Renewable Energy Recovery & Organics Diversion

Landfill Methane Outreach Program (LMOP) Special Session

SWANA Western Regional Symposium

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Presentation Overview

- Summary of MRWMD's History of Waste Management & Energy Recovery
- Small steps lead to long-term success.
- Innovation through partnerships.
- Local solutions to local problems.
- MRWMD infrastructure for energy recovery along the path to "zero waste".

Managing Waste on the Peninsula: Early 1900s

Managing Waste: 1920 - 1955

The MRWMD Today

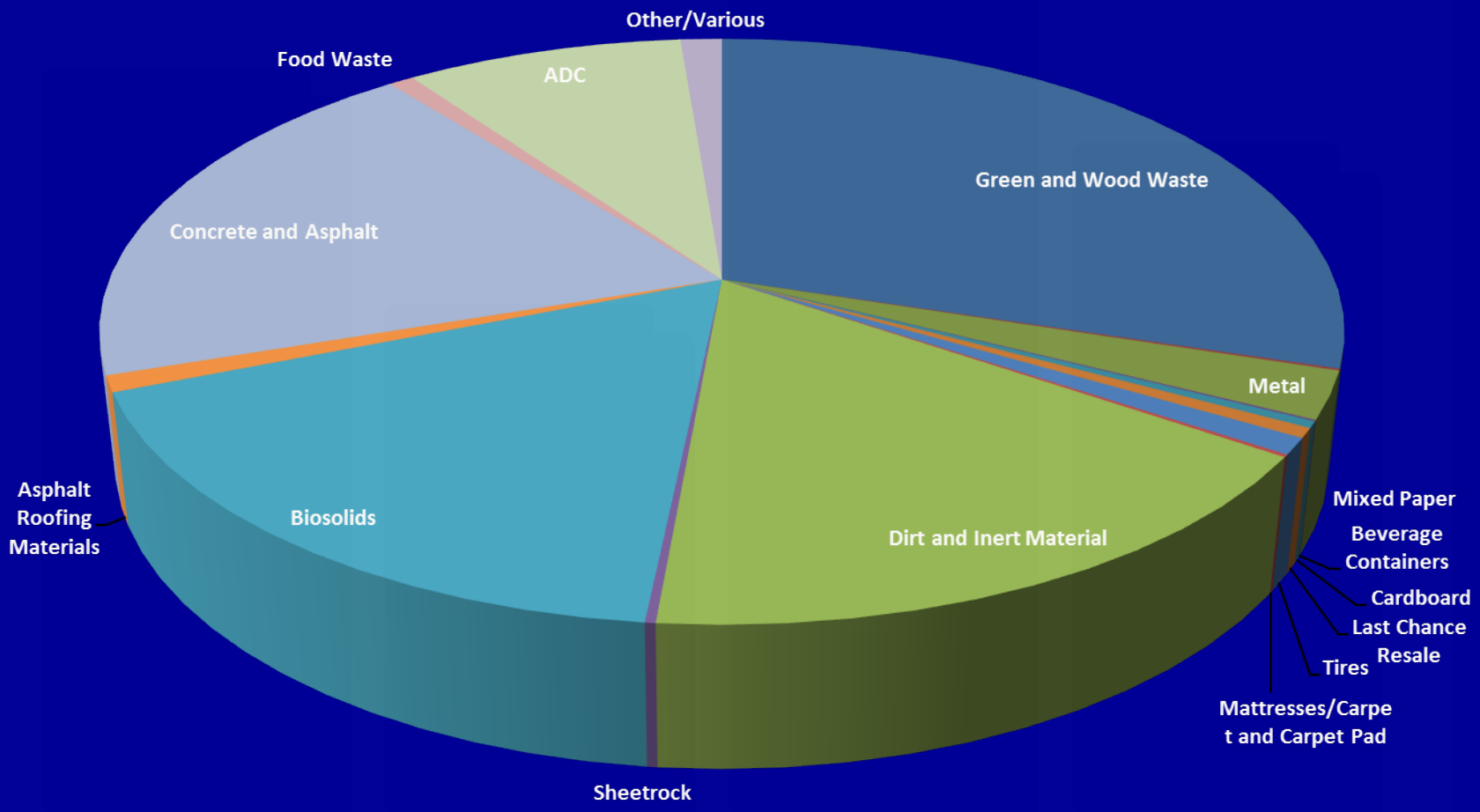
MRWMD Today - An Integrated Approach

- SS, Mixed Waste, & C & D MRF
- Recycling Drop-Off
- Buy- Back Center
- Reuse Store
- HHW & E-Waste
- LFG , 1983
- AD Facility, 2013
- Composting
- Public/ Private Partnerships
- Public Education

MRWMD Public Infrastructure for Managing Waste & Resources

- Last Chance Mercantile Reuse Store
- Household Hazardous Waste Collection
- Drop-off Recycling Center
- Material Recovery Facility Upgrade
- Dry Anaerobic Digester Pilot Project (5000 tons/year)
- Leased Composting Operations
- Leased Concrete & Asphalt Concrete Recycling
- Leased Fine Aggregate Operations
- Community Franchise Truck Yard & Maintenance Facility
- CNG Fueling Facility
- Monterey Peninsula Landfill
- Landfill Gas Renewable Energy
- Public Education and Outreach Program

> 2.7 Million Tons Diverted (1995 thru 2016)



IT'S THE LAW

Legislation Guiding Our Mission

1989 - (AB939)

