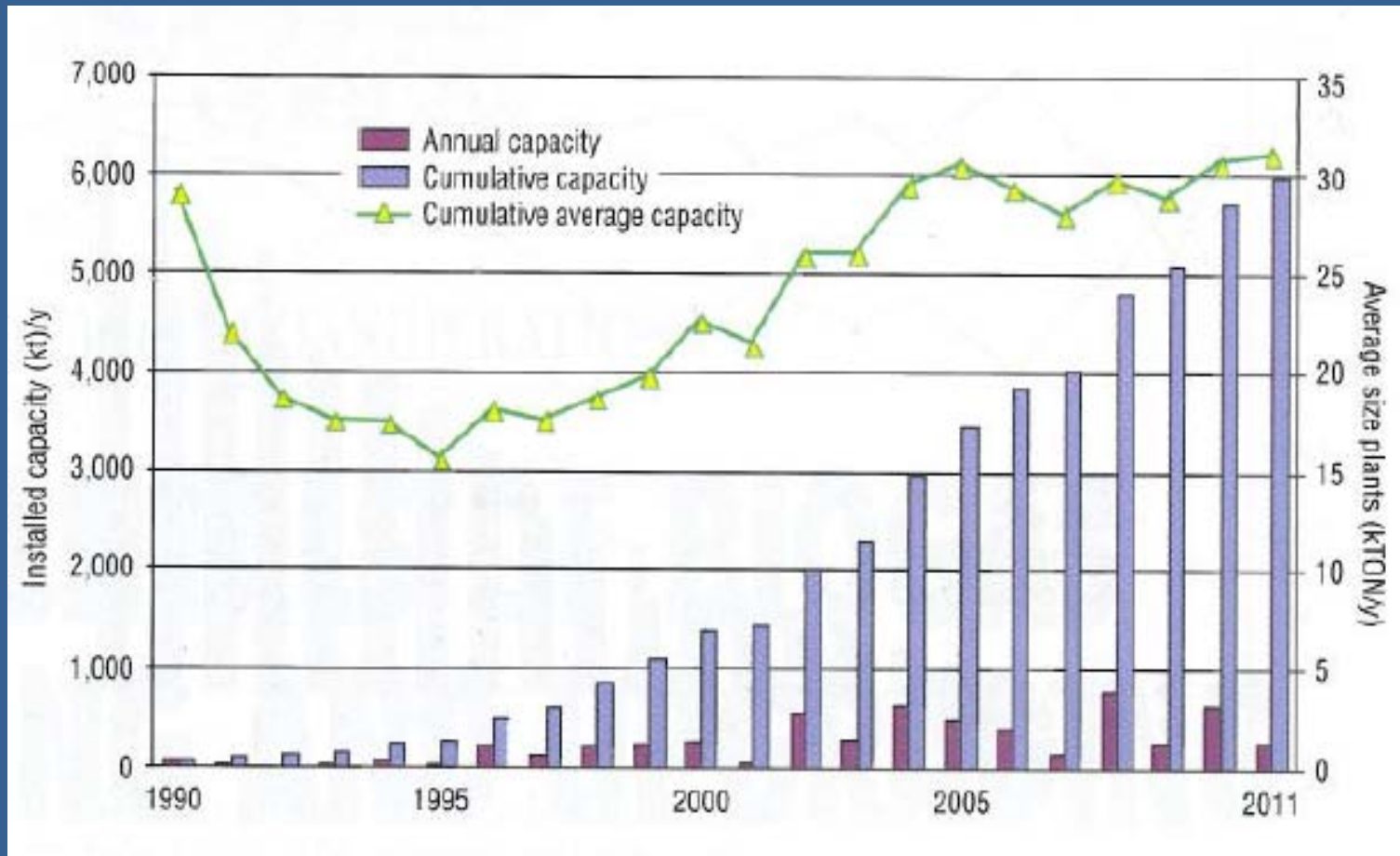
Cellulose
Proteins
Lipids
Phosphorylated
Organics

Glucose
Amino Acids
Fatty Acids
PO₄⁻³

Acetic
Propionic
Lactic + Cells

Cells
Stabilized Organics

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)

