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Honouliuli WWTP Start Up and Operation of the New Anaerobic Digesters

Presentation by

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OVERVIEW

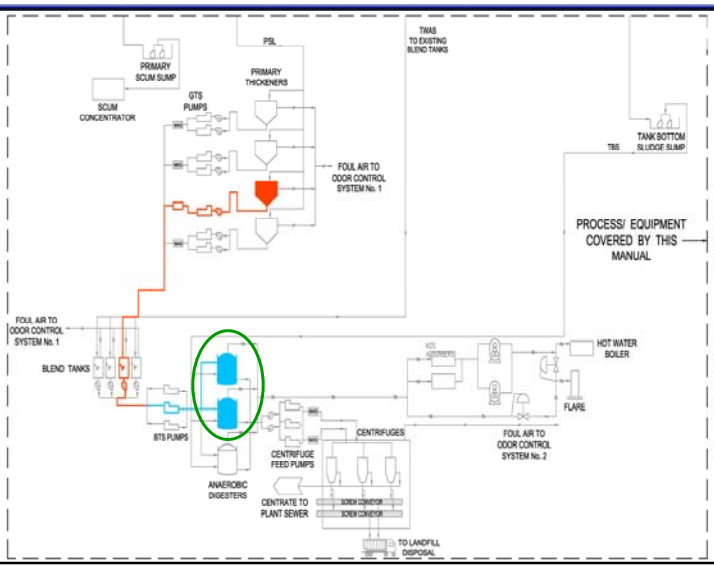
- **Conditions that led to the installing Anaerobic Digestion**
- **Briefly describe the Process & Equipment**
- **Briefly describe the Instrumentation**
- **Start up Procedures and Results**
- **Environmental & Economic Benefits**

HONOULIULI WWTP BACKGROUND

- By 2000, the Low Pressure Oxidation Unit (LPO) was operating at capacity and approaching the end of its equipment life.
- Solids Stream had not been upgraded since the plant's inception in 1984.
- Residential neighborhoods had grown to within 373 yards from the plant.
- Odors generated by LPO became a nuisance.
- We recommended replacing the LPO with three (3) mesophilic high rate digesters.
- Construction was complete in December 2009.