Help Cities & County meet State 50% solid waste reduction law

2011 - **(AB341)**

Mandatory Commercial Waste Recycling

75 percent recycling goal by 2020

2014 - **(AB1826)**

Mandatory Commercial Organics Recycling

2016 - **(SB1383)**

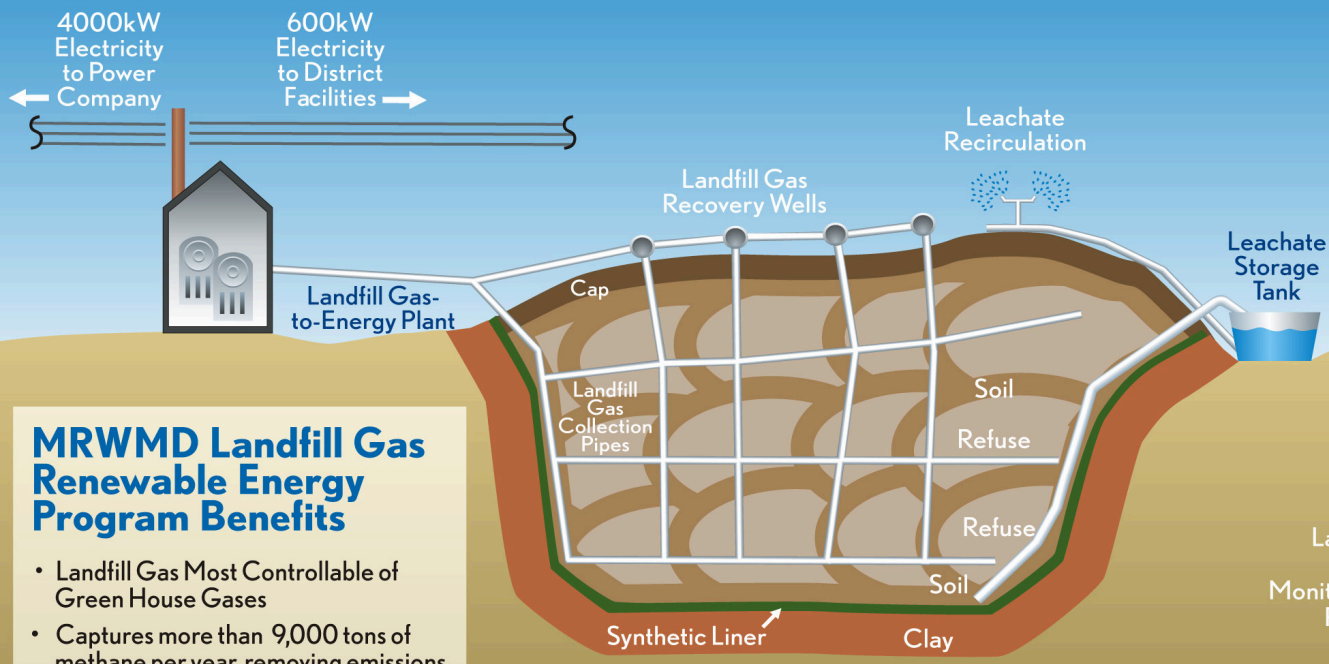
Organics Recycling

50 percent reduction in disposed organic waste by 2020 and a 75 percent reduction by 2025

Source: California Integrated Waste Management Board Waste Characterization Study, 1999.