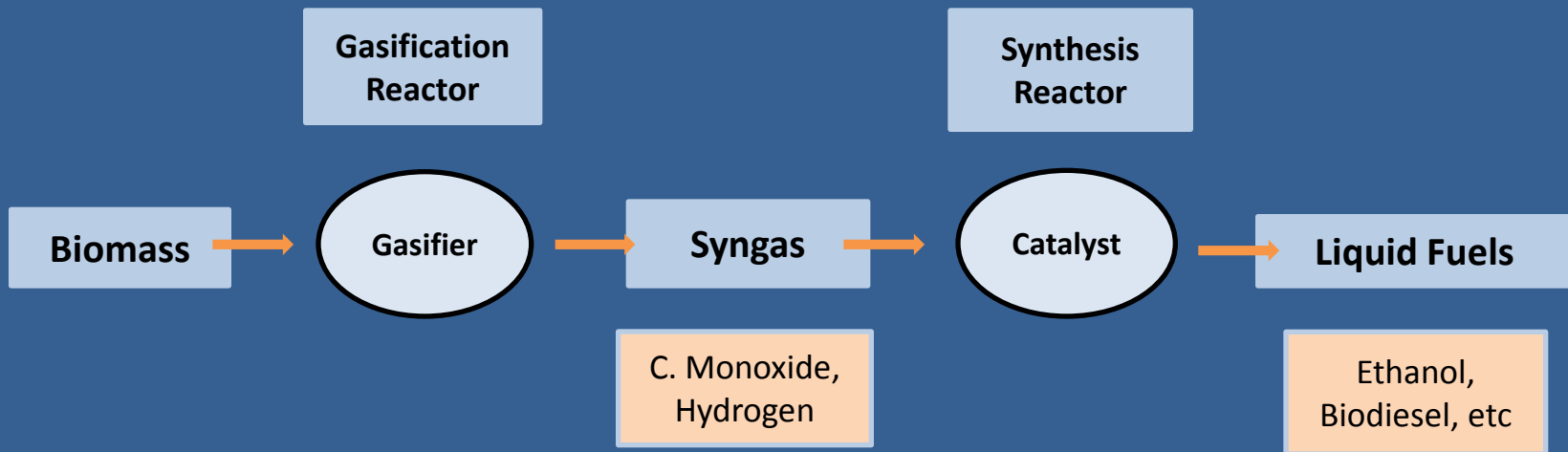


Proposed CR&R, Perris AD Project (150 tpd)



