The Metropolitan

Water Reclamation District

of Greater Chicago

WELCOME

TO THE AUGUST EDITION

OF THE 2017

M&R SEMINAR SERIES

BEFORE WE BEGIN

- SAFETY PRECAUTIONS
  - PLEASE FOLLOW EXIT SIGN IN CASE OF EMERGENCY EVALUATION
  - AUTOMATED EXTERNAL DEFIBRILLATOR (AED) LOCATED OUTSIDE
- PLEASE SILENCE CELL PHONES
- QUESTION AND ANSWER SESSION WILL FOLLOW PRESENTATION
- PLEASE FILL EVALUATION FORM
- SEMINAR SLIDES WILL BE POSTED ON MWRD WEBSITE (www.MWRD.org: Home Page ⇒ Reports ⇒ M&R Data and Reports ⇒ M&R Seminar Series ⇒ 2017 Seminar Series)
- STREAM VIDEO WILL BE AVAILABLE ON MWRD WEBSITE (www.MWRD.org: Home Page ⇒ MWRDGC RSS Feeds)

Mr. Chris Finton

Chris Finton is the Treatment Plant Manager and Chief-Plant-Operator for the Central Marin Sanitation Agency, a regional wastewater treatment facility in San Rafael, California. The Agency is dedicated to the health of its community and the environment.

Chris is a graduate of Sonoma State University, where he received a BA in Environmental Studies and Urban Planning. He is also a California certified Grade V Wastewater Treatment Plant Operator. After spending nearly two decades working in treatment plants, Chris has performed start-up and commissioning, and developed standard techniques, guidelines, procedures, and criteria on several Agency projects.

In addition to managing a WW treatment facility, Chris chairs the Water/Wastewater Technical Advisory Committee at the Santa Rosa Junior College, a steering committee dedicated to water/wastewater utility workforce development. He currently lives in Rohnert Park with his wife Melinda. He can be contacted at cfinton@cmsa.us.

MANAGING CENTRAL MARIN SANITATION AGENCY'S ORGANIC WASTE RECEIVING FACILITY

Metropolitan Water Reclamation District of Greater Chicago
August 25, 2015

PRESENTATION OUTLINE

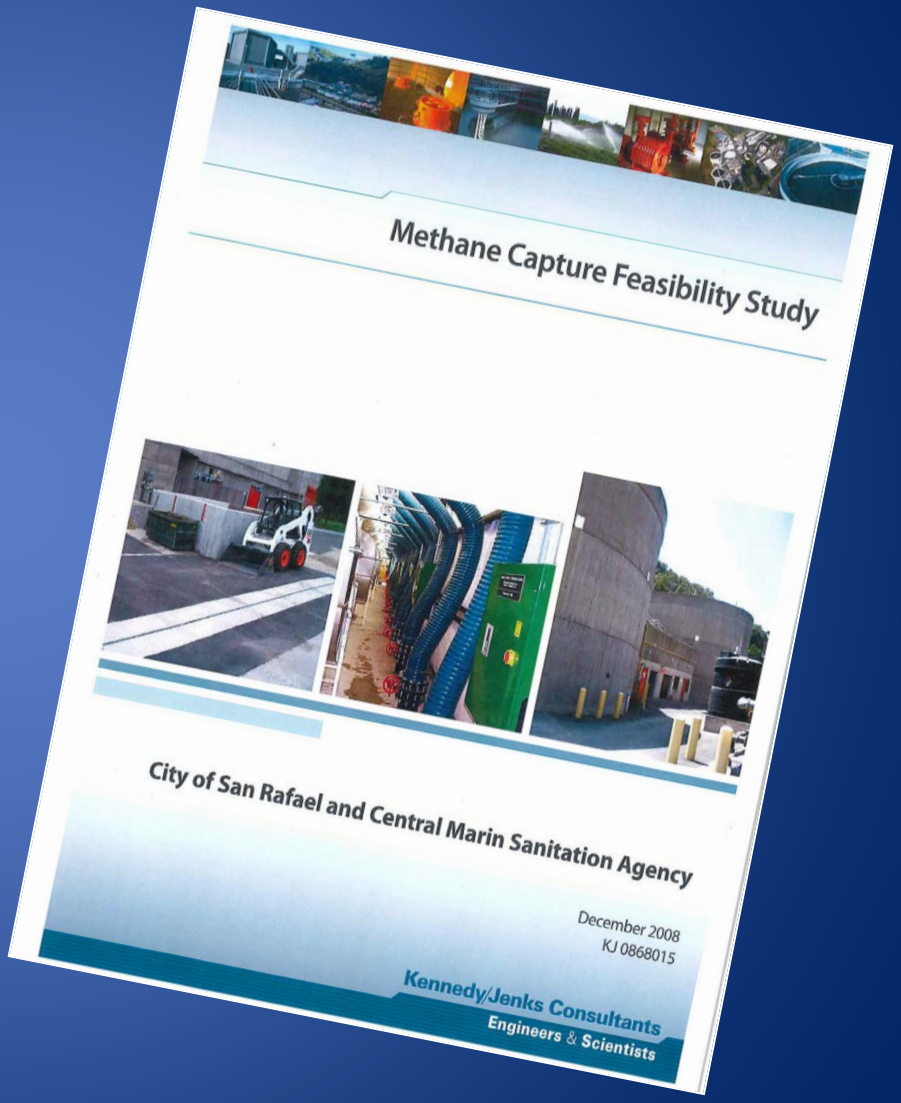
- CMSA Organic Waste Program History
- Facility Design Considerations
- Operating an Organic Waste Receiving Station
- Maintaining an Organic Waste Receiving Station
- Lessons Learned and Key Takeaways
- On the Horizon
- Questions?

CMSA Organic Waste Program History

- 2008-2009
  - Local Utility Grants for Green House Gas Emission Reduction Studies/Projects
- 2009-2010
  - Incorporated Organic Waste Receiving Facility into Planned Digester Improvements
  - Public Outreach
- 2011
  - Public/Private Partnership between Marin Sanitary Service and CMSA
- 2013
  - CMSA and MSS constructed F2E facilities
  - Delivery of FOG and food waste began in late 2013/early 2014

Facility Design Considerations

- FW quantity and characterization
- MSS Service Area--15 tons/day
- Digester capacity to accept FOG and food wastes
- Cogenerator capacity to utilize additional biogas
- Digester improvements to receive FOG/FW