HONOULIULI DIGESTERS Under Construction

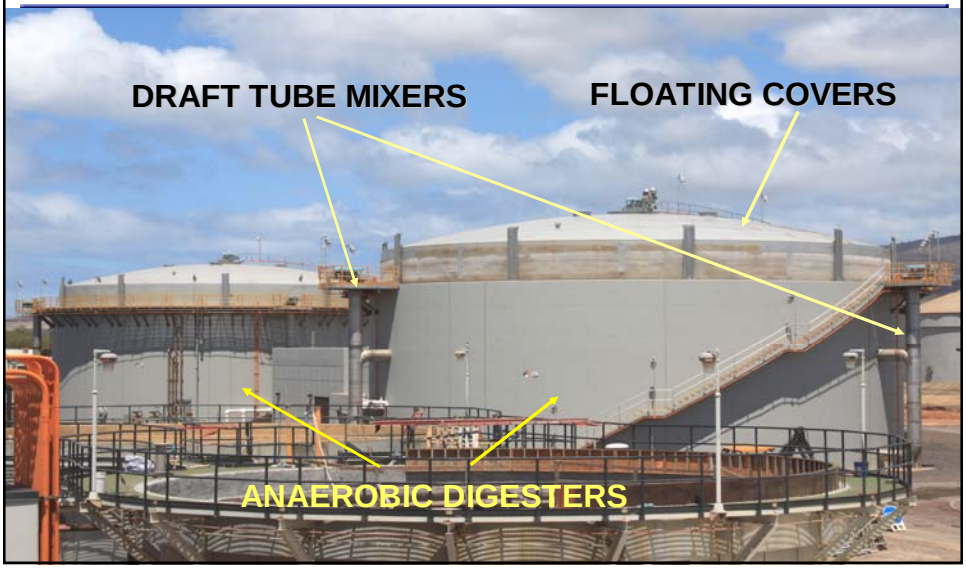
PROCESS SCHEMATIC



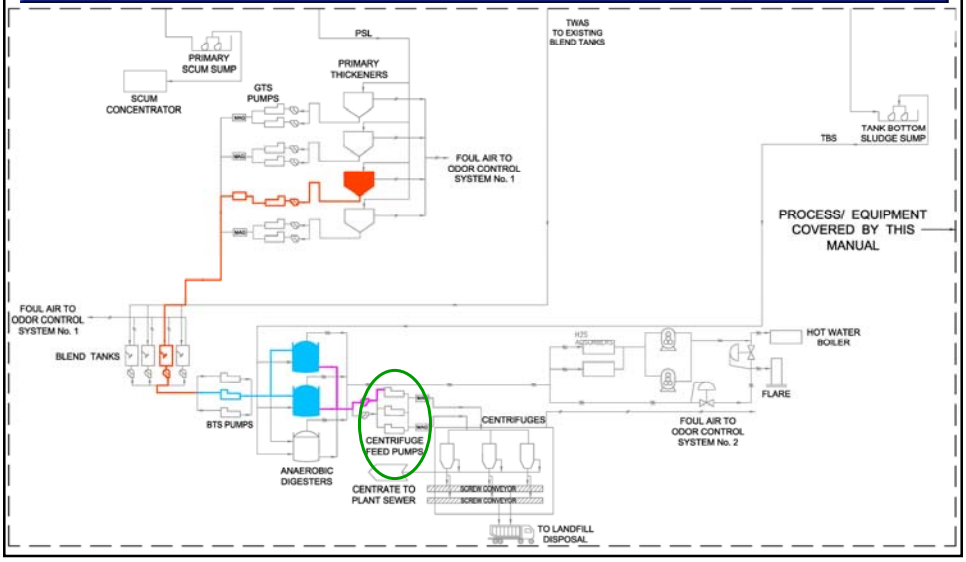
III SOLIDS HANDLING
PROCESS FLOW DIAGRAM

SYMBOL/ABBR.	DESCRIPTION
	CENTRIFUGAL BLOWER
	CENTRIFUGAL PUMP
	FAN
	GRAVITY BELT THICKENER
	GRINDER
MAG	MAGNETIC FLOW METER
	PROGRESSIVE CAVITY PUMP
	VERTICAL TURBINE PUMP
BLO	BLOWER
	AIR FLOW
	DIGESTER GAS FLOW
	LIQUID FLOW
	SOLID FLOW
BTS	BLENDTANK SLUDGE
GTS	GRAVITY THICKENED SLUDGE
PSL	PRIMARY SLUDGE
RAS	RETURN ACTIVATED SLUDGE
TBS	TANK BOTTOM SLUDGE
WAS	WASTE ACTIVATED SLUDGE