- 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/

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



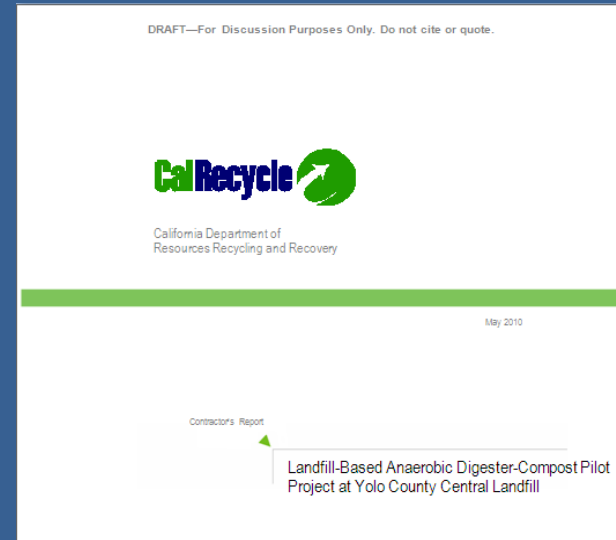
Photo: Ruihong Zhang, UC Davis

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

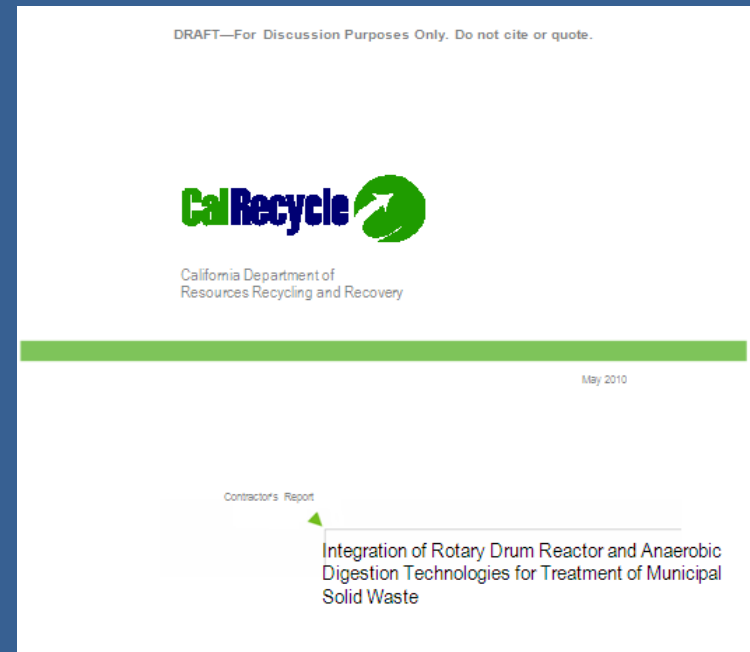


UCD Rotating Drum Reactor Project

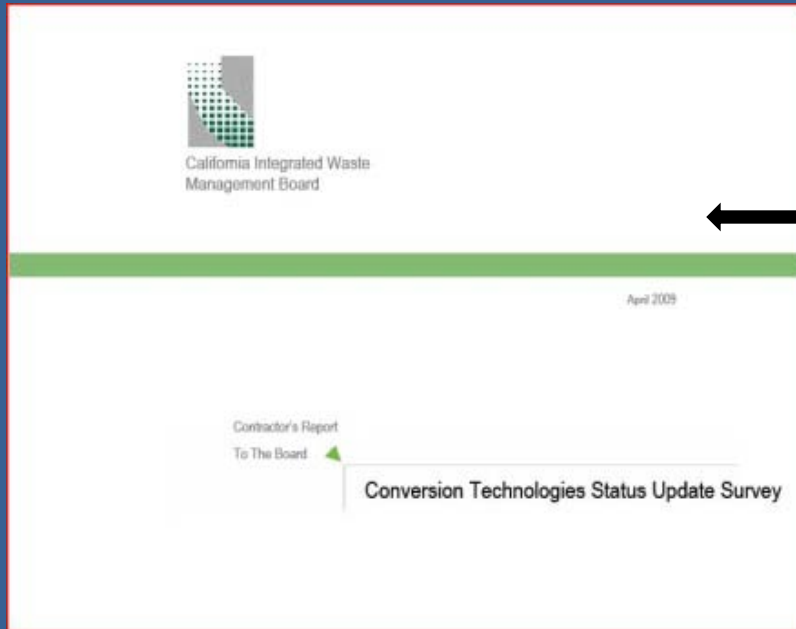


Source: Ruihong Zhang, UC Davis

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

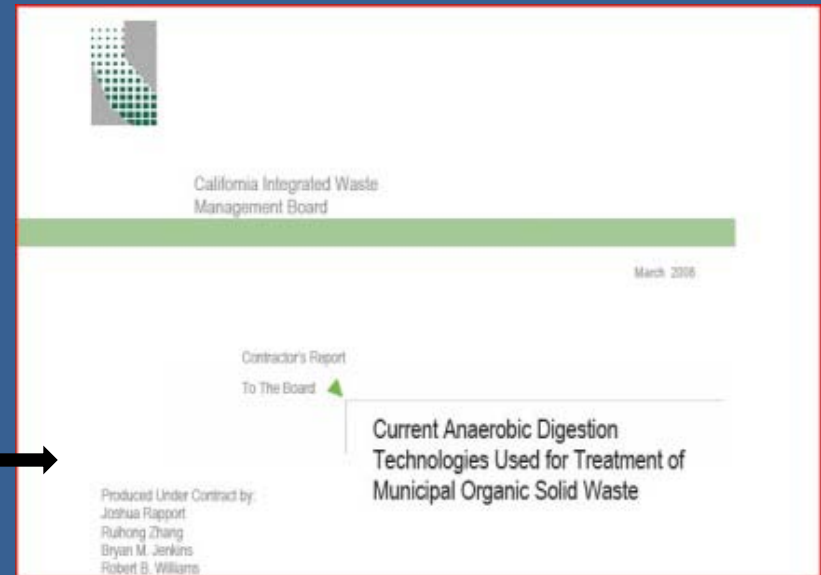


Recent CalRecycle Publications



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

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



www.calrecycle.ca.gov/Organics/Conversion/

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



Resources

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

Questions?

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www.calrecycle.ca.gov/Organics/Conversion

Mail List: www.calrecycle.ca.gov/Listservs/