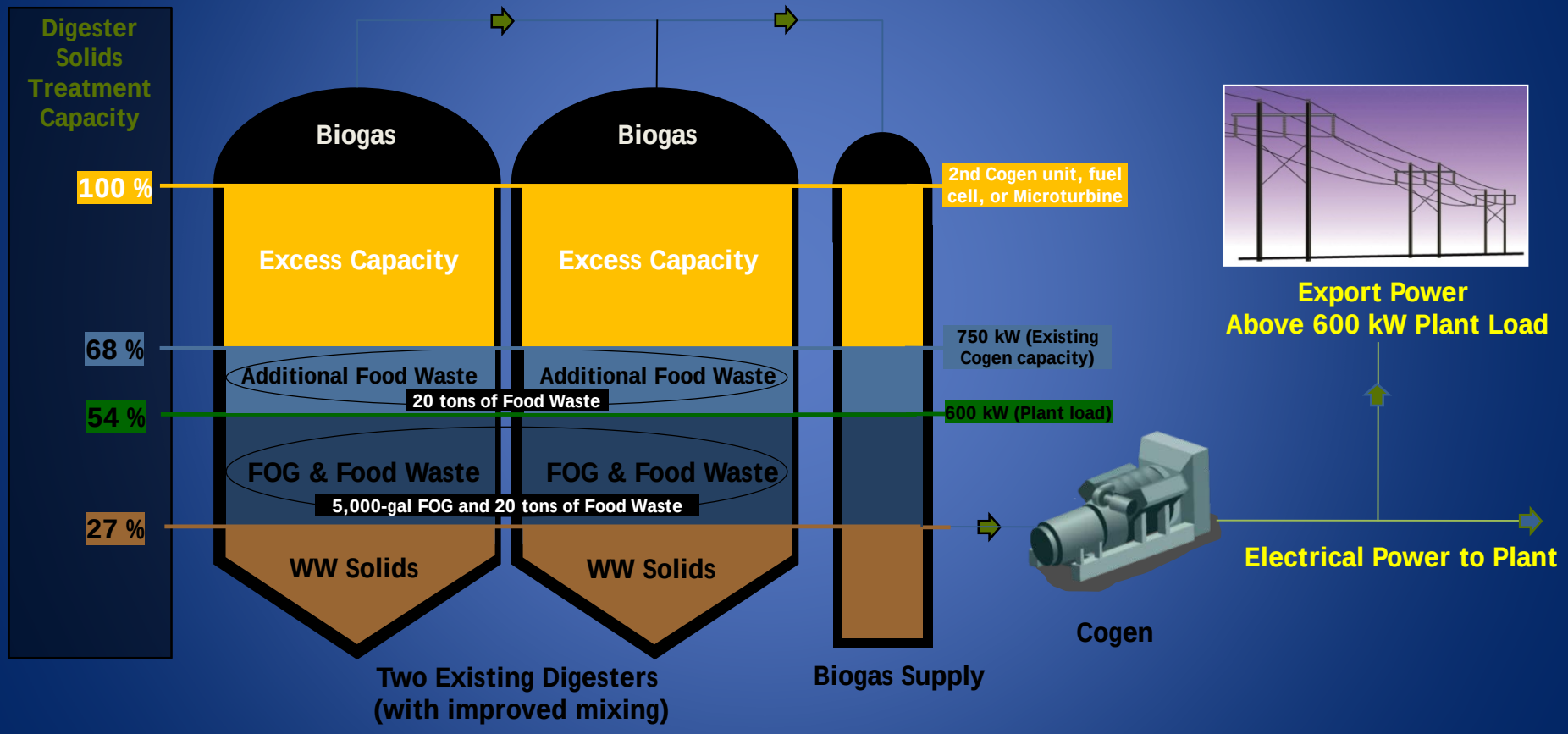


Why Look at Food Waste

- Food is the largest single source of waste in California
- In Marin Sanitary Service's (MSS) Service Area, 27.1% of the solid waste sent to Redwood Landfill is food waste.

- There are over 250 food waste generators (restaurants, delis, grocery stores) in the MSS service area.
- AB 1383 – Cal. Global Warming Solutions Act of 2006

CMSA FOG and Food Waste Capacity



2013 Digester Improvements Project

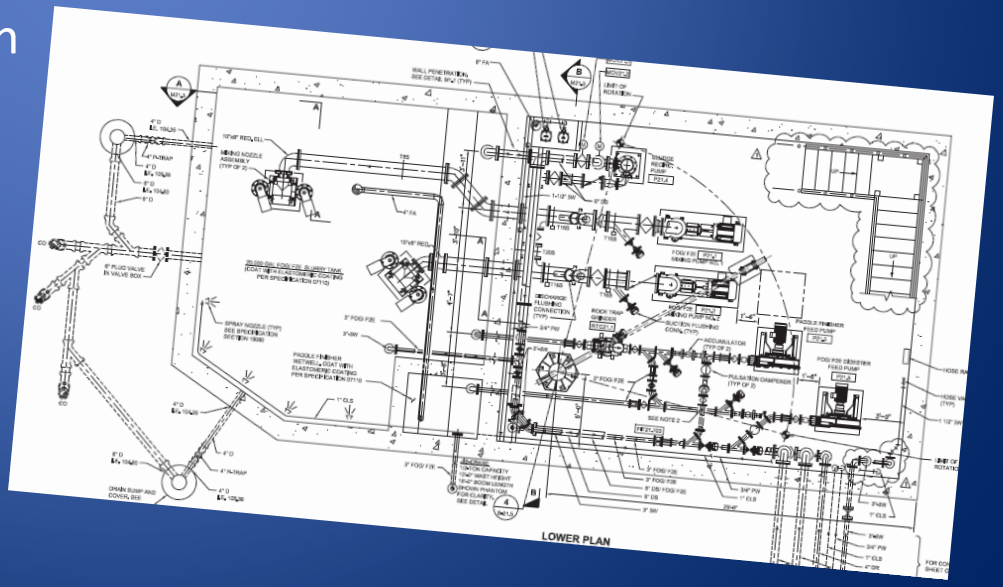
Replaced Digester Covers

- Original Floating Covers at 130,700 cf
- New Membrane Covers at 374,400 cf

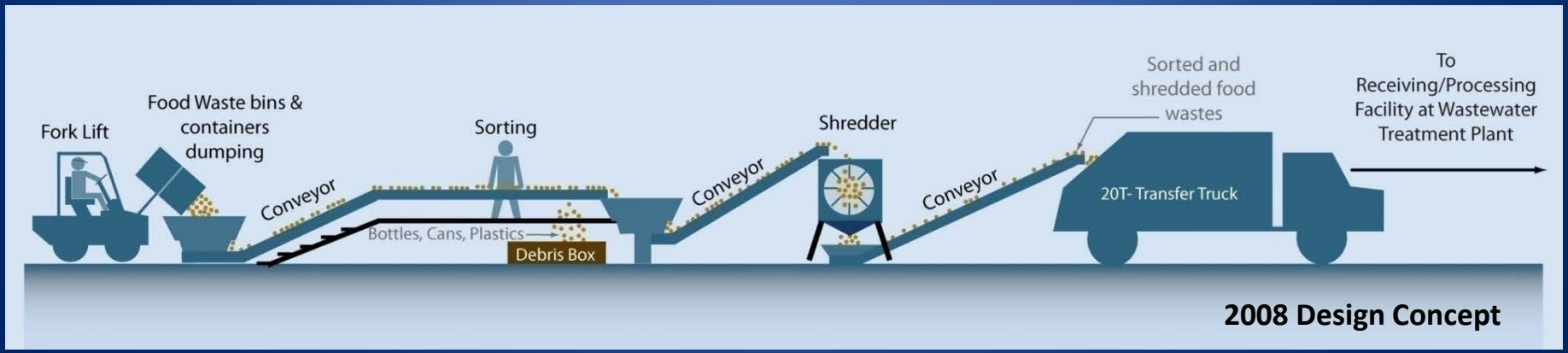
New Sulfatreat Adsorption H2S Scrubbers

New External Pump Mixing System

Organic Waste Receiving Station



2013 Marin Sanitary Improvements



2013 Marin Sanitary Improvements

Food 2 Energy

CMSA - Conventional Advanced Secondary Treatment Plant

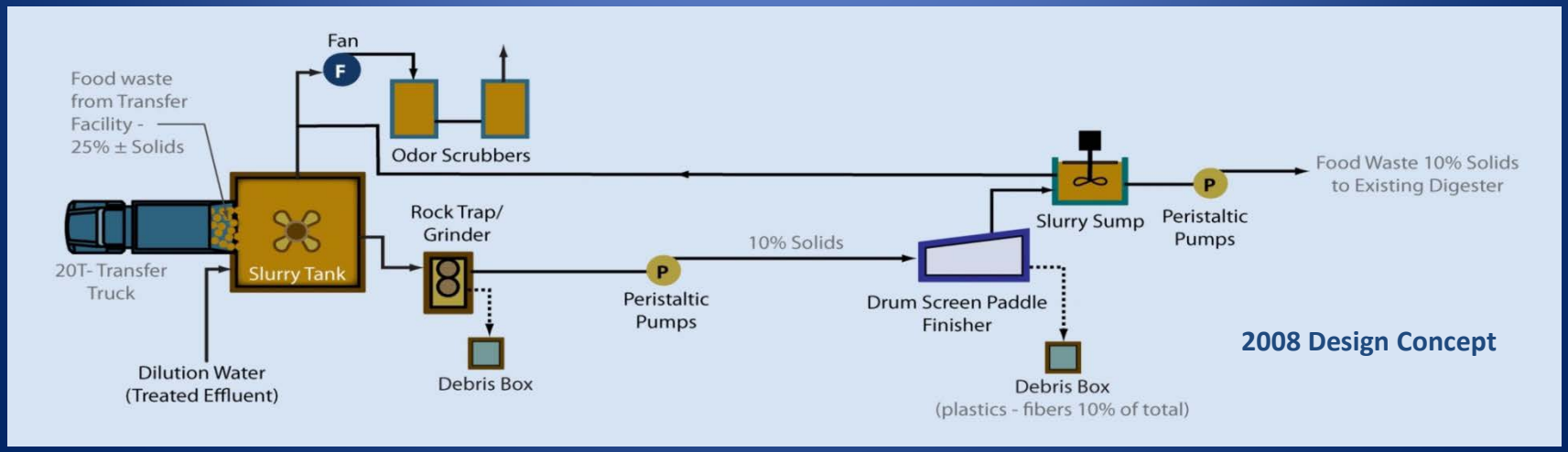
ADWF Design 10 MGD – Actual ADWF 7.0 MGD **Treatment Capacity Design – 30 MGD**

Design Peak Wet Weather Flows 155 MGD – Actual 125+ MGD

Permitted Discharges to SF Bay:

- cBOD 25mg/l monthly – 2016 cBOD Average 5.0 mg/l
- TSS 30mg/l monthly - 2016 TSS Average 4.8 mg/l
- Removal cBOD and TSS 85% minimum – 2016 Average removal cBOD 98.0% TSS 98.3%
- Total Ammonia, as N 60mg/l monthly - 2016 average 28.8 mg/l

