CO-DIGESTION EVALUATIONS

TWO FACILITIES

DIFFERENT DRIVERS

SIMILAR EVALUATION APPROACH

Topics presented:

- **Fresno-Clovis and Las Vegas facilities**
- **Study drivers**
- **Evaluation components**
- **Outcomes**

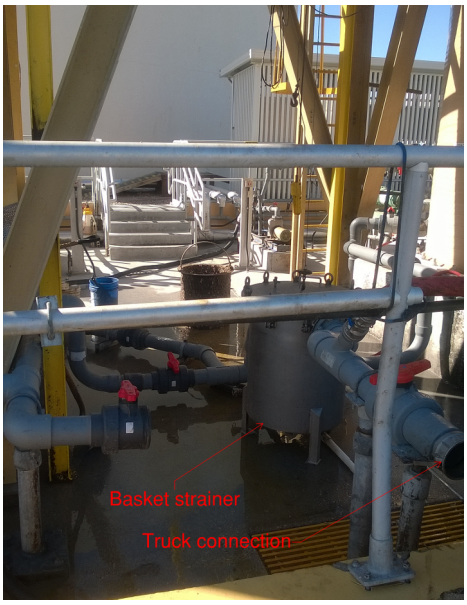
FRESNO-CLOVIS REGIONAL WATER RECLAMATION FACILITY

- 13 anaerobic digesters
- HSW receiving program in place
  - FOG and food waste
  - Permanent receiving station with 3 holding tanks
    - Mix 50/50 primary sludge and HSW prior to pumping to digesters
    - Feed only Digesters 9 - 13

FRESNO-CLOVIS RWRF HSW RECEIVING STATION

LAS VEGAS WATER POLLUTION CONTROL FACILITY

- 8 anaerobic digesters
- HSW receiving pilot plant
  - FOG and liquid food waste
  - Inadequate capacity for available HSW material
  - Slow HSW off-loading
  - Aging components


Basket strainer
Truck connection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DRIVERS FOR EVALUATION

Fresno-Clovis (CA) Regional Water Reclamation Facility

- More digester capacity needed by 2026
  - Population growth
  - CA Senate Bill 1383 mandated cities decrease volume of landfilled organics
- Maximize digester gas production
  - Existing HSW program - digester gas for use in boilers and for combustion turbine fuel (electricity)

Las Vegas Water Pollution Control Facility

- Increase digester gas production
  - Existing pilot HSW receiving station boosted gas production
    - Improvements needed to make it permanent and increase capacity
  - Digester gas used in boilers and for engine generator fuel (electricity)
  - Excess digester volume & abundant sources of FOG

More HSW = More digester gas = More heat & power

THE APPROACH

1. Gather data and ask questions
2. Availability and characteristics of material
3. Digester capacity (volume)
4. Solids retention time
5. Volatile solids loading rate
6. HSW VS/Total VS
7. Digester gas

DATA GATHERING AND SYSTEM UNDERSTANDING

- At least 3 years of data:
  - Flows and loads (gpm, %TS, %VS) into and out of each solids process
  - Digester gas production; volume and gas constituents
  - Use Excel instead of modeling software
- Operating methods; maintenance periods
- Get to know the system through discussion with operators & supervisors

CALCULATION TABLE

Year	TPS TSS	TPS VSS	TPS Flow	TWAS TSS	TWAS VSS	TWAS Flow	Sludge TSS
	lb/d	lb/d	gpd	lb/d	lb/d	gpd	lb/d
2015	**69,585**	**59,527**	347,437	**42,608**	**31,993**	113,462	112,193
2016	70,723	60,508	353,121	43,545	32,704	115,959	114,268
2017	71,861	61,490	358,804	44,483	33,416	118,455	116,344
2018	73,000	62,471	364,488	45,420	34,127	120,952	118,420
2019	74,138	63,453	370,171	46,358	34,839	123,448	120,496
2020	75,276	64,434	375,855	47,296	35,550	125,945	122,572

WHAT HSW IS AVAILABLE?

Las Vegas WPCF - Organic Solution Management (OSM) provided a market analysis

Volume of Organic Waste Stream Material Available in the Las Vegas Region (Table Adapted from CLV Feed Stock Report by OSM, June 2017)

ORGANIC WASTE STREAM NAME	SOLID/LIQUID	VOLUME ESTIMATED (GALLONS PER YEAR)
Grease Trap	Liquid	42,000,000
Grease Trap Processing Sludge	Solid	6,200,000
Yellow Oil Processing Material	Liquid	1,400,000
Food Manufacturing	Liquid	3,500,000
Food Manufacturing	Solid	8,000,000
Casino Food Waste	Solid	50,000,000
Grocery Food Waste	Solid	40,000,000

A Market Assessment is a valuable planning tool.