FLOATING COVERS & DRAFT TUBE MIXERS

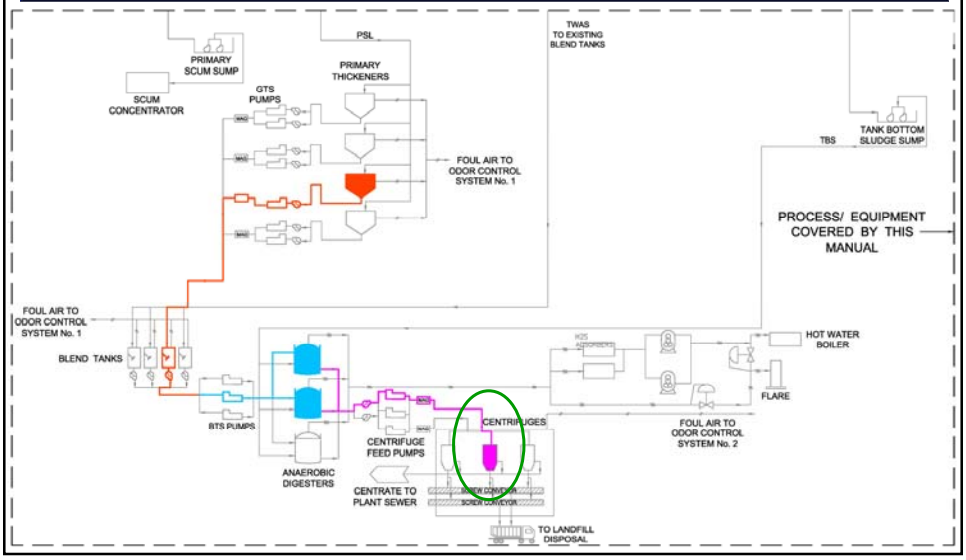


PROCESS SCHEMATIC



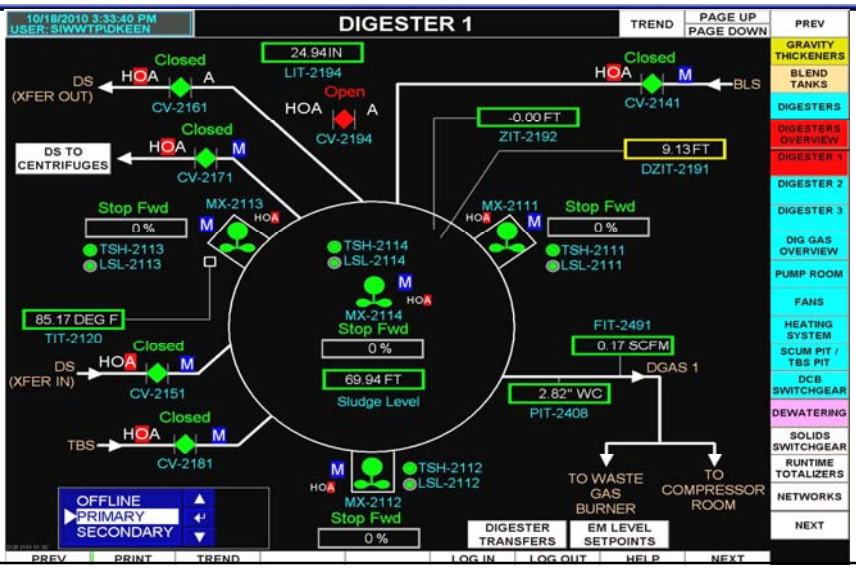
SLUDGE TRANSFER & CENTRIFUGE FEED PUMPS

PROCESS SCHEMATIC



DEWATERING CENTRIFUGES

INSTRUMENTATION

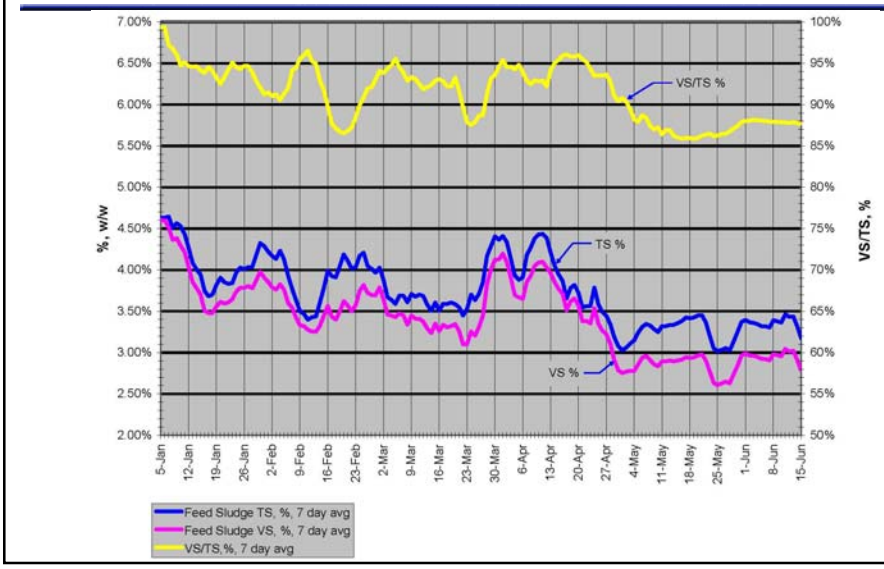


BASIS OF DESIGN

Year	Primary Flow mgd	Secondary Flow mgd	Primary Sludge Flow gpd	Secondary Sludge Flow gpd	Volatile Solids Loading ppd	Hydraulic Residence Time days	Volatile Solids Reduction
2011	25.6	13	100,800	21,106	31,110	26	60%
2020	42	20	180,000	36,000	55,300	22	60%

In 2011, the plant needs to operate only two digesters as high rate digesters, while the third can provide sludge storage.