Organic Waste Receiving Facility

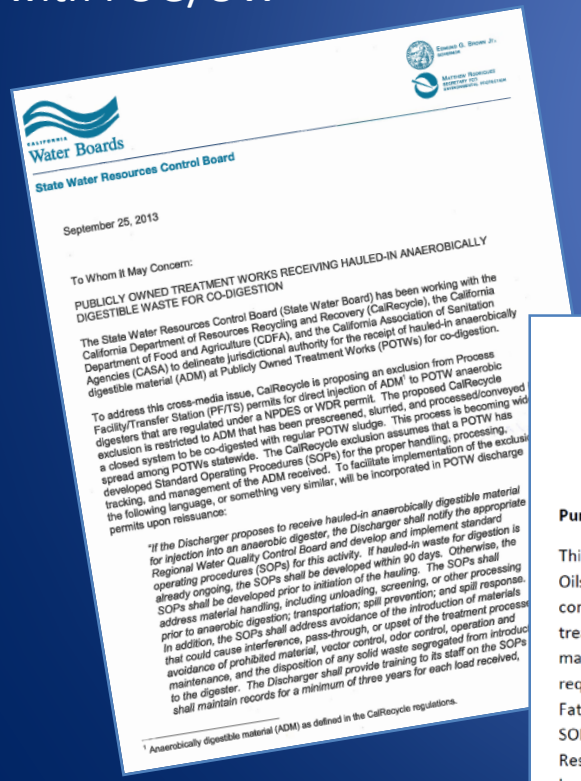


Receiving a FOG Load – Nov. 2013

Facility Equipment

Operating an OWRF

SWRCB Executive Order for Co-digestion of FW with FOG/OW



State Water Resources Control Board

September 25, 2013

To Whom It May Concern:

PUBLICLY OWNED TREATMENT WORKS RECEIVING HAULED-IN ANAEROBICALLY DIGESTIBLE WASTE FOR CO-DIGESTION

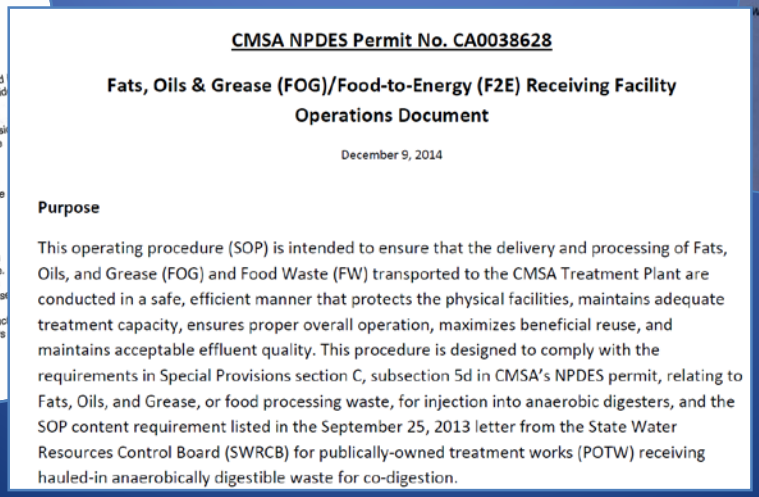
The State Water Resources Control Board (State Water Board) has been working with the California Department of Resources Recycling and Recovery (CalRecycle), the California Department of Food and Agriculture (CDFA), and the California Association of Sanitation Agencies (CASA) to delineate jurisdictional authority for the receipt of hauled-in anaerobically digestible material (ADM) at Publicly Owned Treatment Works (POTWs) for co-digestion.

To address this cross-media issue, CalRecycle is proposing an exclusion from Process Facility/Transfer Station (PF/TS) permits for direct injection of ADM[1] to POTW anaerobic digesters that are regulated under a NPDES or WDR permit. The proposed CalRecycle exclusion is restricted to ADM that has been prescreened, slurried, and processed/conveyed a closed system to be co-digested with regular POTW sludge. This process is becoming wid spread among POTWs statewide. The CalRecycle exclusion assumes that a POTW has developed Standard Operating Procedures (SOPs) for the proper handling, processing, tracking, and management of the ADM received. To facilitate implementation of the exclusi the following language, or something very similar, will be incorporated in POTW discharge permits upon reissuance:

"If the Discharger proposes to receive hauled-in anaerobically digestible material for injection into an anaerobic digester, the Discharger shall notify the appropriate Regional Water Quality Control Board and develop and implement standard operating procedures (SOPs) for this activity. If hauled-in waste for digestion is already ongoing, the SOPs shall be developed within 90 days. Otherwise, the SOPs shall be developed prior to initiation of the hauling. The SOPs shall address material handling, including unloading, screening, or other processing prior to anaerobic digestion; transportation; spill prevention; and spill response. In addition, the SOPs shall address avoidance of the introduction of materials that could cause interference, pass-through, or upset of the treatment process avoidance of prohibited material, vector control, odor control, operation and maintenance, and the disposition of any solid waste segregated from introduc to the digester. The Discharger shall provide training to its staff on the SOPs shall maintain records for a minimum of three years for each load received,

[1] Anaerobically digestible material (ADM) as defined in the CalRecycle regulations.

CMSA Regulated Under NPDES Permit



CMSA NPDES Permit No. CA0038628

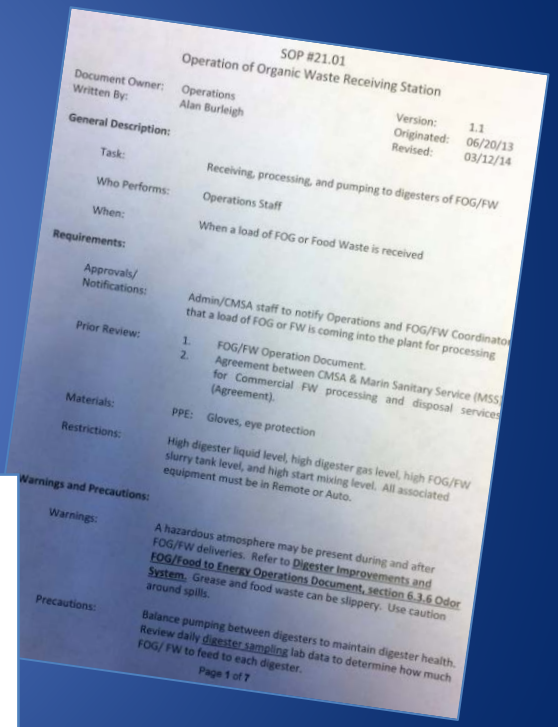
Fats, Oils & Grease (FOG)/Food-to-Energy (F2E) Receiving Facility Operations Document

December 9, 2014

Purpose

This operating procedure (SOP) is intended to ensure that the delivery and processing of Fats, Oils, and Grease (FOG) and Food Waste (FW) transported to the CMSA Treatment Plant are conducted in a safe, efficient manner that protects the physical facilities, maintains adequate treatment capacity, ensures proper overall operation, maximizes beneficial reuse, and maintains acceptable effluent quality. This procedure is designed to comply with the requirements in Special Provisions section C, subsection 5d in CMSA's NPDES permit, relating to Fats, Oils, and Grease, or food processing waste, for injection into anaerobic digesters, and the SOP content requirement listed in the September 25, 2013 letter from the State Water Resources Control Board (SWRCB) for publically-owned treatment works (POTW) receiving hauled-in anaerobically digestible waste for co-digestion.

Detailed Operations and Maintenance Procedures



SOP #21.01

Operation of Organic Waste Receiving Station

Document Owner: Operations
Written By: Alan Burleigh
Version: 1.1
Originated: 06/20/13
Revised: 03/12/14

General Description:

Task: Receiving, processing, and pumping to digesters of FOG/FW

Who Performs: Operations Staff

When: When a load of FOG or Food Waste is received

Requirements:

Approvals/ Notifications: Admin/CMSA staff to notify Operations and FOG/FW Coordinator that a load of FOG or FW is coming into the plant for processing

Prior Review:
1. FOG/FW Operation Document.
2. Agreement between CMSA & Marin Sanitary Service (MSS for Commercial FW processing and disposal services (Agreement).

Materials:

PPE: Gloves, eye protection

Restrictions: High digester liquid level, high digester gas level, high FOG/FW slurry tank level, and high start mixing level. All associated equipment must be in Remote or Auto.

