Dewatering Technology: Traditional versus New?

W. James Gellner, PE
Steven Reese, PE

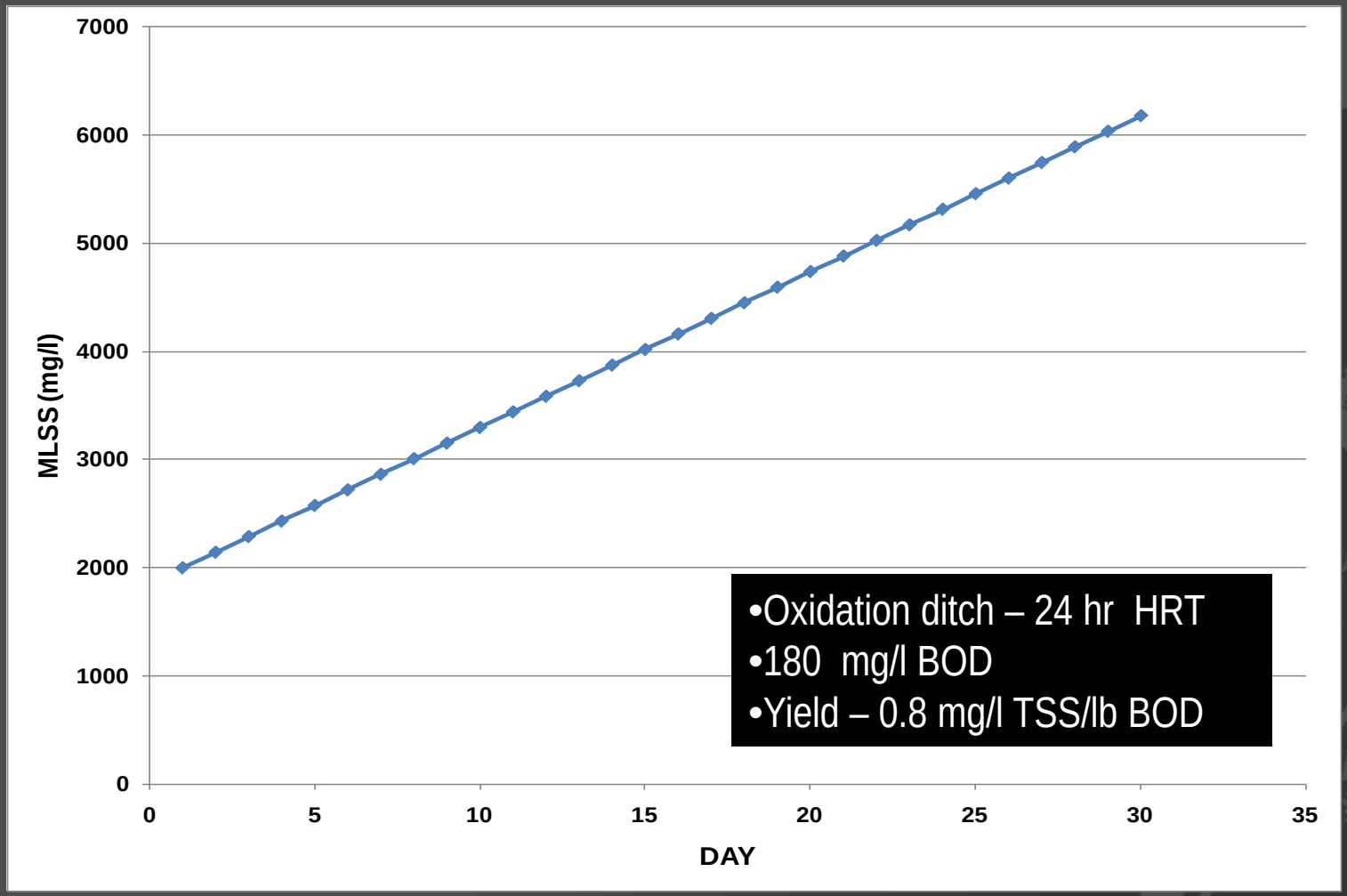
OWEA State Conference
6/16/2010

HAZEN AND SAWYER