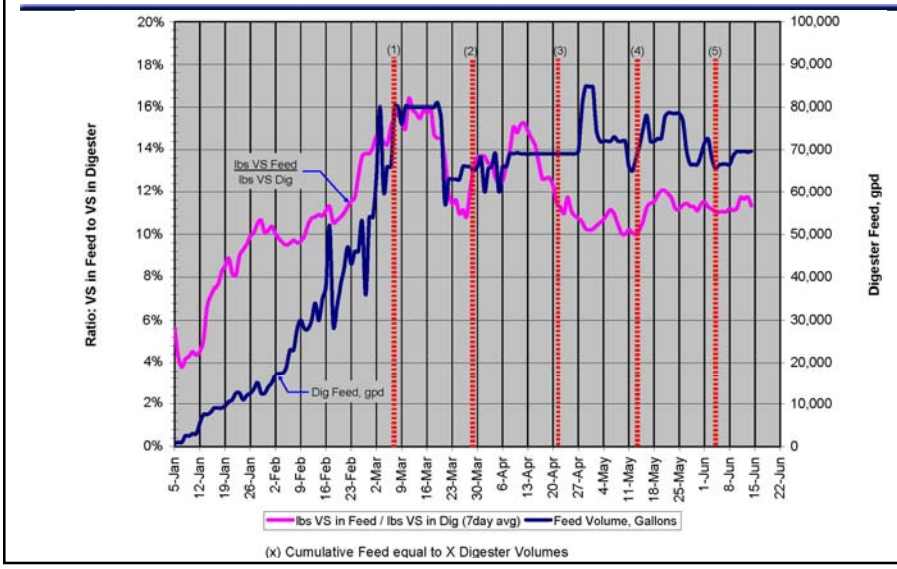
FEED SLUDGE



DIGESTER START UP PROCEDURE

- Fill the Digester to the mixer's minimum operating level.
- Preheat the contents to 95^{o}F.
- Purge the gas space with N_2 to Reduce O_2 level to below 12%.
- Add Seed Sludge to Raise Volatile Solids Contents to at least 10% of the steady State Level. *We actually added 12.5%.*
- Add 10% of the Digester Volatile Solids Content Daily.

RATIO OF VS IN FEED TO VS IN DIGESTER



(x) Cumulative Feed equal to X Digester Volumes

DIGESTER MONITORING PARAMETERS

Analyze for the Parameters listed below daily until the Digester Contents are completely turned over.