Warnings and Precautions:

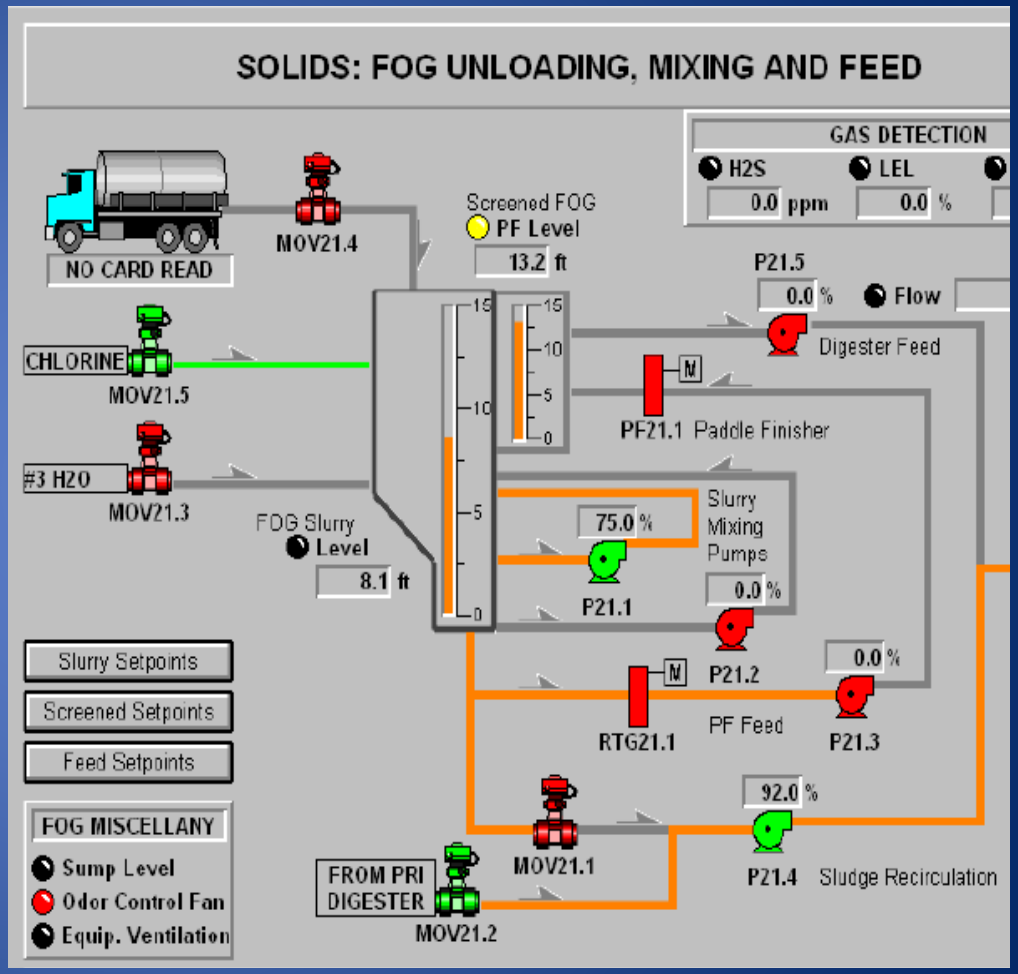
Warnings: A hazardous atmosphere may be present during and after FOG/FW deliveries. Refer to Digester Improvements and FOG/Food to Energy Operations Document, section 6.3.6 Odor System. Grease and food waste can be slippery. Use caution around spills.

Precautions: Balance pumping between digesters to maintain digester health. Review daily digester sampling lab data to determine how much FOG/ FW to feed to each digester.

Page 1 of 7

Equipment Start-up

- FOG delivery testing period started November 2013
- Began receiving January 2014
  10,000 gallons per day
- Now ~23,000 gpd
- Food waste delivery began February 2014
  4.2 tons per day
- Now ~7.0 tons/day

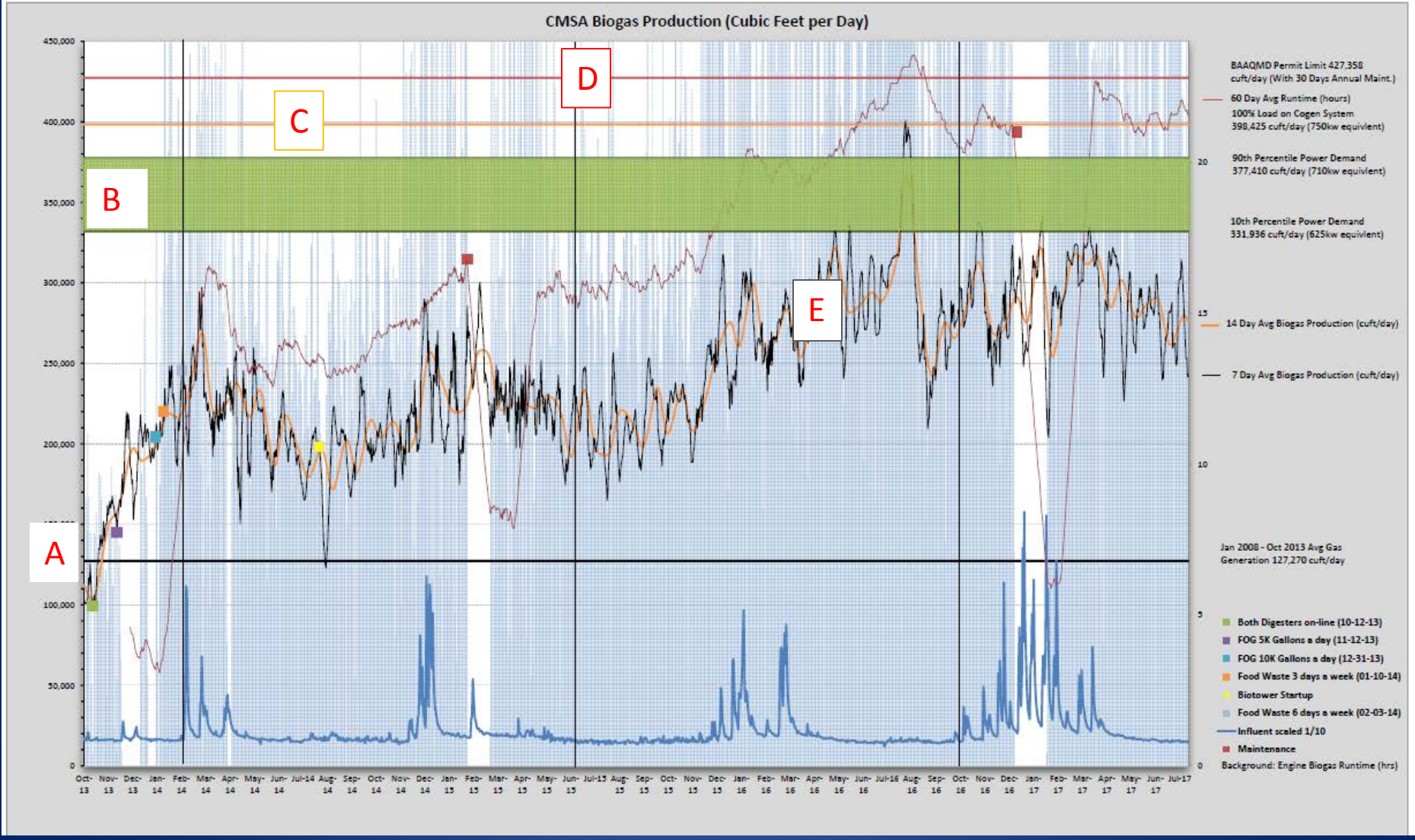


SCADA Overview Screen of the FOG/OW Station

First Delivery in January 2014

First Official Delivery in February 2014

Baseline Data

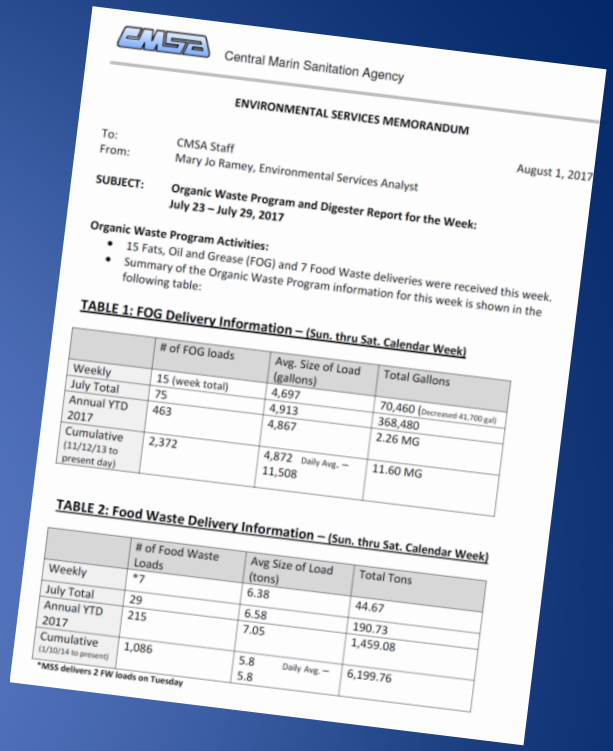


July 17 Data Collection and Performance Measurements

FOG/ FW Delivery Information	**FOG**	**Foodwaste**
• Number of Loads	**76**	**30**
• Avg. Size of Load	**4,913 Gal.**	**6.56 Tons**
• Pomace Bins and Reject Material	**12 Bins or 5.9% of Total Loading**	
Participants in the Program	**191 FSE's in July**	
FOG/FW Slurry Feed to Digesters	**%TS 5.9 %VS 89**	