Environmental Engineers & Scientists

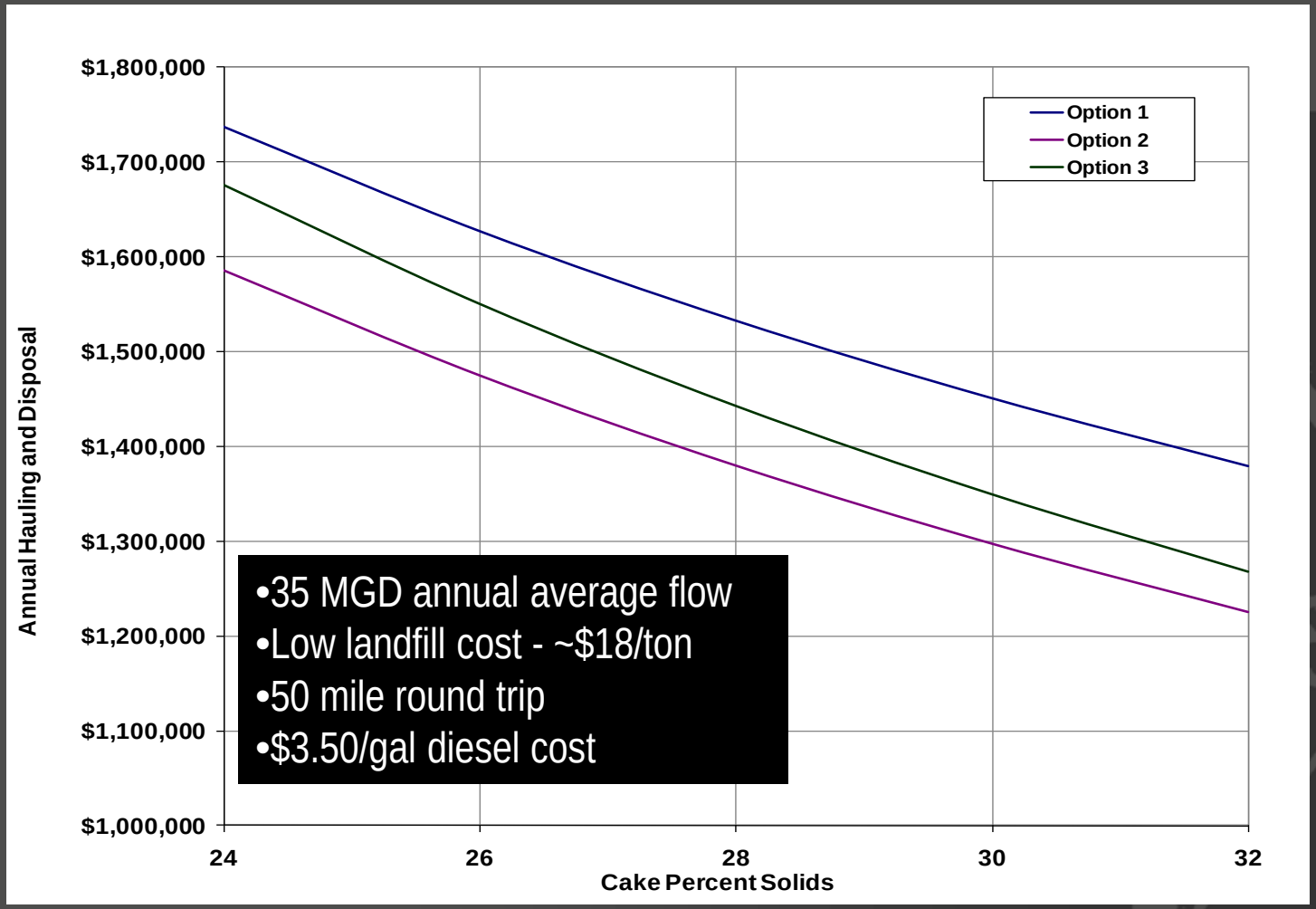
Presentation Overview

- A Reminder of Importance
- Technologies
- Evaluation of Options
- A Few Case Studies
- Future Trends