MRWMD Landfill Gas-to-Electricity Facility

How the Monterey Peninsula Landfill Works

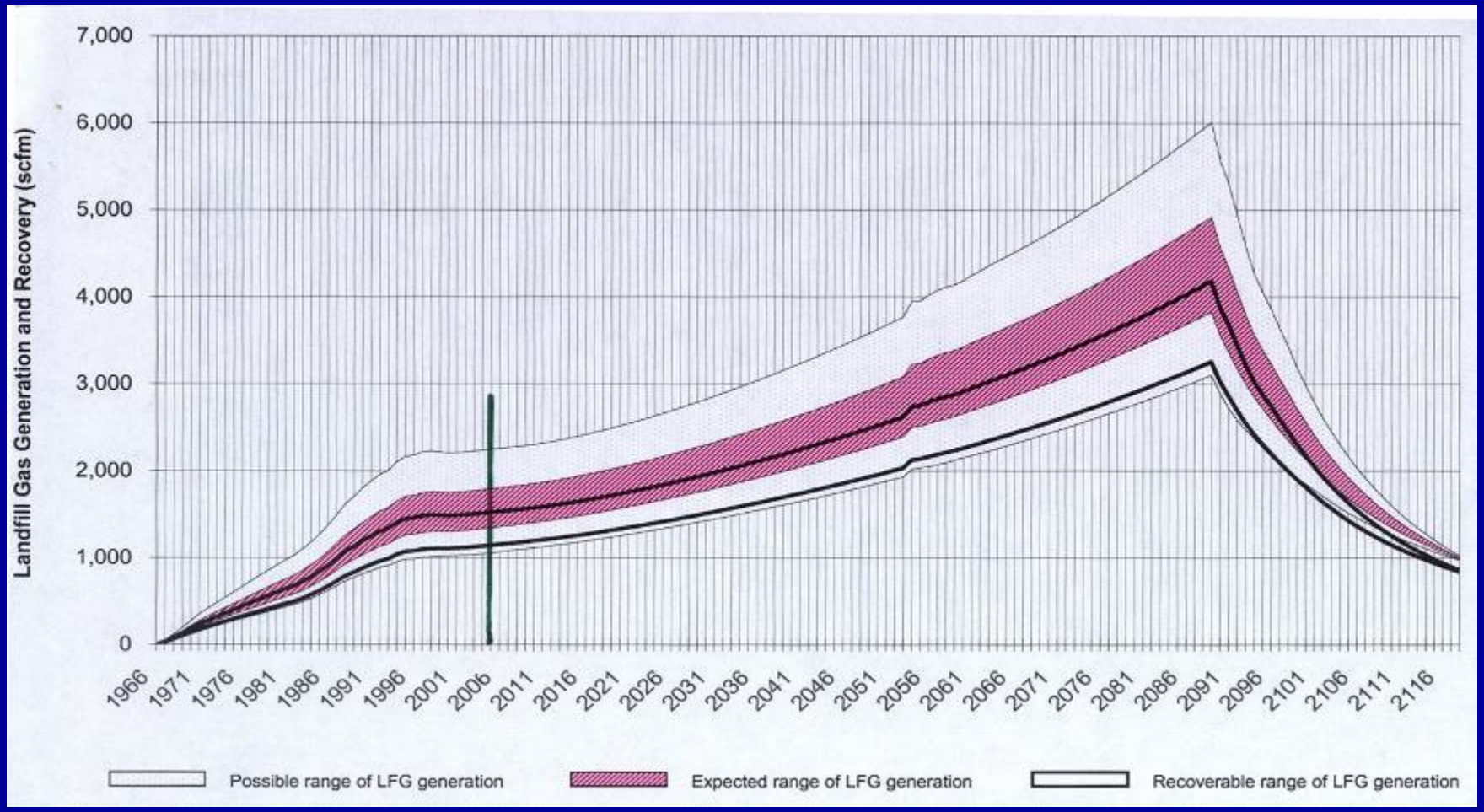


MRWMD Landfill Gas Renewable Energy Program Benefits

- Landfill Gas Most Controllable of Green House Gases
- Captures more than 9,000 tons of methane per year, removing emissions equivalent to 33,760 vehicles
- CO2 Offset from avoiding use of fossil fuels more than 27,000 tons per year
- Project Revenue, Tax Credits
- California Energy Commission Renewable Energy Credits
- U.S. Department of Energy Renewable Energy Production Incentives

Landfill Gas Generation

without organics diversion & recycling



The four engine generators now consume 10,000 tons of methane gas annually.

Initial LFG Renewable Energy Project

1983

Trailer mounted engine generators

Gas Production & Project Revenue

1983:

- 1.3 MW, 2 units, 9,000 MW generated / yr