Digester health has remained stable and has not been affected by the addition of FW

• Total Dig. Loading	**% of Total VS Loading**
• Primary Sludge	**36%**
• TWAS	**40%**
• Organic Slurry	**24%**
• Digester HRT / days	**38**



Central Marin Sanitation Agency

ENVIRONMENTAL SERVICES MEMORANDUM

To: CMSA Staff
From: Mary Jo Ramey, Environmental Services Analyst
August 1, 2017

SUBJECT: Organic Waste Program and Digester Report for the Week: July 23 – July 29, 2017

Organic Waste Program Activities:

- 15 Fats, Oil and Grease (FOG) and 7 Food Waste deliveries were received this week.
- Summary of the Organic Waste Program information for this week is shown in the following table:

TABLE 1: FOG Delivery Information – (Sun. thru Sat. Calendar Week)

	# of FOG loads	Avg. Size of Load (gallons)	Total Gallons
Weekly	15 (week total)	4,697	70,460 (Decreased 41,700 gal)
July Total	75	4,913	368,480
Annual YTD 2017	463	4,867	2.26 MG
Cumulative (11/12/13 to present day)	2,372	4,872 Daily Avg. – 11,508	11.60 MG

TABLE 2: Food Waste Delivery Information – (Sun. thru Sat. Calendar Week)

	# of Food Waste Loads	Avg Size of Load (tons)	Total Tons
Weekly	*7	6.38	44.67
July Total	29	6.58	190.73
Annual YTD 2017	215	7.05	1,459.08
Cumulative (1/10/14 to present)	1,086	5.8 Daily Avg. – 5.8	6,199.76

*MSS delivers 2 FW loads on Tuesday

PROCESS LAB DATA METRICS

		Digester #1	range	Digester #2	
DIGESTER SAMPLING	Total Solids (%)	**2.2**	*1.7 – 2.8*	**2.5**	Sample Date: 7/28/17
	Volatile Solids (%)	**72**	*65-72*	**71**	Sample Date: 7/28/17
	Volatile Solids Reduction (%) Land App >38%	**72.1**	*>45*	**72.1**	
	Total Alkalinity (mg/L)	**5800**	*4300 – 5500*	**5800**	Sample Date: 7/31/17
	Volatile Acids (mg/L)	**86**	*85 - 129*	**86**	Sample Date: 7/31/17
	Ratio: VA/TA	**0.0148**	*0.018 – 0.029*	**0.0148**	Sample Date: 7/31/17

Facility Processes Control When Operating an OWRF

Primary Sedimentation

- Blanket Depths

Secondary System

- MLSS Inventory

Digester Feeding

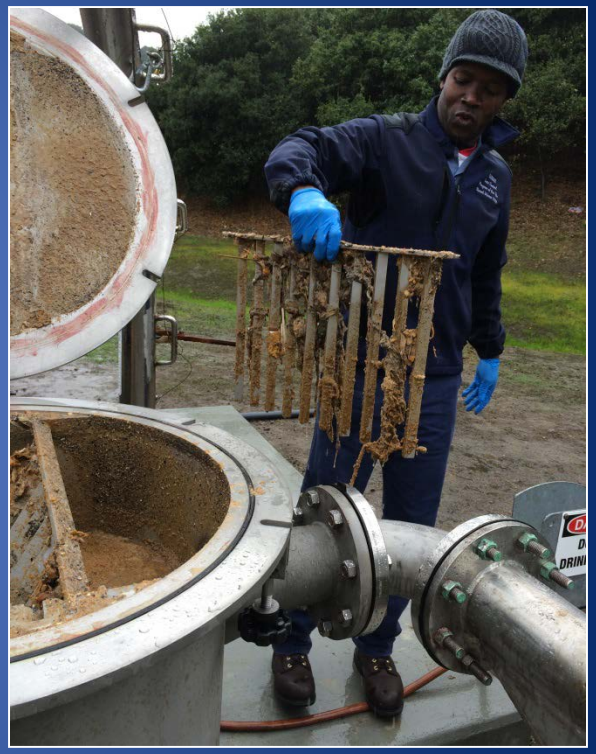
- Fill and mix slurry during the day
- Feeding in afternoon
- Empty and clean in late evening

Solids Handling

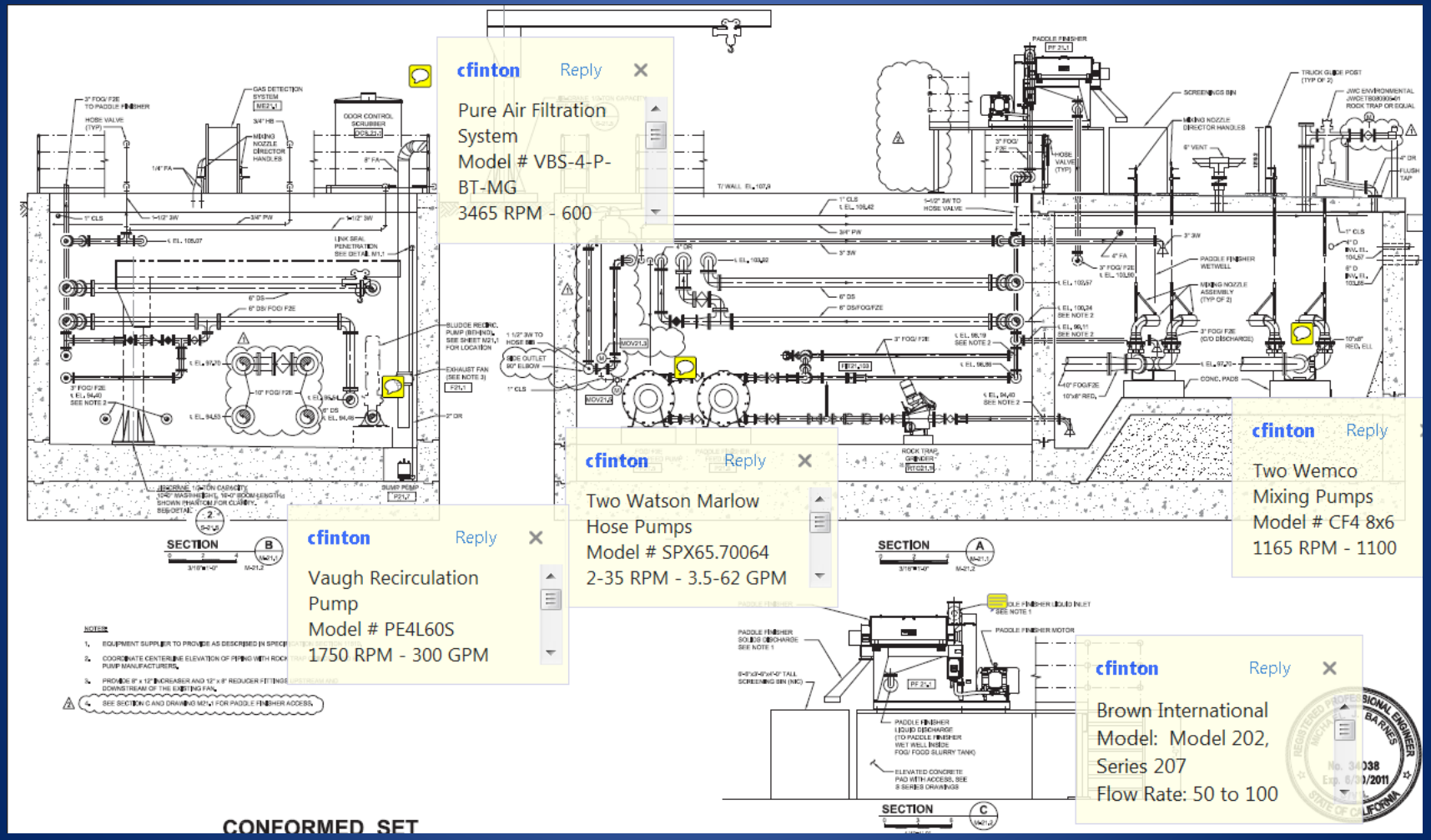
- No Significant Increase in Biosolids
- Dewatering Operations
- Managing Biogas

