Food Waste Anaerobic Digestion Demonstration Program at the Joint Water Pollution Control Plant

SUSTAINABLE SOLID WASTE MANAGEMENT
FUTURE ROADMAP IMPLEMENTATION
Regional Countywide Subcommittee Meeting

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What we'll talk about today…

- Policy Drivers in California
- Background & Objectives
- Processing & Receiving
- Results to Date
- Lessons Learned

Policy Drivers

- AB 341 establishes a statewide solid waste recycling goal of 75% by 2020
- CARB AB32 scoping plan establishes approaches to GHG emission reductions
- AB1826 established mandatory commercial organics recycling starting in 2016
- Organic waste estimated at 6-7 million tons per year statewide, 3 million tons in Southern California

AB1826 THRESHOLDS

Apr 1, 2016 – **8** cubic yards/week organics
Jan 1, 2017 – **4** cubic yards/week organics
Jan 1, 2019 – **4** cubic yards/week solid waste
Jan 1, 2020 – **2** cubic yards/week solid waste (*maybe*)

What this Demonstration is about.

- In 2013, the Districts and WM entered into a multi-year demonstration program Agreement. Operations began in Feb. 2014
- WM sources and processes food waste at its Orange County facility, producing an Engineered BioSlurry (EBS™)
- WM deliveries up to 84 WTPD (~20,000 GPD) of EBS™ to JWPCP for co-digestion in a designated, full scale test digester (#16)
- EBS™ is fed into the test digester at a controlled rate.
- WM and JWPCP's Research team monitors the program to evaluate the impacts and performance of the co-digestion process.
- Results will be used to determine the feasibility of a full-scale food waste AD program at Districts WWTPs

Food Waste AD Options

- Two main types of food/organic waste anaerobic digesters:

  - Dry TS ≥ 15%. Best if feedstock high in green waste up to 50%, needed to stack in digester.

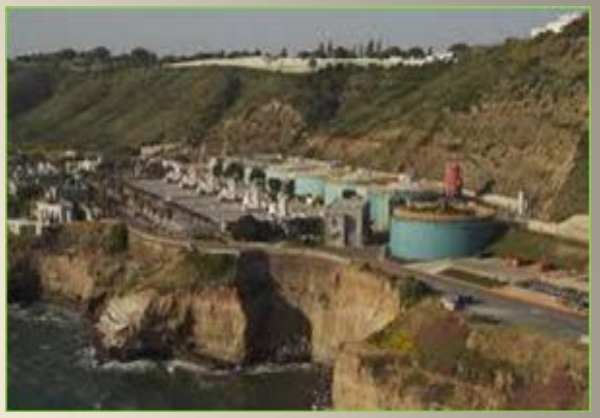
  - Wet TS < 15%. Best if feedstock has no green waste, can be pumped & mixed in digester.

- Dry FW AD digestion generally requires larger and adjacent composting area, provides lower biogas yield, and produces more solid digestate.
- Wet FW AD digestion generally provides better mixing and digestion, higher biogas yields, good odor control, and lower O&M costs.
  - Co-digestion …The digestion of multiple organic wastes in one digester such as our demonstration program where food waste is mixed with sludge at JWPCP.

Types of Organic Municipal Waste

- Suitable for WWTP co-digestion
  - Source separated and processed food waste
  - Fats oils and grease (FOG)
- Not suitable for WWTP co-digestion
  - Green waste
  - Mixed waste