Considerations

- Volume
- Schedule of availability
- Size of collection area
- Extent of preprocessing needed
- %TS and %VS

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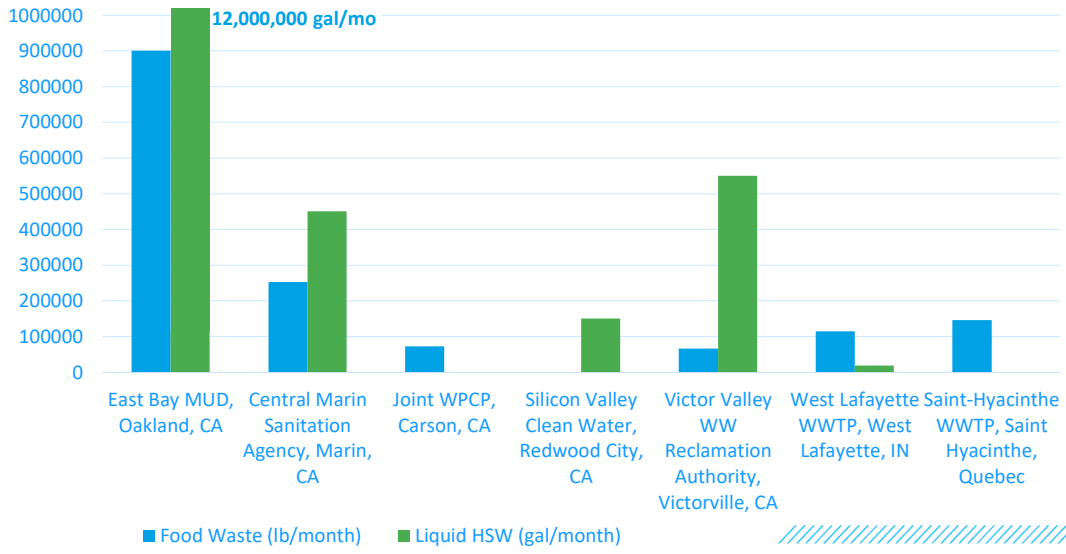
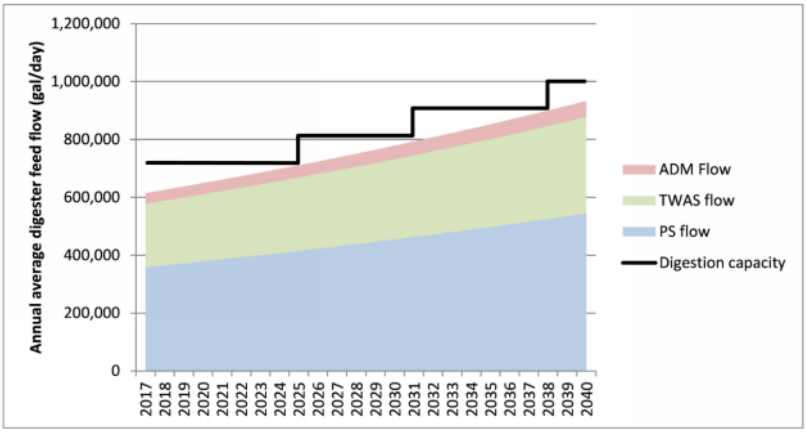
OSM operates and maintains the pilot HSW receiving facility at Las Vegas. They are the HSW collector and hauler.

FRESNO-CLOVIS RWRF – B&V PREPARED 7 CASE STUDIES



DIGESTER CAPACITY



FRESNO-CLOVIS – CONTINUE CONSTANT PROPORTION OF HSW TO SLUDGE

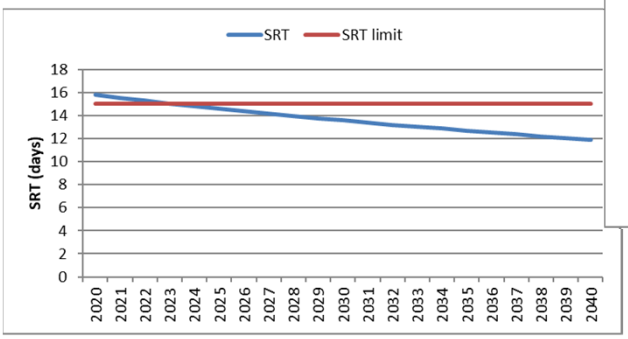
(ADM = ANAEROBICALLY DIGESTABLE MATERIAL)

- **Population-based influent loading projections**
- **BioWin or GPS-X modeling isn't typically required unless major process changes are planned**
- **Use industry experience and engineering judgement when data analysis results are unexpected**

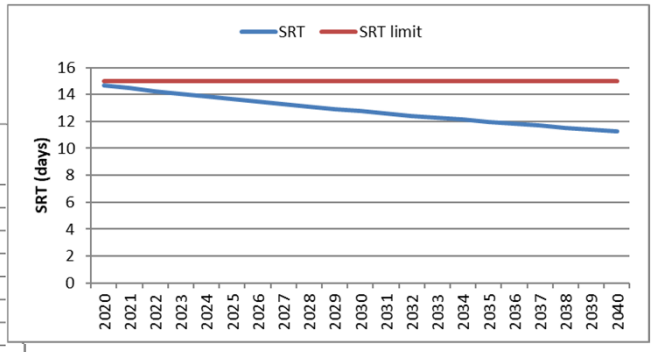
For this project we assumed historical performance was indicative of future process performance. Example of engineering judgement: data shows that 90% of the influent TSS is dropping out in the primary clarifier. That's too high. We'd back that off to 70%.