- Power sales at 1-2 cents / kw-hr
- $180,000 in project revenue

FY 2015:

- 5 MW - 4 units
- Power sales at 4 – 5 cents / kw-hr
- $1.58 M in project revenue (7% of Operating Revenue)

Recipient of the 2007 SWANA

"Gold Landfill Gas Utilization Award"

New Diversion Frontier: Food Scraps

Food Scrap Composting

- Program began in October 2008, 20 tons per month.
- Now 375 - 425 tons per month including collection routes from Monterey, Pacific Grove, Pebble Beach, Santa Cruz County, UCSC and special events.

Renewable Energy at the MRWMD

Converting Waste to Energy

Challenges

- Political
- Technological
- Financial
- Regulatory

Opportunities

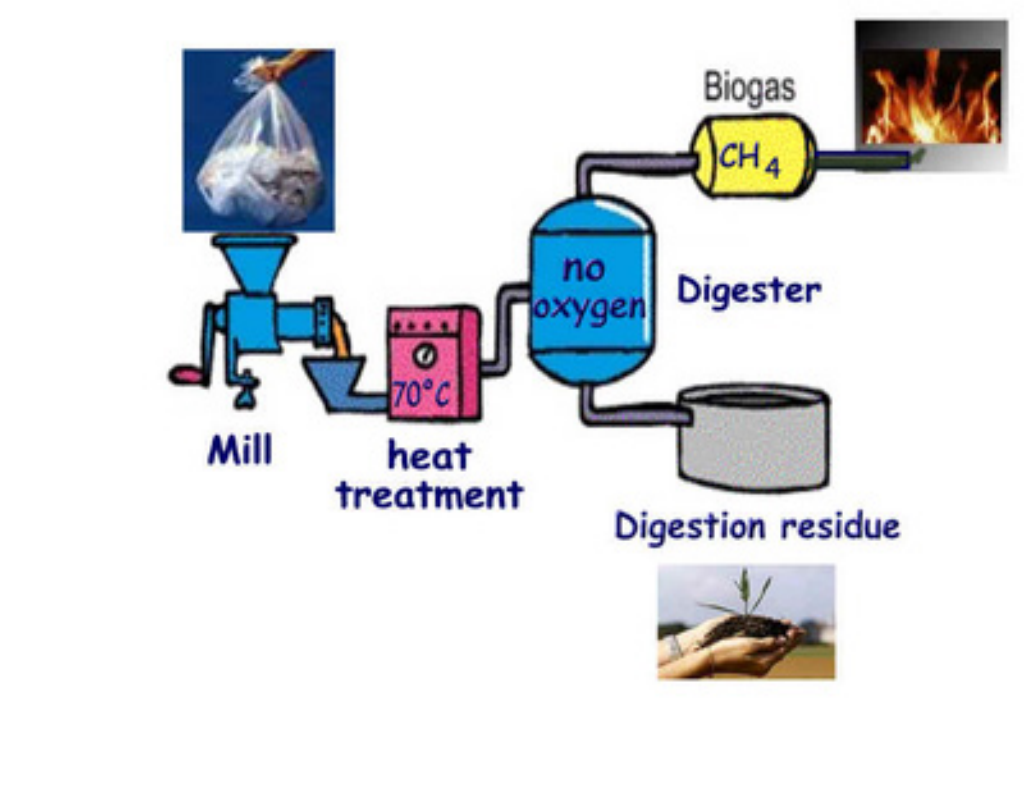
- Permits
- Land
- Location
- Track record of success
- Supply Regional Water Project with Renewable Energy
- Potential Future Supply to Community Choice Power JPA