Why Co-digestion of Food Waste at WWTPs may make sense

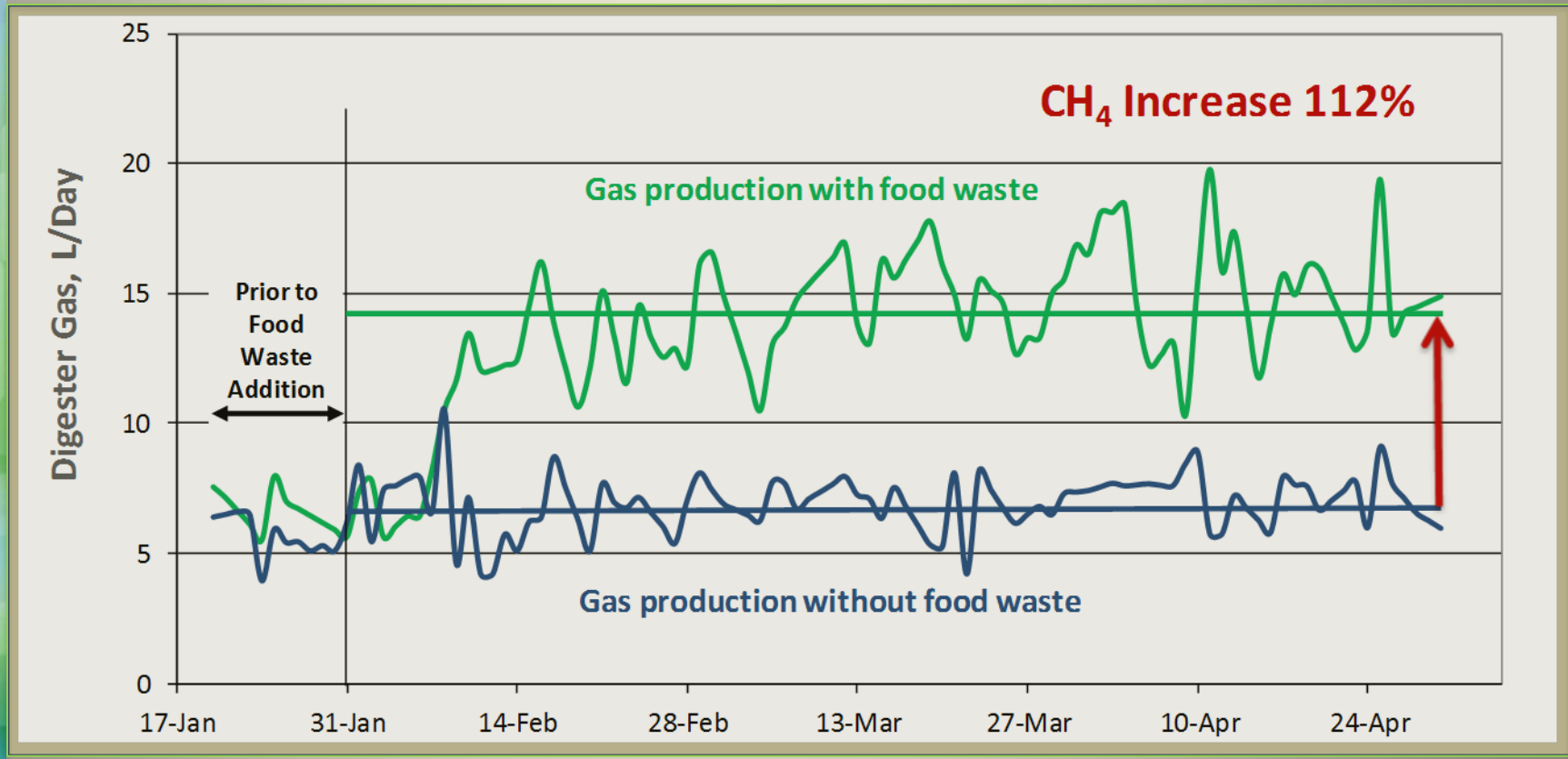


- Advantages:
  - Digester and associated infrastructure already exists
  - Energy recovery equipment may already exist
  - Assists WWTPs to become net energy producers
- Concerns and challenges:
  - Limited capacity statewide – a niche, not a solution
  - Can accept only relatively clean feedstock
  - WWTPs have an important public health mission

Project Backdrop

- In 2011, Districts completed a feasibility study on co-digestion of food waste at Districts WWTPs.
- Conclusion…we had a viable project at JWPCP.
  - It is technically feasible (economics still a question)
  - It is allowed under current regulations
  - It could assist L.A. County cities/haulers with diversion efforts
- In 2012, performed bench scale testing of co-digestion of FW slurry and JWPCP sludges…
  - Characterized FW slurry (developed FW specifications)
  - Identified no negative impacts on digester operation
  - Quantified biogas production potential