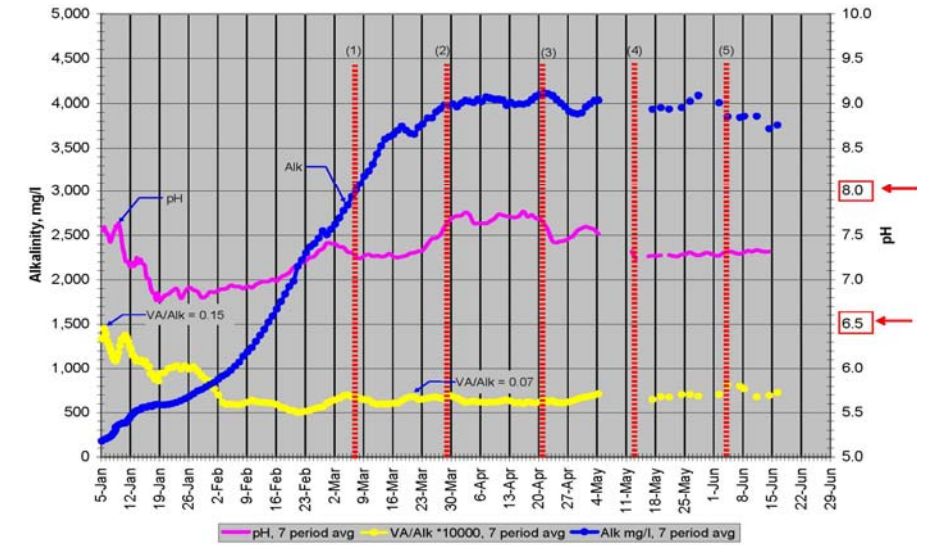
Then continue analyzing 3 times per week.

Parameter	% Total Solids	% Volatile Solids	Volatile Acids	Alkalinity	pH
Digester Sludge	X	X	X	X	X
Target Value	1.75	1.25	*	*	6.5 to 8
Feed sludge	X	X			
Target Value	4	3.6			

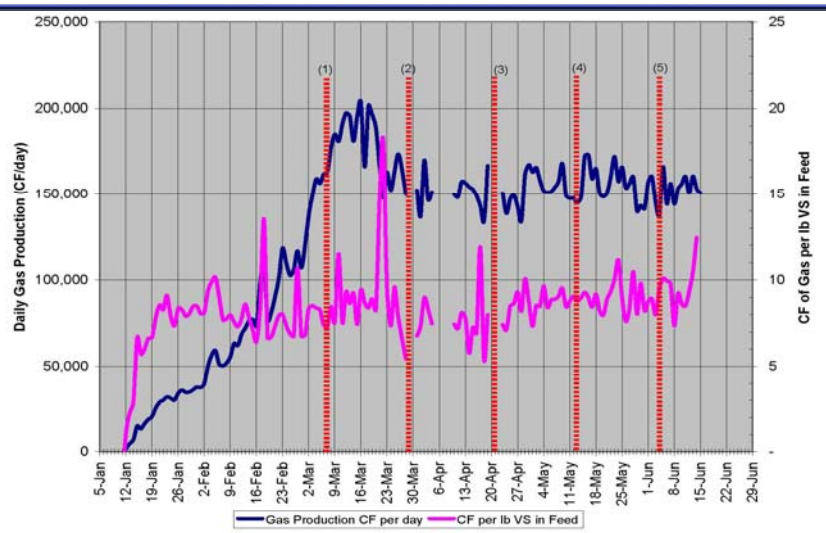
Calculated the *VOLATILE ACIDS* Ratio and Plotted Daily *ALKALINITY