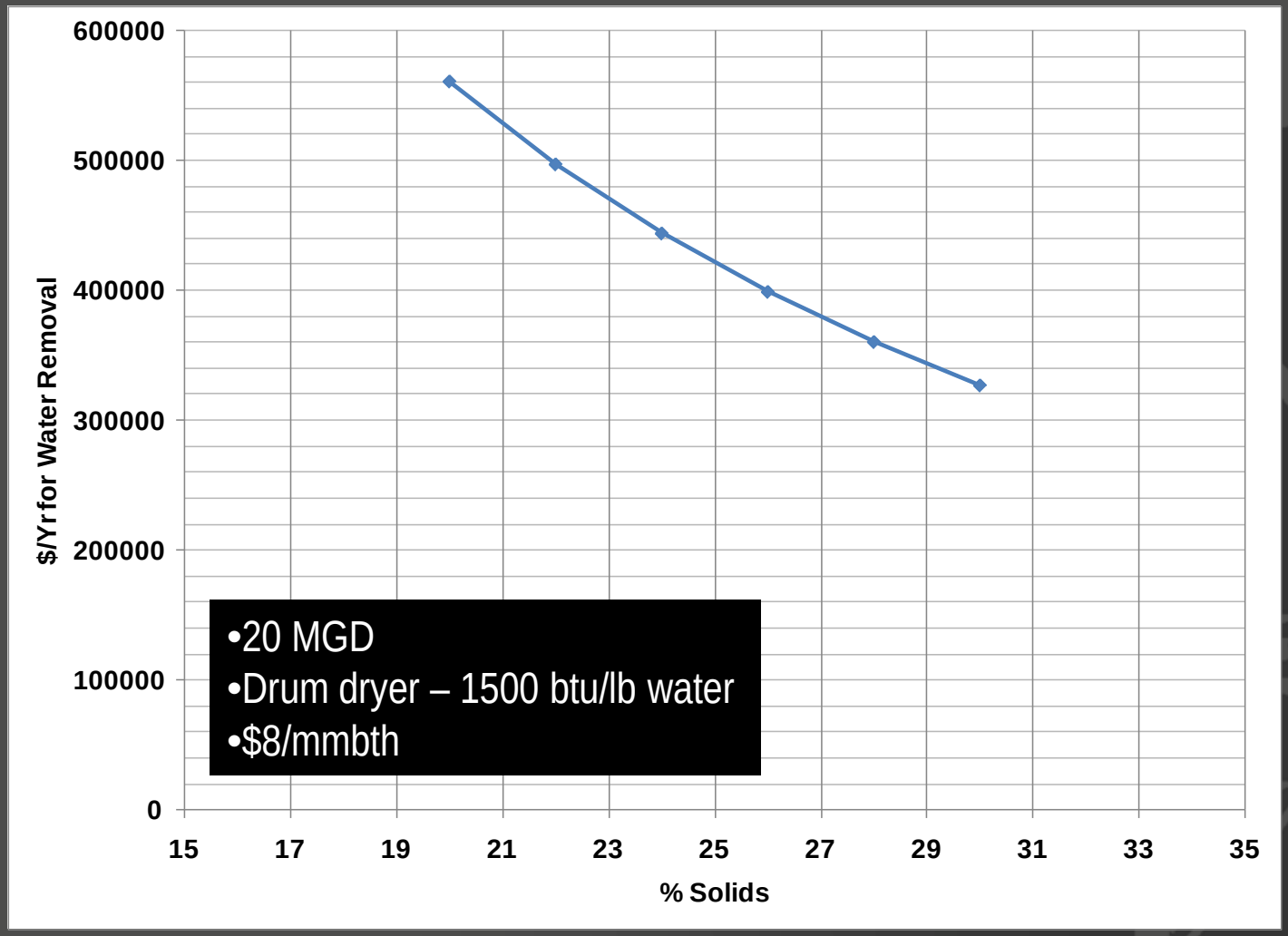
If you can't treat solids…….