Looking to the Future: “AD”

- The process of anaerobic digestion consists of three steps:
- The first step is the decomposition (hydrolysis) of plant or animal matter. This step breaks down the organic material to usable-sized molecules such as sugar.
- The second step is the conversion of decomposed matter to organic acids.
- Finally, the acids are converted to methane gas.

Organics Diversion: the Next Frontier

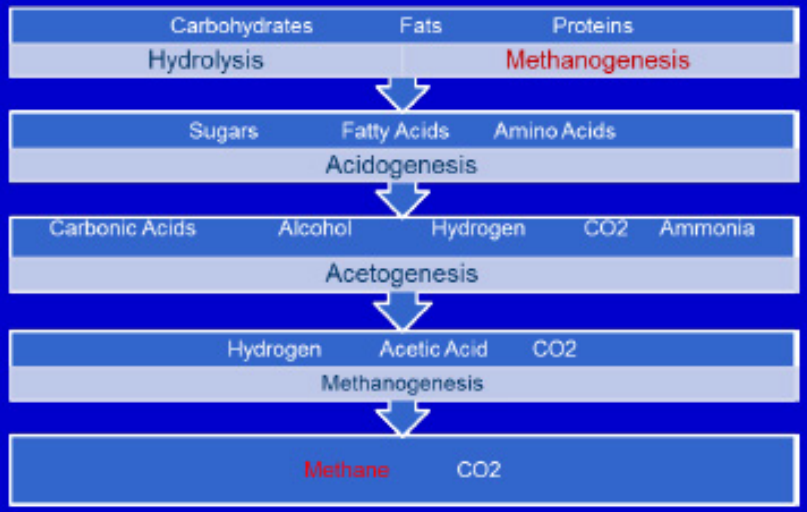
- Dry Anaerobic Digestion pilot project launched at MRWMD in FY 2011-12; Operations in March 2013.