Adding Food Waste to Bench-scale Digesters Increases Gas Production

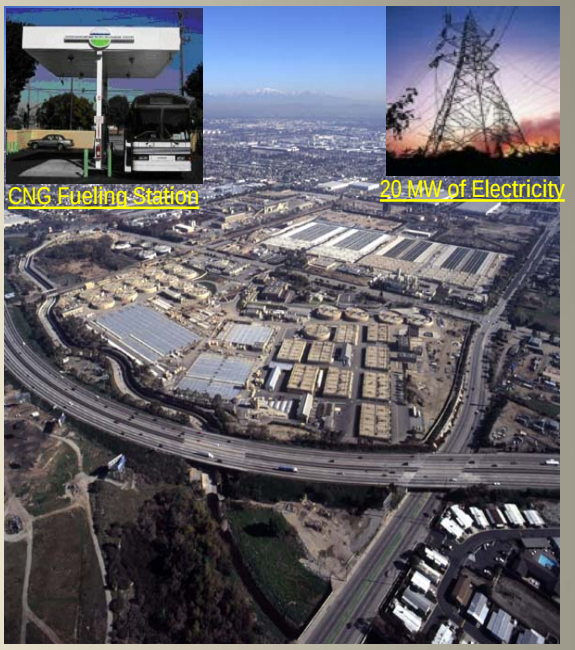


Adding 10-12% (v/v) food waste slurry to sludge could <u>double</u> biogas production

Food Waste Slurry characteristics: Total Solids ~ 14% by wt., Volatile Solids ~ 92% by wt., COD ~ 222,400 mg/L

Joint Water Pollution Control Plant

- 24 active digesters each with capacity of 3.7 million gallons
- 4.4 million gallons of sludge is added to digesters each day
- Volatile solids breakdown (digest) for 18-19 days before exiting digester



- 5,000 scfm (or ~ 20 MW) of biogas is created
- Remaining biosolids are dewatered and trucked off for use in composting and for land application

JWPCP Total Energy Facility

Combined Cycle Cogeneration Power Plant

- (3) 9 MW Solar Turbine Mars 90's gas turbine generators
- (1) 8.7 MW Shin Nippon Machinery steam turbine-generator
- 20 MW used to meet on-site load

2012 Grand Prize Winners – Operations Management

AAEE Excellence in Environmental Engineering and Science

Demonstration Project Objectives

- Assist Districts member cities and haulers in diversion efforts
- Determine the impacts of full-scale food waste co-digestion on WWTP operations

- Evaluate the performance and cost-effectiveness of food waste co-digestion at a WWTP
- Use project results to determine feasibility of a larger food waste digestion program at Districts wastewater treatment facilities

Video up next

MSNBC "LA Scrapping Food Waste"

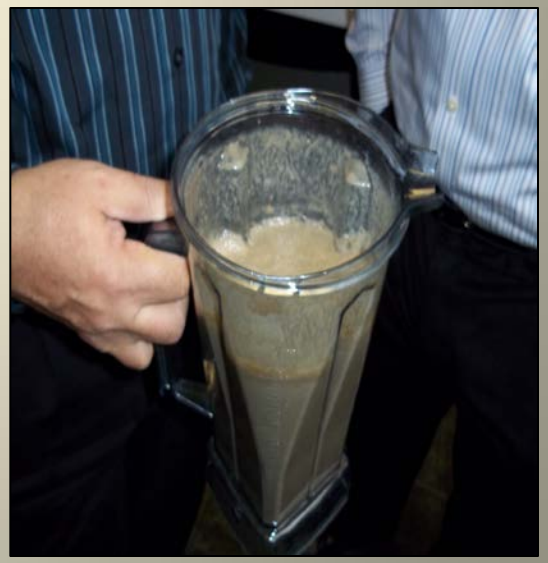
Click here for video

Czerniak

WM's CORe® Facility in Orange

CORe® (Centralized Organics Recycling equipment)

- WM collects food waste from sources such as restaurants, food processing plants, and grocery stores. Tipped material is inspected prior to processing.
- Food waste is processed to remove physical contamination (e.g., utensils, cans, packaging, and heavies) and blended into a consistent EBS™ product
- EBS™ is loaded into tanker trucks for delivery to JWPCP



EBS™ Receiving at JWPCP

EBS™ is pumped from WM tanker trucks into closed, sealed storage tanks, controlling odors.

Two identical receiving/feed-in stations for redundancy.