Disposal


$1,800,000
$1,700,000
$1,600,000
$1,500,000
$1,400,000
$1,300,000
$1,200,000
$1,100,000
$1,000,000
Annual Hauling and Disposal
24
26
28
30
32
Cake Percent Solids
Option 1
Option 2
Option 3
•35 MGD annual average flow
•Low landfill cost - ~$18/ton
•50 mile round trip
•$3.50/gal diesel cost

Downstream?....Drying



Dewatering Technologies

Thickening	Stabilization	**Dewatering**	Post Treatment
Centrifuges	Aerobic Digestion	Centrifuges	Microwave Drying
GBTs	Anaerobic Digestion	Belt Filter Press	Conventional Drying
Gravity Thickeners	ATAD	Rotary Press	Composting
	TPAD	Screw Press	Lime Stabilization
		Plate Filter Press	Incineration
		Drying Beds	

Centrifuge

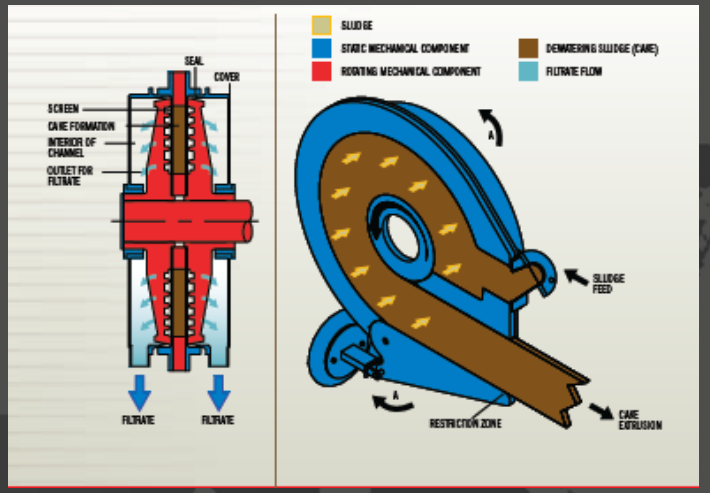
- Good
  - Generally higher solids content than belt press (1-2%?)
  - Compact footprint
  - Can generally be automated
  - High solids capture rate
  - Fully enclosed
- Not so Good
  - Specialized maintenance and operation
  - High rotational speeds
  - Higher power consumption
  - Higher noise
  - Wear and tear

Belt Filter Press

- Good
  - Simpler than centrifuge operation
  - Can be automated
  - High solids capture rate
  - Relatively low maintenance costs
- Not so Good
  - Odor control
  - High water requirements
  - Difficult for large roller and belt replacement
  - Large footprint requirements

Rotary Press

- Slow turning internal disc, pressure creates cake
- Good
  - Low speed, low power
  - High solids capture rate
  - Low water requirements
  - Automated operations
  - Ease of maintenance
- Not so Good
  - Better with primary solids
  - Performance with WAS should be piloted.



From Fournier Industries, Inc.

Screw Press

- Slow rotating screw presses solids into smaller and smaller area toward discharge
- Two types – inclined and straight
- Good
  - Low speed, low power
  - High solids capture rate
  - Low water requirements
  - Automated operations
  - Ease of maintenance
- Not so Good
  - Recent technology
  - Lower performance without primary solids

From Huber Technology, Inc.

Plate Filter Press

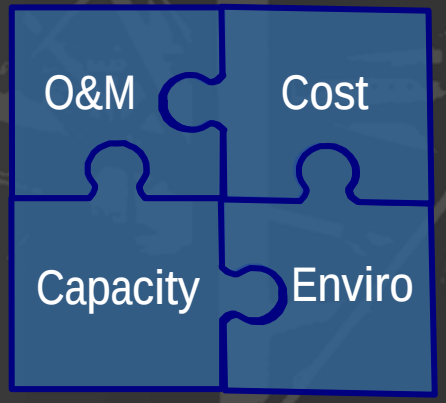
- Good
  - High solids
- Not so Good
  - High pressure operation
  - Batch process
  - Difficult to automate
  - High operation and maintenance requirements
  - Skilled / trained labor requirements
  - High chemical costs (typically lime and ferric)