Dry Anaerobic Digestion

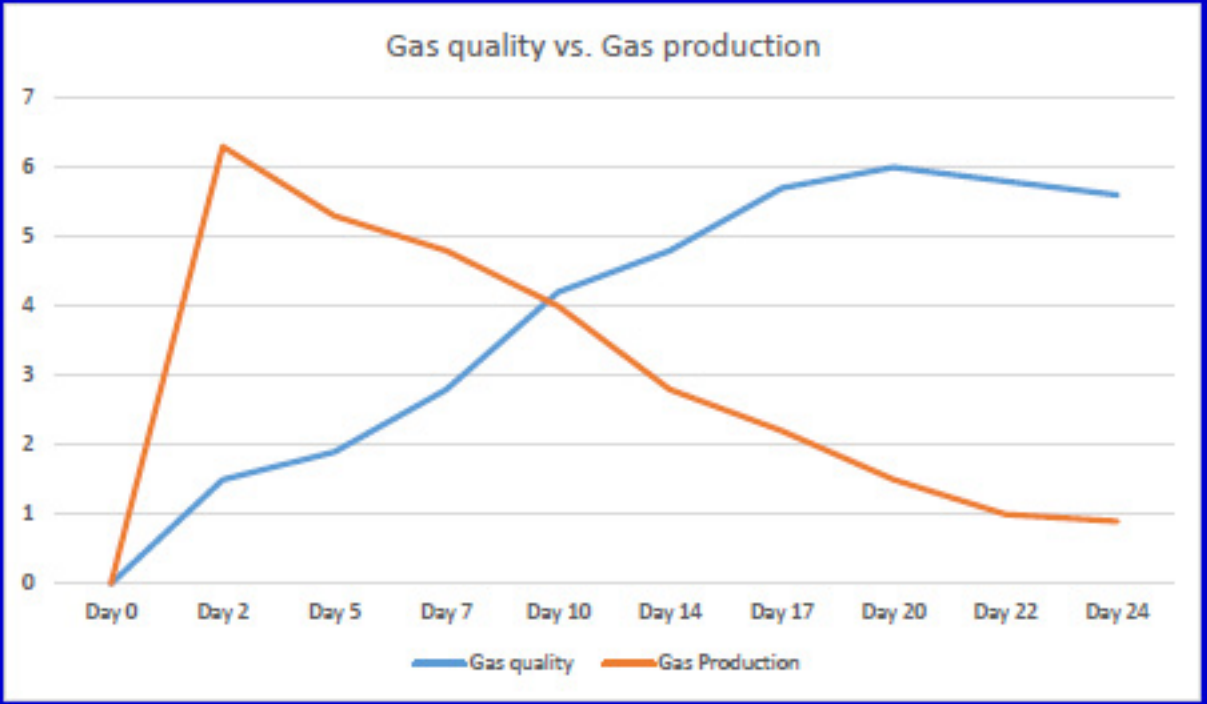
Dry Anaerobic Digestion

The Dry Anaerobic Digestion Process



The SmartFerm Dry Anaerobic process:

- Begins with "Bacterial Hydrolysis" where carbohydrates and organic polymers are broken down, here acetate and hydrogen are produced which can immediately be rendered by "methanogens" into methane. This is happening in combination with acidogenesis.
- The next step is "Acetogenisis" where the breakdown of longer polymers occurs resulting in the creation of "volatile fatty acids" this is not unlike the way milk sours. During Acetogens" the simpler chains of polymers are basically rendered into acetic acid, CO2 and hydrogen.
- The final step of the process is "Methanogenisis" at this point the bacteria involved (methanogens) proliferate and are responsible for the production of the biogas and CO2.