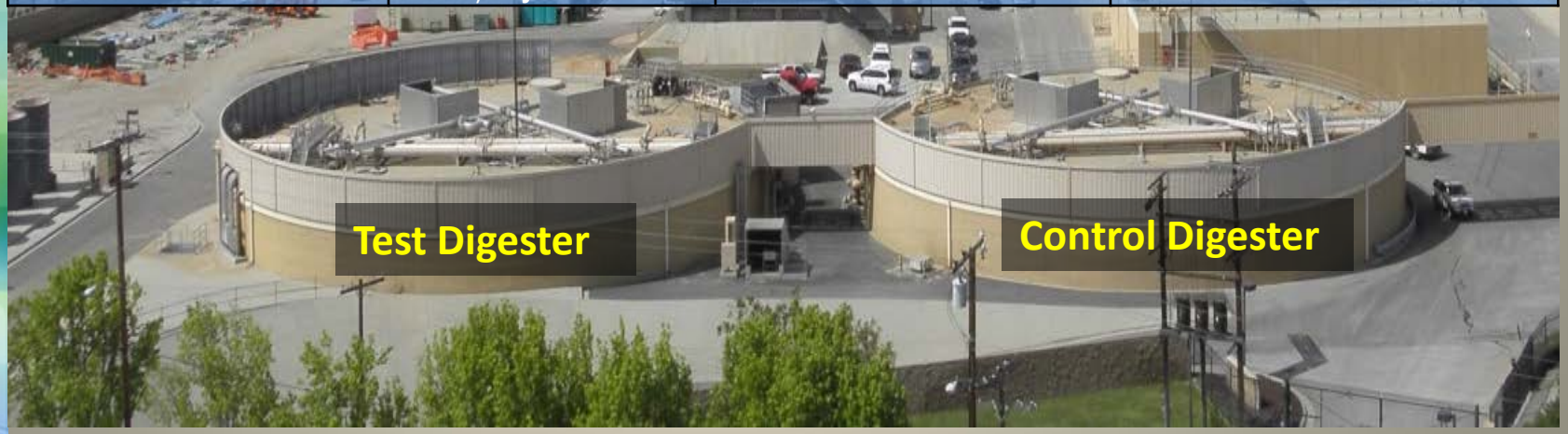
EBS™ Feed-in Station

- EBS™ is recirculated (mixed) in the storage tanks on an intermittent basis to remain "fresh"
- EBS™ is pumped from storage tanks into the top of the test digester
- EBS™ is fed to the test digester at a feed rate set by the control program