Drying Beds

- Good
  - Traditional technology
  - Minimal operations
- Not so Good
  - Typically requires additional handling and hauling
  - Large footprint required
  - Mercy of the weather unless covered

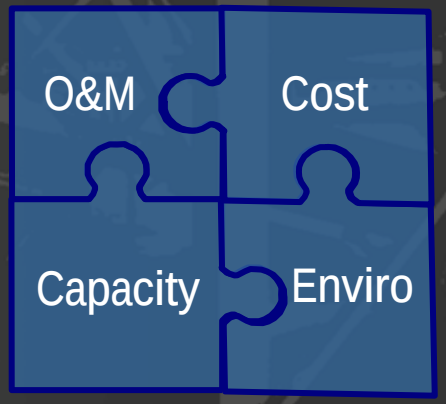
Dewatering Considerations

- Require relatively large capital investment
  - Site constraints / available space
- Substantial share of annual O&M budget
  - Chemical addition
  - Wash water
  - Electricity
  - Labor



Dewatering Considerations (Cont.)

- Dewaterability (sludge characteristics)
- Consider impacts on treatment train
  - Sidestream treatment
  - Odor control
  - Future capacity / adaptability
- End-use
  - Further treatment?
  - Disposal requirements?



Typical Recurring Costs

Typical O&M

- Utilities
- Labor Training
- Chemicals Supplies Equipment
- Maintenance

“Non Costs”

- Performance Sidestreams Odor
- Ease of Use Flexibility Adaption
- Environmental Impacts Noise Level

Case Study No. 1 – "Changes in Feed"

- 26.5 MGD annual average flow
- Anaerobic digested WAS
- Existing FKC screw presses – 17.7% solids
- Evaluating drying
- Primaries to be added as part of upgrade
- Drying downstream

Case Study No. 1 (Cont'd)

Table H-5 "Conservative" Approach Summary

	Alternative "A1"	Alternative "A2"	Alternative "A3"
Dewatering Technology	Screw Press	Screw Press	Centrifuge
Number of Dewatering Units Installed	Seven (7)	Eight (8)	Three (3)
Number of Dewatering Units Operating	Seven (7)	Seven (7)	Two (2)
Dewatering Unit Capacity Utilization	97.1%	97.1%	90.0%
Drying Capacity, lb H2O/hour	11,000	11,000	9,900
Dryer Feed Rate, lb(dry)/hour	3,580	3,580	3,590
Dewatering Construction Cost ($MM)	$8.39	$9.08	$7.82
Drying Construction Costs ($MM)	$17.39	$17.39	$16.16
Dewatering Differential O&M NPC ($MM)			$1.02
Drying O&M Differential NPC ($MM)	$1.62	$1.62	
Comparative Total NPC ($MM)	$27.40	$28.09	$25.00
Additional NPC from "Low Cost" Option	$2.40	$3.09	Low Cost