CENTRIFUGE SAMPLING	Unit # / Date	**#1-7/24**	**#1-7/25**	**#3-7/26**	**#1-7/27**			
	Feed (%)	**2.5**	**2.4**	**2.4**	**2.8**			
	Centrate (TSS mg/L)	**124**	**148**	**308**	**188**			
	Cake (%)	**28.1**	**27**	**26.8**	**25.9**			
	Capture Rate (%)	**99.5**	**99.4**	**98.8**	**99.4**			

Maintaining an OWRF



Facility Equipment



Preventative Maintenance

Daily

- Hose down Down Equipment and Receiving Station
- Rinse out Pumps and Piping
- Cleanout Heavy Object Trap (FOG Screen)

Preventative Maintenance

Weekly

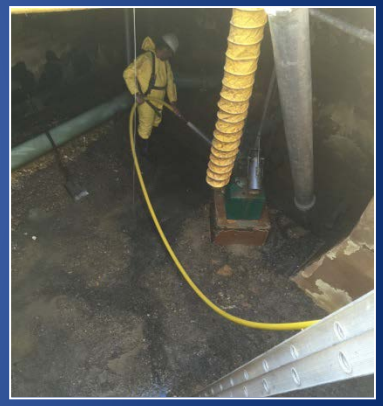
- Pomace Bins
- Rock Trap Grinder
- Equipment Area

Monthly

- Pumps
- Paddle Finisher

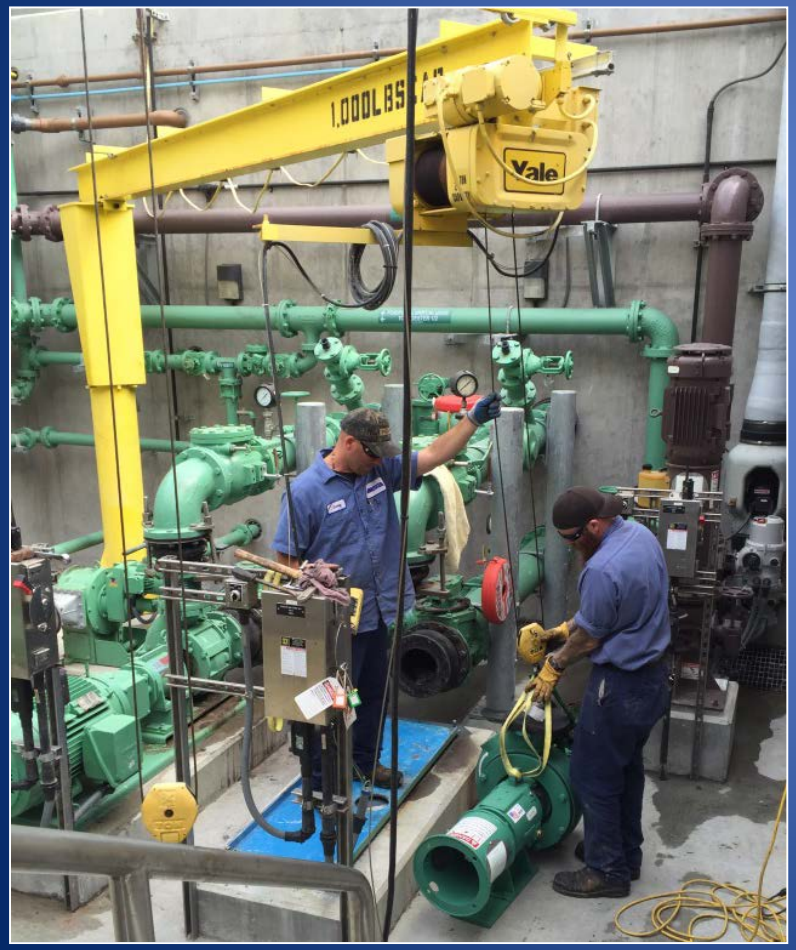
Quarterly

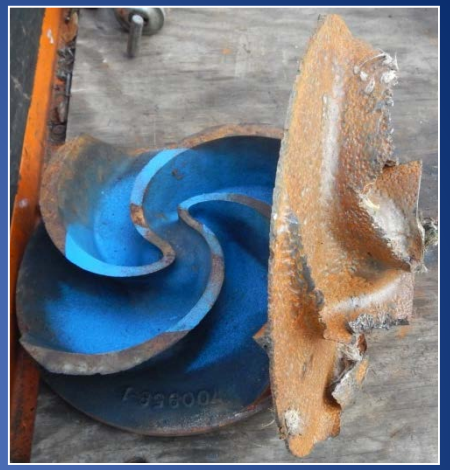
- Receiving Tank Cleaning and Coating Inspection



Corrective Maintenance

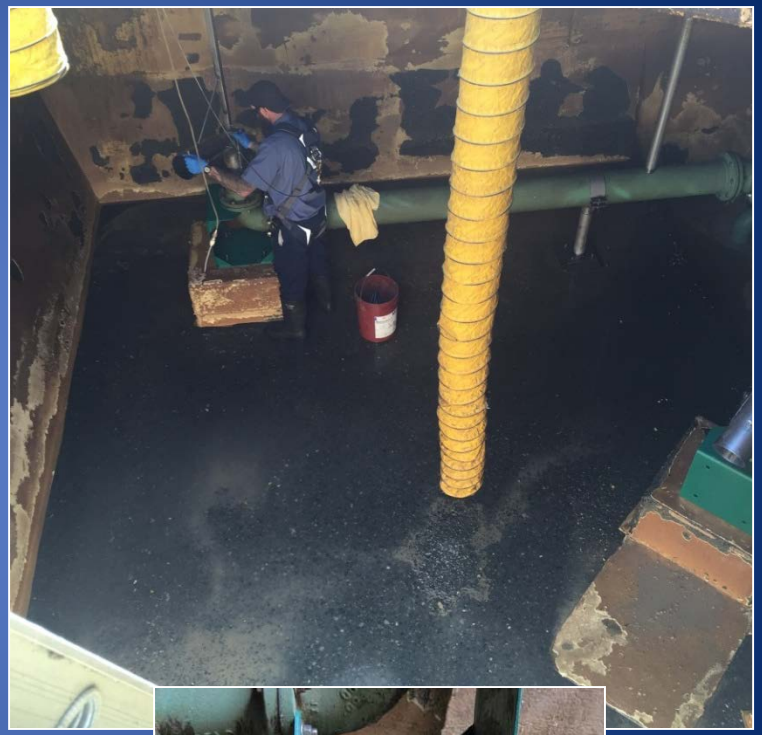
Mixing Pumps





Corrective Maintenance

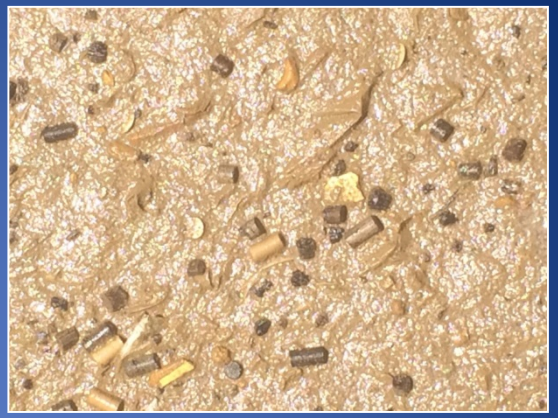
Tank Coating Failure

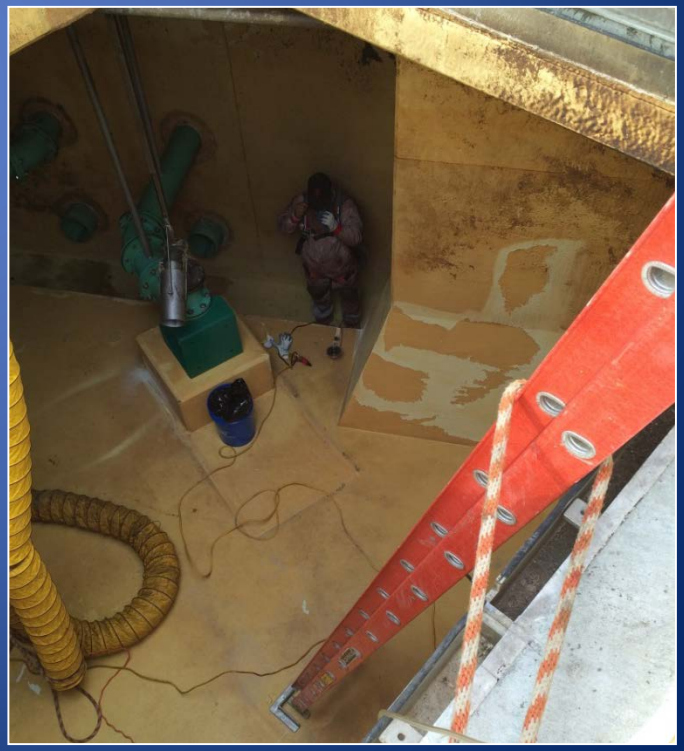


Corrective Maintenance

Quarterly Cleaning

Quarterly Cleaning





Unplanned Corrective Maintenance

Feed Pump Hoses

- Most unpredictable failure regardless of hose material
  - $2,000 per hose labor/material
  - Average 6 hose replacements per year
  - Paddle Finisher Feed Pump Leads Hose Replacements
  - Two Hoses and Five Gallons of Glycerin - Critical Inventory