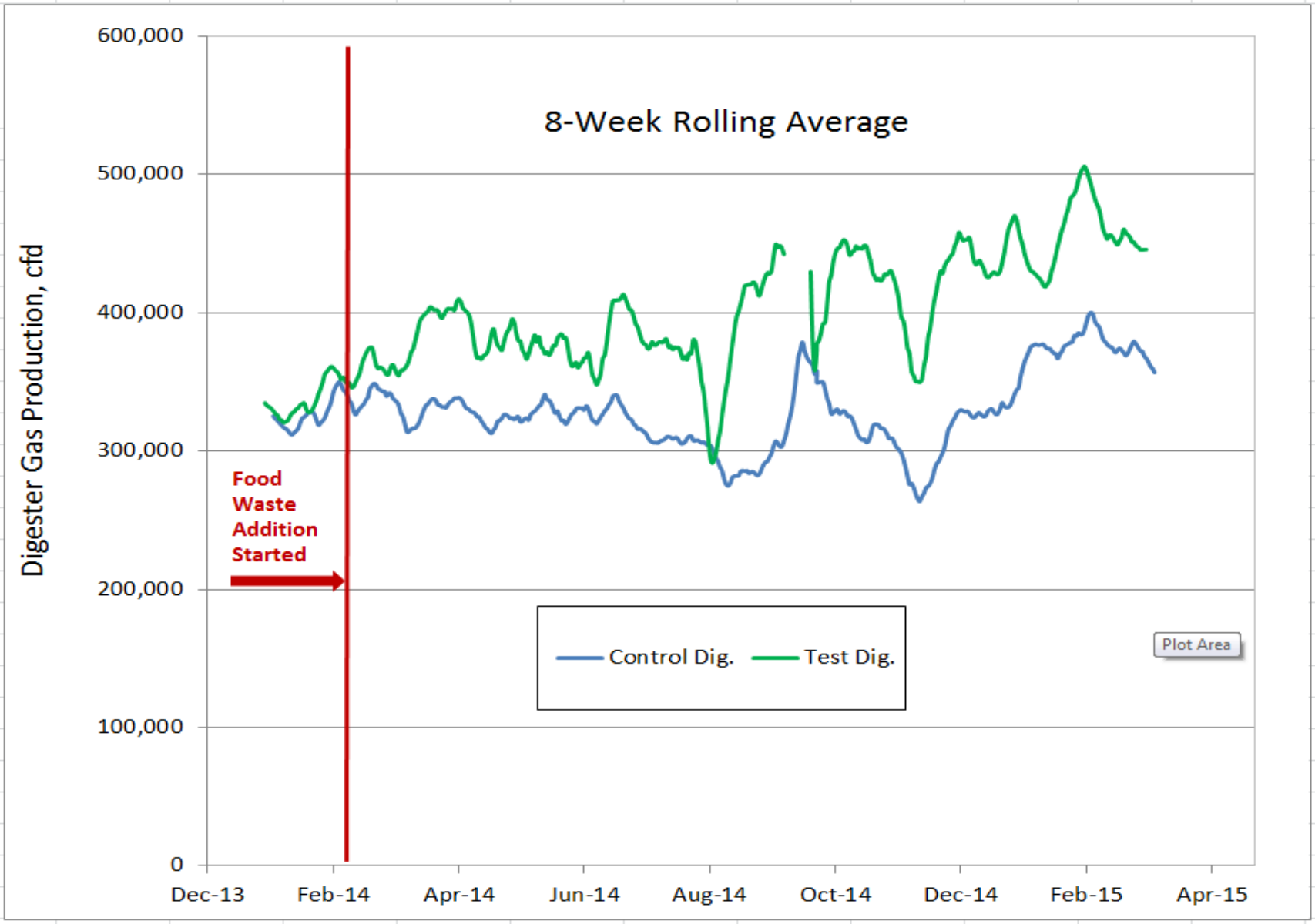
- WM and Districts remotely monitor feed-in station operating parameters including storage levels, pump speed, mixing times, and feed in rates.