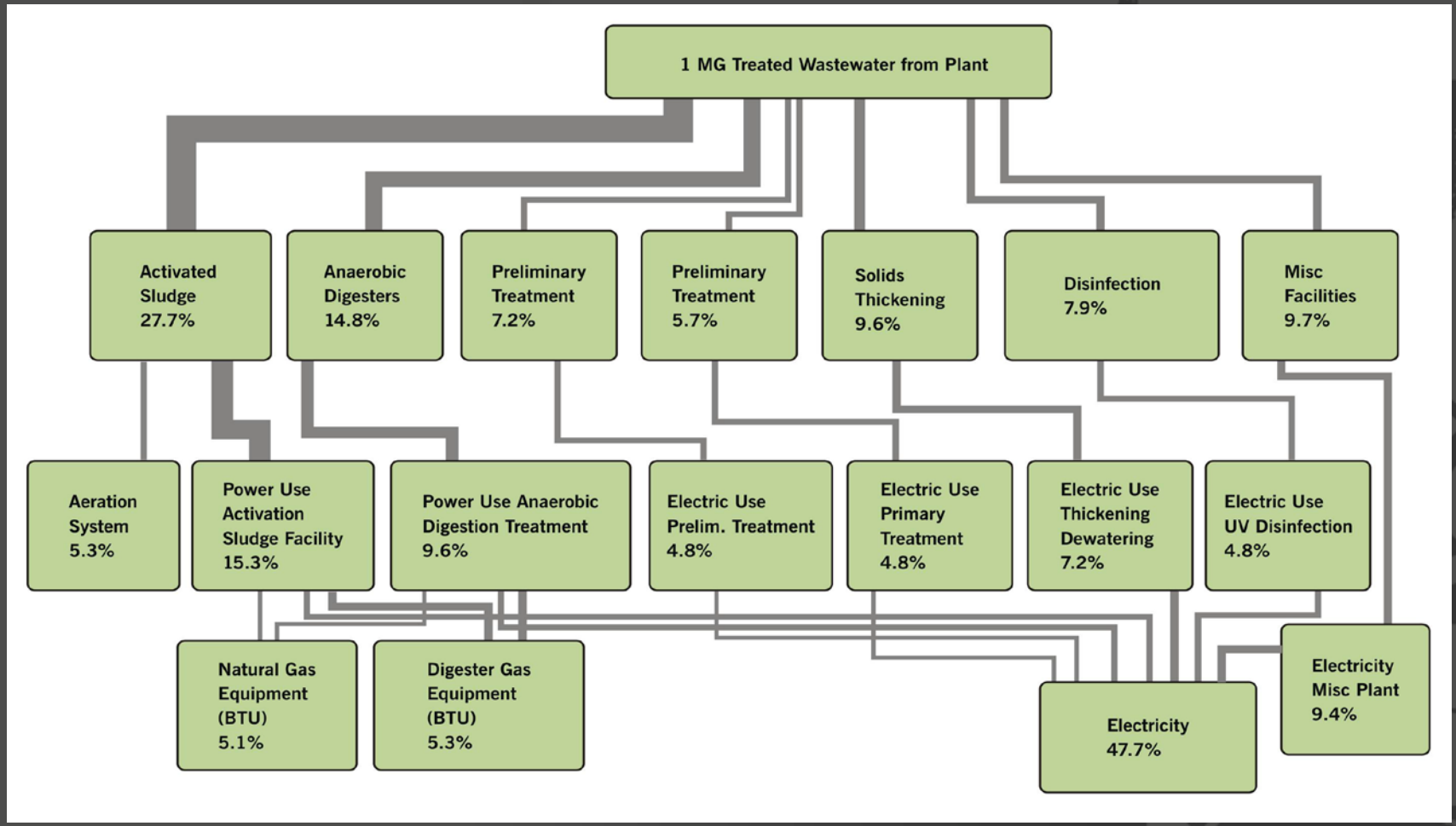
Case Study No. 2 – "Change Upstream"

- 46.5 MGD plant
- Zimpro treatment process
- Existing centrifuges
  - Wear and tear – extreme edition
- Landfill disposal
- Evaluation of belt press / centrifuge
- Client preferred belt press
- Elimination of Zimpro key in evaluation
  - Increased solids production
  - Lower wear and tear
  - Allowed footprint to become focus

Case No. 3 – "Clean Slate Analysis"

- 25 MGD plant
- Existing – 5 plate and frame presses
  - Lime and ferric pretreatment
- Flooding severely damaged existing lime process
- Over $250,000 in dewatering savings BFP / centrifuge vs plate and frame press
- Evaluating BFP or centrifuge with "lease" then own option

Carbon Footprint?



Other Trends?

- Carbon cap and trade
- Life Cycle Cost Analysis (non-cost – environmental)
  - Simulation software (i.e. SimaPro)
  - "Damage"
    - Human health
    - Ecosystem quality
    - Climate change
    - Resources
- "New" dewatering technologies
  - Cinetik
  - Power Press?

Summary and Wrap-up

- Dewatering can’t be ignored
- Several options out there
  - Centrifuge / BFP most common
- Considerations in choice of dewatering
  - Site specifics rule the day
- Old vs New? Traditional concepts still apply.....

jgellner@hazenandsawyer.com