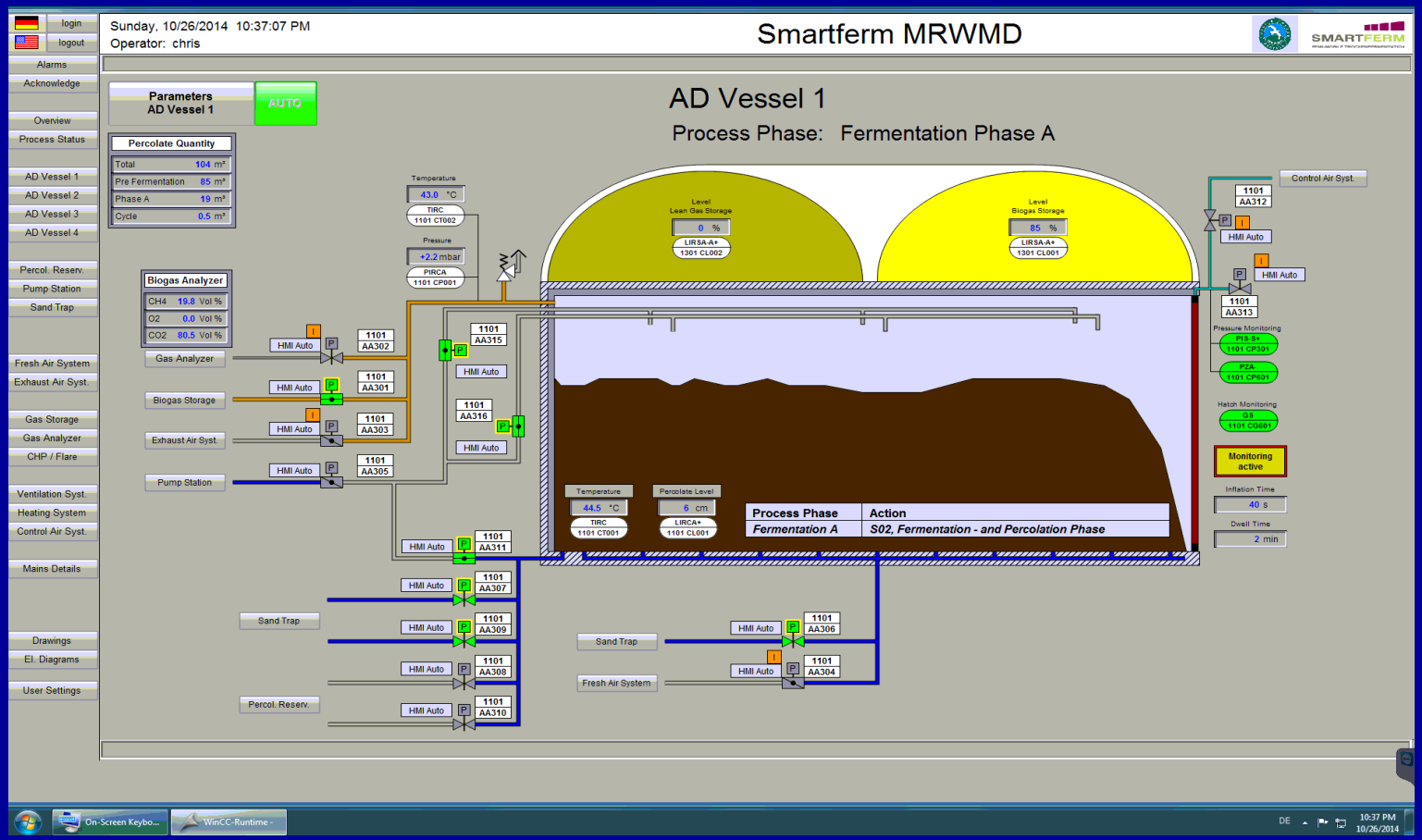


The first order of bacteria will consume readily available sugars converting them into CO2, displacing the O2 in the mass in the process.

This is generating high biogas volume but low quality, breaking down polymers into the different constituents for use by secondary and tertiary bacteria on the way to the Methanogens.

Dry Anaerobic Digestion

- Anaerobic Digestion gas is combusted in a CHP unit to produce 100KW of electricity used by the neighboring POTW Facility



Challenges & Opportunities of Organics Diversion

CHALLENGES

- Managing a “waste” material outside of a modern Landfill Waste Management Unit
- Permitting – Environmental, Land Use, Solid Waste, & Air Permits
- Access to Available Development Areas
- Organic Waste Collection Strategies
- Managing various Organic Waste Materials

OPPORTUNITIES

- Increasing Dry Anaerobic Digestion Capacity
- POTW Partnership Wet Anaerobic Digestion Capacity
- Digester Gas to Energy Production
- Digester Gas &/or LFG Cleanup For CNG Production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a sustainable community by Turning
Waste into Resources
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