Food Waste Co-Digestion Plan

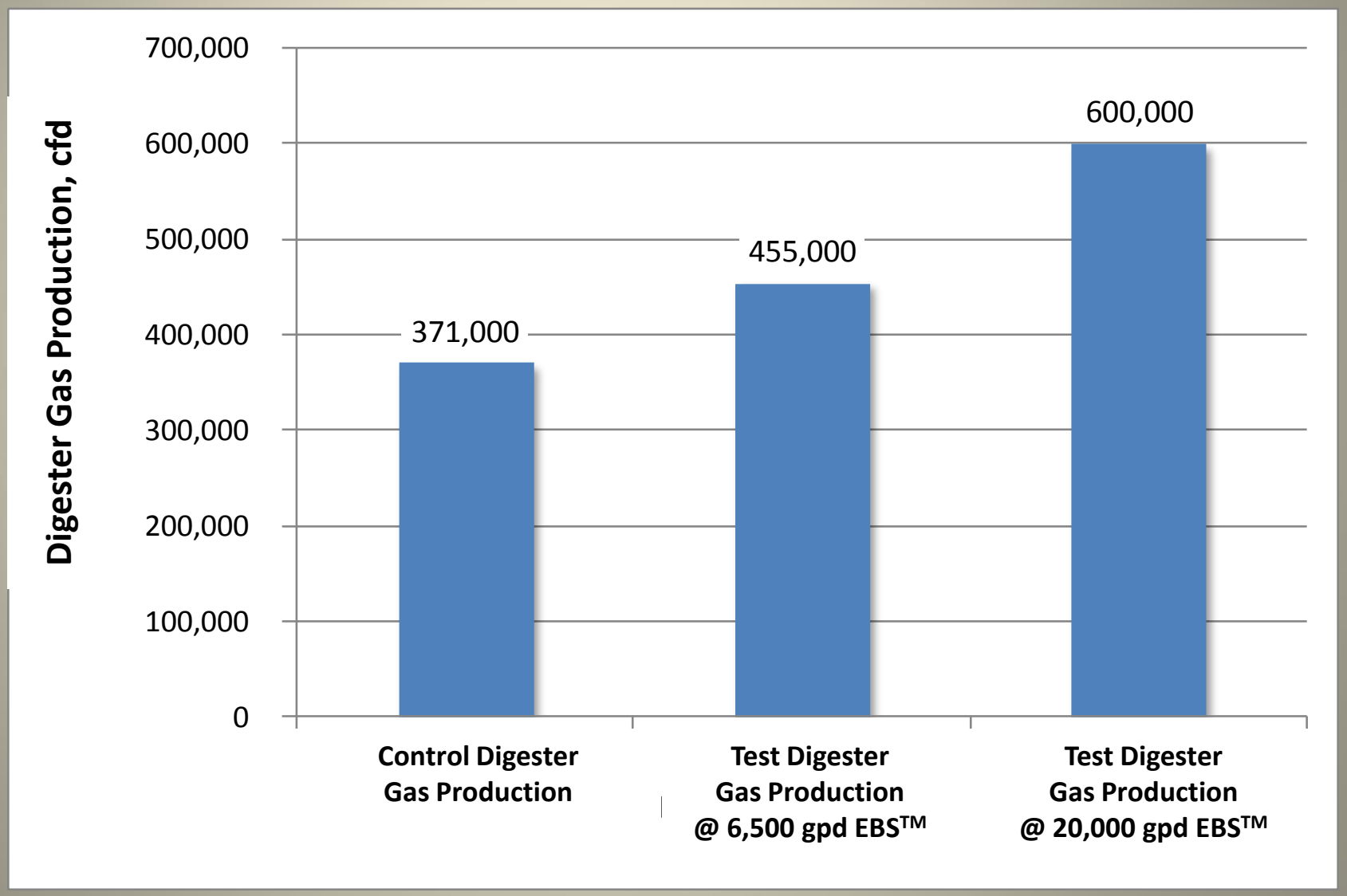
		Test Digester	Control Digesters
WW/Sludge/TWAS Feed	gal/day	205,000	205,000
	% solids	3.20%	3.20%
	tons per day solids	27.3	27.3
Food waste slurry feed	gal/day	20,000	---
	% Solids	14%	---
	tons per day solids	11.7	---
% Food Waste	liquid basis	9%	---
	solids basis	30%	---
Digester total	gal/day	225,000	205,000
	% Solids	4.2%	3.20%
	HRT, days	16.4	18.0



Project Results – Gas Production



Projected Digester Gas Production



Performance of Digesters

4-Week Average as of March 7, 2015

Parameter	Units	Control	Test	% Change
EBS™ Feed Rate	gpd	0	6,500	---
Digester Gas	cfd	371,000	455,000	23%
Methane	%	62.5	62.5	0%
Digester Gas H_2S	ppm (v/v)	27	30	11%
VSD	%	51.9	63.8	23%
Digester Gas/lb VS	cf/lb	8.92	9.11	2%

Use of DG from Food Waste

- Potential usage of digester gas from 84 tpd EBS™
  - 200 scfm at 60% methane
  - 1,500 GGE/day CNG
  - 750 kW
- Current usage of digester gas
  - TEF uses additional digester gas to generate extra electricity for sale when excess digester gas is not being flared
  - If all the gas could be used (non-flaring days), current digester gas production of 100,000 cfd of digester gas from EBS™ can produce an additional 270 kW.

Lessons Learned & Takeaways

- Early on, EBS™ transport, transfer and control systems at LACSD had issues. Issures resolved and now work as intended.
- The original odor control system (biofilters) could not handle the high level of H2S generated from EBS™ storage. Switched to carbon filter canisters. …no further issues
- There have been no major impacts to treatment plant operation or digester operations seen to date. All indicators look good.
- Biogas production levels from EBS™ has met expectations.
- Finding suitable sources of Food Waste has been more challenging than originally envisioned, and has delayed increased ramp up of EBS™ to the test digester.

New Wet Dry Food Waste Collection System

- Cutting Edge
- Neighborhood-Friendly
- Low Capital Cost

Thank you. Questions?

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"So, this Humpty Dumpty guy falls off the wall and I think, Dang, ain't lettin' this go to the food waste bin."