Critical Spare Inventory – Risk Analysis

- Equipment Name and Function
- Options Available if Equipment was Out of Service (OOS)
- Can we Operate the Station w/o Equipment for 72 hours
- Consequences if Equipment is OOS
- Recommendation for Spare in Inventory (Yes / No)
- List of Spare Parts Onsite
- Estimated Equipment Delivery time for purchase to shipment

FOG/F2E STATION EQUIPMENT FUNCTION AND RISK ANALYSIS

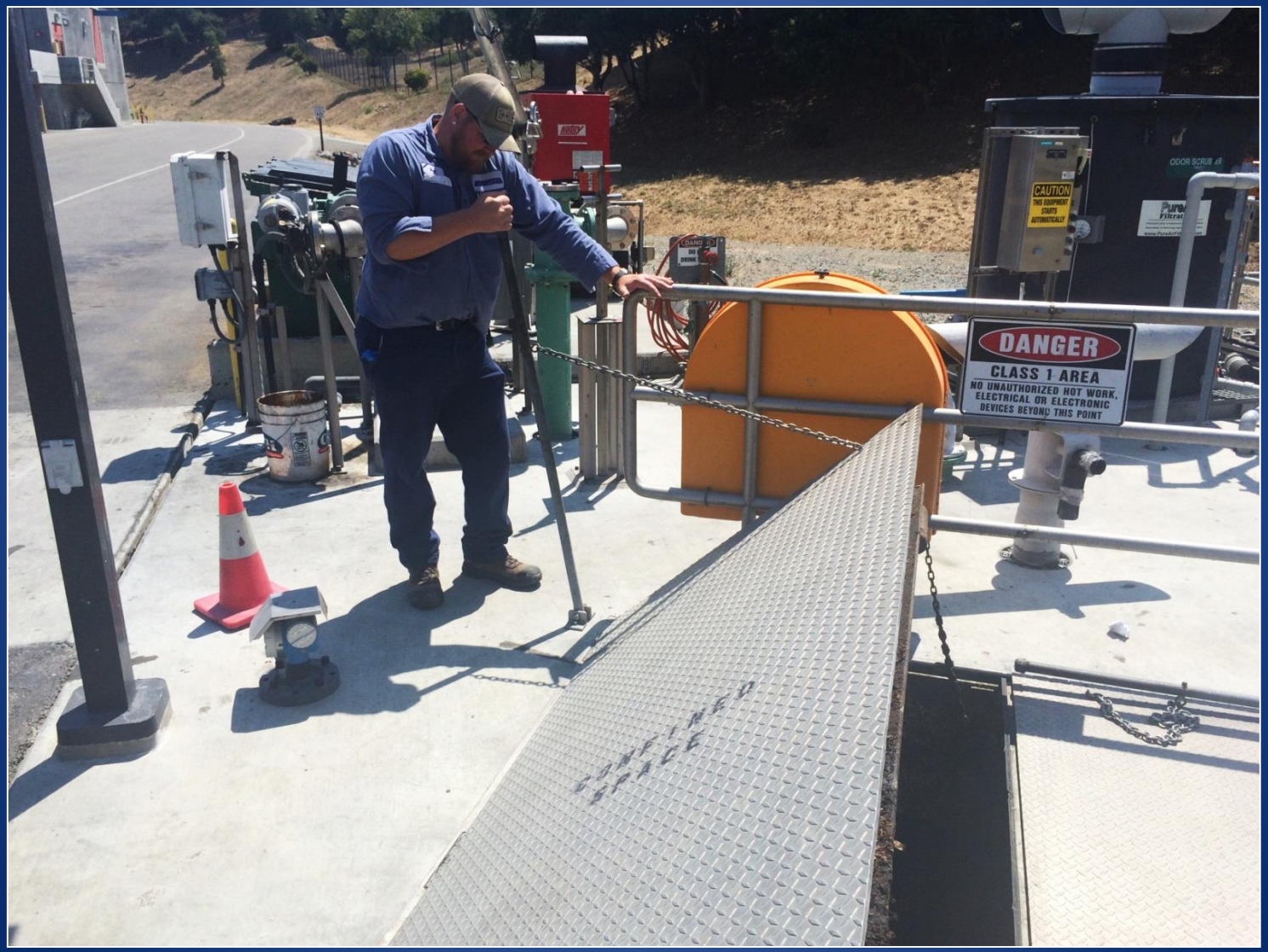
Equipment name:	Equipment function:	Possible options if equipment is out of service. CMSA Operation Department will review and refer this to SOP.	Can CMSA staff operate the FOG station without this equipment for 72 hours (YES / NO): Please explain why. Comments from team:	Consequences if equipment is out of service (other than increased staff time to operate)	Recommend having spare parts onsite? And why?	List of spare parts CMSA already have onsite	Recommended for additional spare parts onsite:	Estimate equipment delivery time from purchase to shipment:
Equipment Area Exhaust Fan	The exhaust fan is to minimize the potential harmful gases accumulating in the lower equipment area.	Use portable fan if the exhaust fan is out of service.	Yes Use portable exhaust fan if the permanent exhaust fan is out of service.	None.	No There is little to no impact if equipment is out of service, with the temporary solution in place.	None	No	
FOG/F2E Mixing Pumps	The mixing system was designed with the corner nozzles and waste mixing nozzles to avoid collecting the material in dead zones. These pumps are designed to chop as it pumps, keeping oversized solids and stringy material from clogging downstream process.	Use one mixing pump to mix the slurry tank in longer period for flow circulation. CMSA operation staff can either common the mixing nozzle or adjust the nozzle location to avoid collecting the slurry waste material in dead zones.	Yes Lead operator reported that the texture of the recently received food waste is watery and will able to mix well with only one pump in service.	Potentially decease the slurry tank's mixing performance.	No. FOG or waste slurry will able to mix using one pump.	1 complete spare pump, fully assembled 1 impeller with cutter bar and cutter nut 1 set of bearing 1 set of mechanical seals 1 set of o-rings 1 set of shims	No	
Rock Trap Grinder RTG21.1	Rock Trap Grinder will let rocks and gravel drop out, and will use the grinder cutter to shred any larger size solids. RTG21.1 will start and stop based on the operation perimeters of Paddle Finisher Feed Pump P21.3.	Increase the slurry tank mixing duration, using the FOG/F2E Mixing Pumps. These pumps are designed to chop as it pumps, keeping oversized solids and stringy material from clogging downstream process.	Mixing waste slurry longer will shred the waste in smaller size, and the paddle finisher may capture the remaining unwanted waste.	There is a risk of damaging the paddle finisher feed pump (P21.3) and the paddle finisher, if the rock trap grinder is not in service.	Yes Protect downstream equipment. The cutting surface is a normal wear and tear item, and may need replacement frequently. It is recommended to have the normal wear and tear parts onsite.	2 seal assemblies 2 bearing assemblies 4 gaskets 2 complete cutter head tensioning devices 2 complete cutting surfaces	No	
Paddle Finisher Feed Pump (Hose Pump P21.3)	Paddle Finisher Feed Pump P21.3 will take in the waste slurry material from the slurry tank, send it to the Paddle Finisher, and discharge it back to the paddle finisher wet well.	Option 1: Operator can open the manual (normally closed) isolation valve so that the FOG/F2E feed pump (Hose Pump P21.5) can take the waste slurry from the slurry tank to the paddle finisher. When the paddle finisher wet well is full, it will spill over back to slurry tank. Operator can shut off the paddle finisher, and close the manual isolation valve, and serve it as an FOG/F2E feed pump. The paddle finisher wet well volume is approximately 1180 gallon (size 8'x4'x5'), assuming the hose pump feed rate is 60	Options seem to be available to bypass the out of service pump, however, it will be too troublesome to operate the system if the pump is out of service	Option 1: Require almost a full time operator staff to be staged at the FOG Station during the period when the slurry tank is being emptied. Option2: Unable to screen the unwanted materials from the food waste slurry. Potential slurry waste material with size	Yes Team discussed this believed that it will be too troublesome to operate if the pump is out of service, as replacing normally wear parts such as hose, coolant, and wear shoes can be done in few hours.	4 spare hoses 4 gallons of lubricant refills	No	