SOLIDS RETENTION TIME (SRT)

Typical SRT of mesophilic digester: 15 – 20 days



Las Vegas WPCF - Sludge Only



Las Vegas WPCF – Sludge + HSW to all 12 digesters

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SRT=FLOW/VOLUME. 40 CFR 503 requires 15 days at 95 - 131 deg to achieve Class B. Las Vegas noted they had excess digester capacity but the data showed that it would not last long. Recommended they thicken TWAS more, which could be done with existing equipment. Dewatered sludge is landfilled and not required to be class B, so 12 days of SRT is the minimum for stable digester operation.

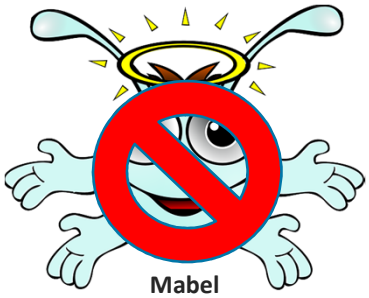
VOLATILE SOLIDS LOADING RATE

VS loading rate = lb VS/cf/day

Industry knowledge: 0.16 – 0.19 lb VS/cf/day

Varies greatly

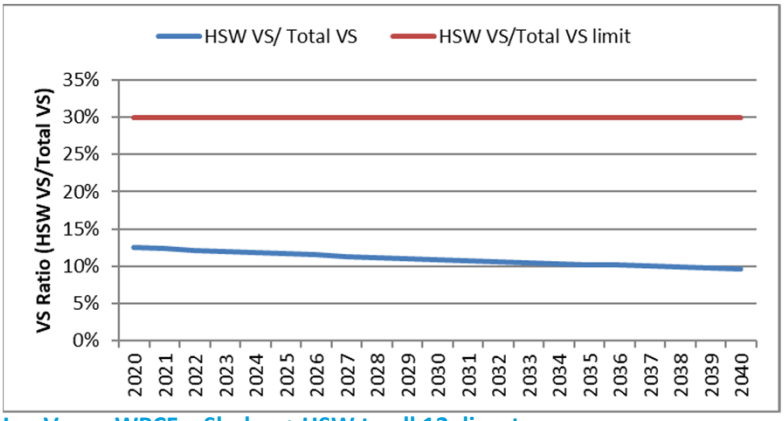
Poor outcome if VS loading rate is exceeded



Mabel Methanogen

RATIO OF HSW VS : TOTAL VS

- Limited documentation of upper limit
- Des Moines Wastewater Reclamation Facility co-digests 25% - 35% of Total VS
- Foaming required submerged fixed covers, large diameter overflow pipes and spray nozzles



Las Vegas WPCF – Sludge + HSW to all 12 digesters

DIGESTER GAS

Develop digester gas projections for the feasible alternatives

Digester Gas-fueled Boiler

ASSUMPTIONS

PARAMETER	SLUDGE	HSW
Volatile solids reduction (%VSr)	54%	93%
VSr to gas conversion (scf/lb. VSr)	15	17
Methane content (%)	60%	72%

RNG or CNG

Can the existing system use the projected volume of gas?

Explore improvements or changes to technology.

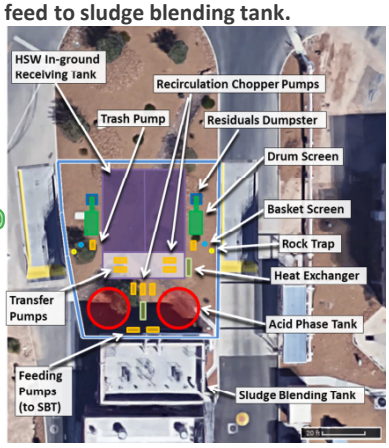
OUTCOMES

Fresno – Clovis RWRF

- Feed HSW to all digesters on a 15 minute cycle
- Add HSW unloading and storage capacity
- Serve as a reliable, long term HSW accepter by adding new digesters in 2026, 2033 and 2039
- Digester gas analysis was not part of the study

New, complete HSW receiving station with acid phase digestion & constant feed to sludge blending tank.

Las Vegas WPCF



- Thicken WAS to maximize digester vol.
- Upgrade biogas to RNG (inexpensive electricity locally)

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Las Vegas: Acid phase digester has a 24 – 48 hour detention time. A small amount of WAS is added to promote hydrolysis.

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Questions?

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