The target for the VA/ALK is from 0.1 to 0.3
BUT NEVER GREATER THAN 0.5

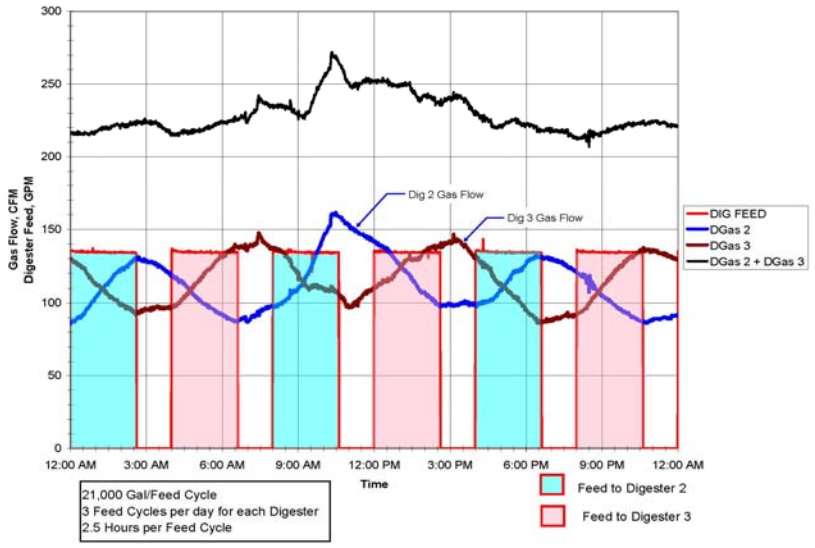
ALKALINITY, VA/ALK, pH PARAMETERS



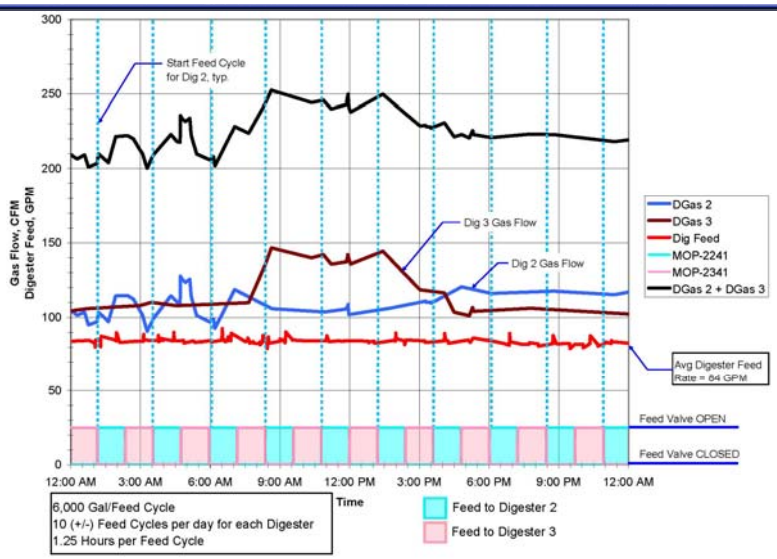
BIOGAS PRODUCTION



BIOGAS PRODUCTION
DURING STARTUP OPERATIONS



BIOGAS PRODUCTION
DURING SCADA OPERATIONS



OPERATING CONCLUSIONS

- Feeding the Anaerobic Digester in Increments Equivalent to 10% of the Volatile Solids in the Digester Resulted in an *INCIDENT FREE* Startup.
- Digester Alkalinity Stabilizes within Two (2) Turnovers.
- Gas Production Stabilizes in three (3) Weeks after Startup.

OPERATING CONCLUSIONS

- Ability to Continually Track Biogas Flows Demonstrates the Rapid Destruction of Volatile Solids.
- Decrease in Biogas Flow after Feeding Stops Suggests that Organic Loading can be increased to 0.2 lbs per day VS per ft^3 Digester Volume.
- Increasing the Number of Feeding Cycles while Decreasing the Duration Helps to Even Out the Biogas Production.

ENVIRONMENTAL BENEFITS

- Biological Oxygen Demand (BOD) in the plant's effluent has been Reduced by 28%.
- UV Transmittance Increases in Plant Effluent, which Reduces Power Usage at the Water Reclamation Plant.
- Odor Complaints from the Surrounding Community have Dropped to Almost ZERO.

ECONOMIC BENEFITS

- **Plant Electrical Consumption is Reduced by 8%, which is equivalent to providing power to 96 households.**
- **Reduction in Diesel Fuel Decreased Annual Crude Oil Imports by 350,000 barrels.**
- **Plant Cost/Benefit Includes**

1. Direct Plant Fuel/Power Savings = $3,000 per day

2. Additional Plant Chemical Costs = $1,166 per day

Savings = $ 1,834 per day

Mahalo! Mahalo! Mahalo! Mahalo! Mahalo! Mahalo!

Mahalo! Mahalo! Mahalo! Mahalo! Mahalo! Mahalo!

Mahalo! Mahalo! Mahalo! Mahalo! Mahalo! Mahalo!

Mahalo! Mahalo! Mahalo! Mahalo!

Mahalo! Mahalo! Mahalo! Mahalo!

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