Lessons Learned and Key Takeaways

- OW Program Coordinator a Must
- Accepting Non-Traditional Wastes

Operator demonstrating Safe Access Gates

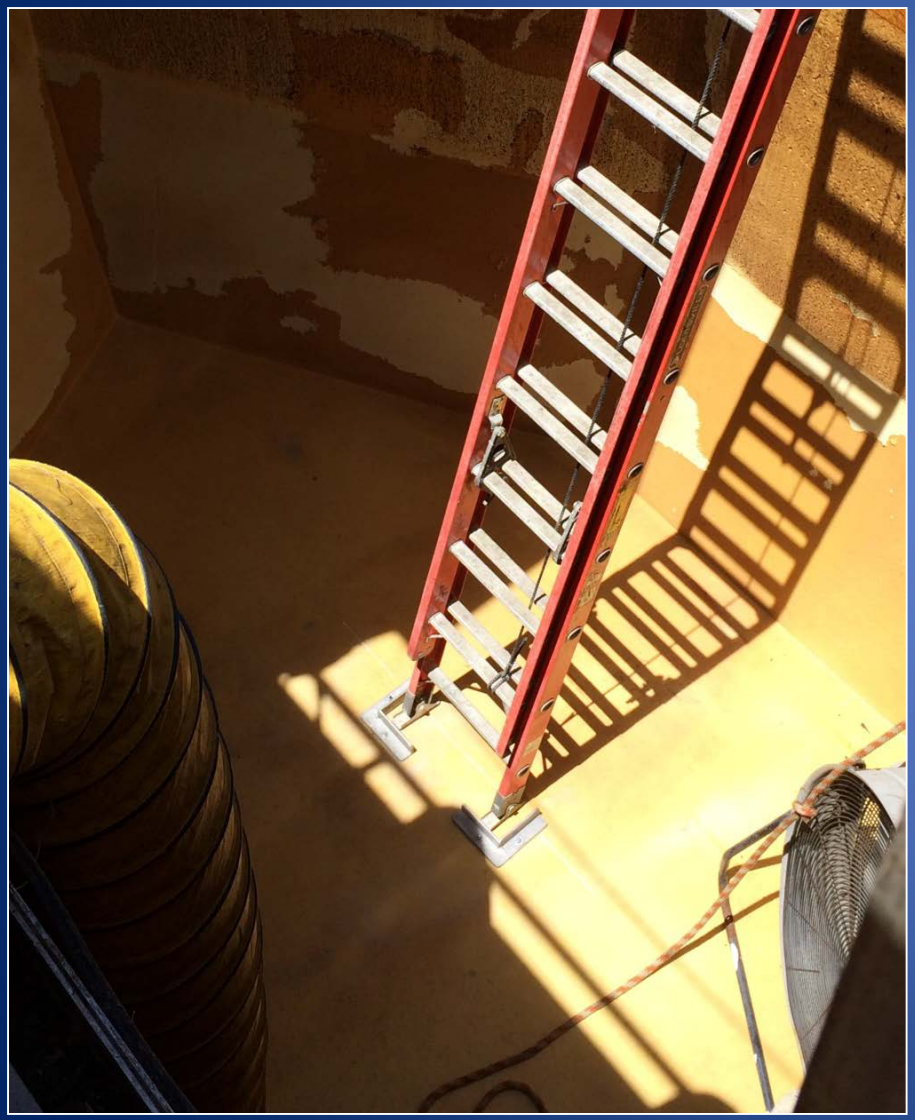
- Leaver and Chain

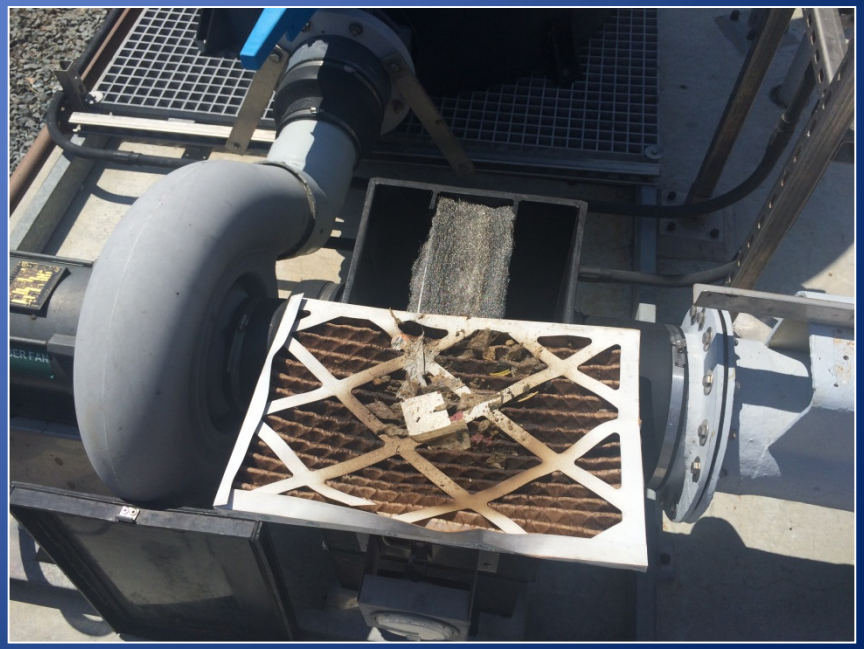


- Paddle Finisher Chute

- Hazardous Atmosphere Monitoring

- Ladder Cleats and Scrubber Fan





Budget Considerations

OWRF Maintenance Consumables Budget

- 2014 = $20,000
- 2017 = $45,000 or 55.5% increase

Biogas Conditioning Media

Total Revenue and Expenses

- OW Program Staff Levels 1.6 FTE
- Breaking Even on Revenue versus Expenses

Cost Information

OWRF Construction Cost = $1.9 million

2016 Tipping Fee Revenue: $146,056

- FOG / Foodwaste / Soy-Whey / Brewery Waste

2016 Biogas Energy Value (NG =) $122,397

79% Reduction in Natural Gas Procurement*

Self-Sustainable Biogas Production

98.9% of Agency Power Produced in July by Cogenerator

91.6% Produced w/ Biogas

Methane Content 64%

CMSA CY17 PERFORMANCE METRICS – July 2017

TABLE I - TREATMENT/PROCESS METRICS

Metric	Definition	Measurement	Range/Target/Goal
1) Wastewater Treated	Volume of wastewater influent treated and disposed, in million gallons (Mg)	252.5 Mg	165 – 820 Mg
2) Biosolids Reuse	Alternate Daily Cover (ADC) at the Redwood Landfill, in wet tons (wt) Fertilizer and soil amendment at land application sites, in wet tons (wt) Bio-Fertilizer production at the Lystek facility, in wet tons (wt)	wt wt	360 – 665 wt
3) Conventional Pollutant Removal	Removal of the conventional NPDES pollutants - Total Suspended Solids (TSS) and Biological Oxygen Demand (BOD) a. tons of TSS removed; % TSS removal b. tons of organics removed (BOD); % BOD removal	 0; 0% 0; 0%	 > 85% > 85%
4) Priority Pollutants Removal	Diversion of priority NPDES metals from discharge to the S.F. Bay: a. % Mercury b. % Copper	 0.0% 0.0%	 88 – 99% 84 – 98%
5) Biogas Production	Biogas generated in our anaerobic digesters, in million cubic feet (Mft^3) Natural gas (methane) equivalent of the biogas, in million cubic feet (Mft^3)	8.50 Mft^3 5.44 Mft^3	6.0 to 9.5 Mft^3 3.8 to 6.1 Mft^3
6) Energy Produced	Energy produced from cogeneration of generated biogas and purchased natural gas - in kilowatt hours Cogeneration system runtime on biogas , *in hours (hrs.); % time during month* Biogas value (natural gas cost equivalent)	431,313 kWh 682 hrs; 91.6% $25,134	380 to 480,000 kWh 540 hrs.; 75% $7,000 to $24,000
7) Efficiency	The cost to operate and maintain the treatment plant per million gallons of wastewater treated, in dollars per million gallons Energy used, kilowatt hours, per million gallons treated	$1,425 /Mg 1,812 kWh/Mg	$451-$1,830/Mg (wet - dry) 670 - 2,400 kWh/Mg

On the Horizon

Achieve Energy Self-Sufficiency

Deliver Power to Local Utility

- Interconnection Agreement
- Improvements to Export Power
- Power Sale Agreements

Expand Program

- Find Additional Sources of OW
- Produce More Biogas

Questions?

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