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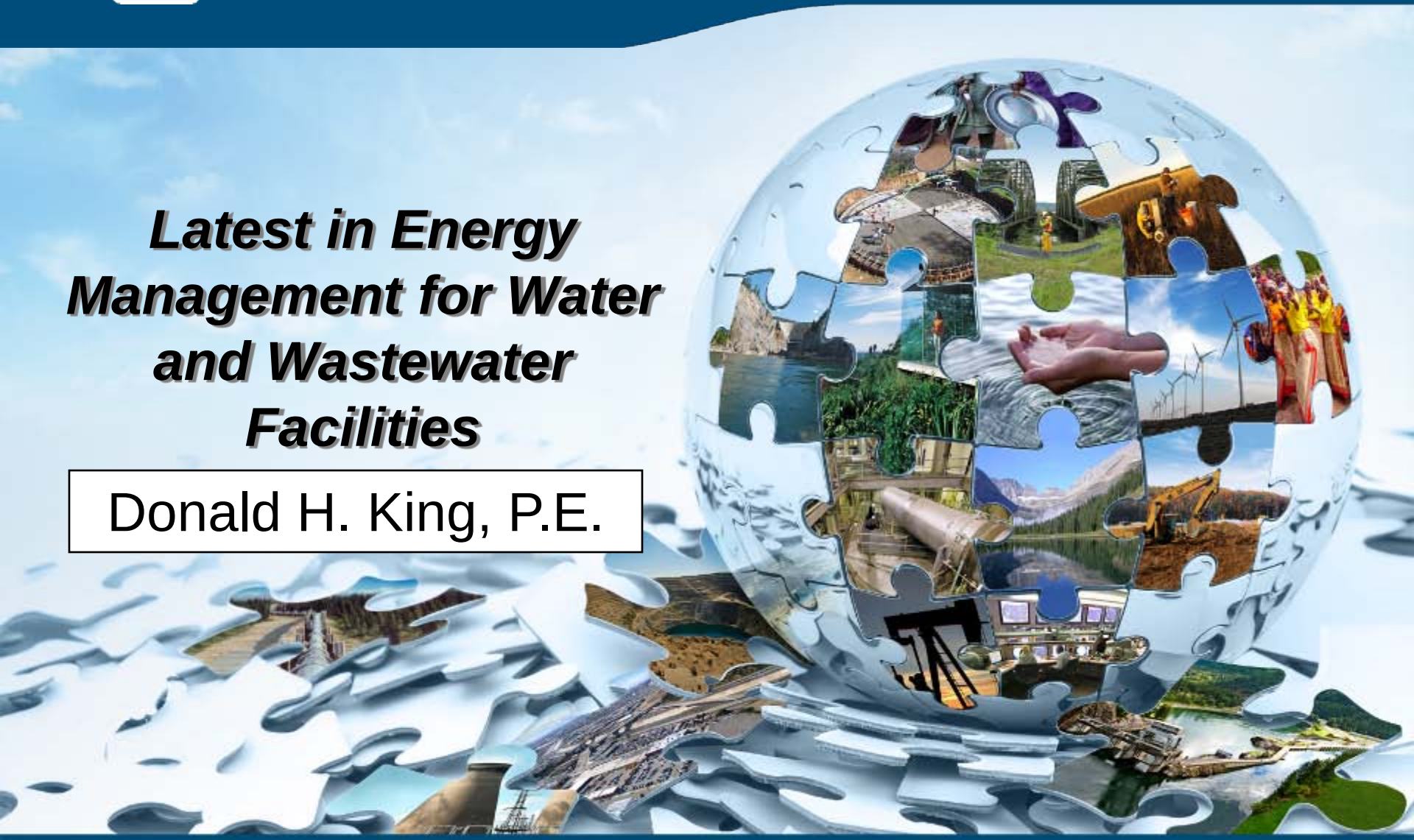
complex world | CLEAR SOLUTIONS™

Latest in Energy Management for Water and Wastewater Facilities

Donald H. King, P.E.



October 5, 2010

THE BUILDING BLOCK STORY- Part 2

Finding Smaller Building Blocks

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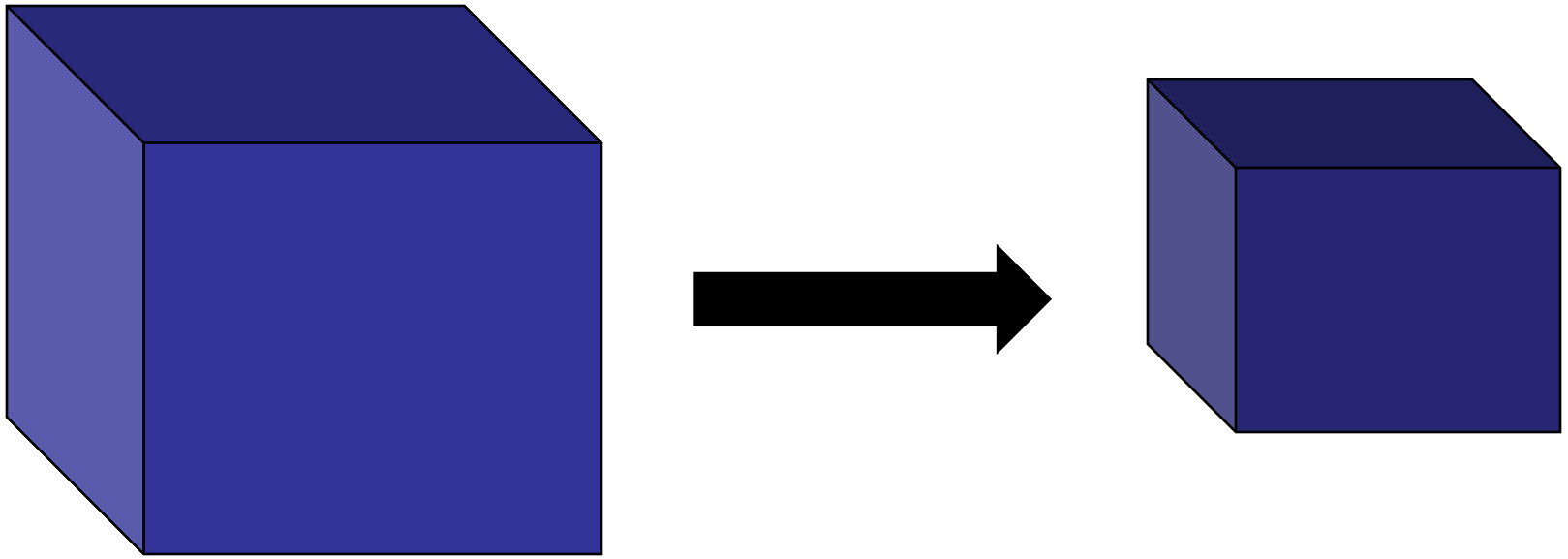
GOAL- REPLACE LARGE BLOCKS



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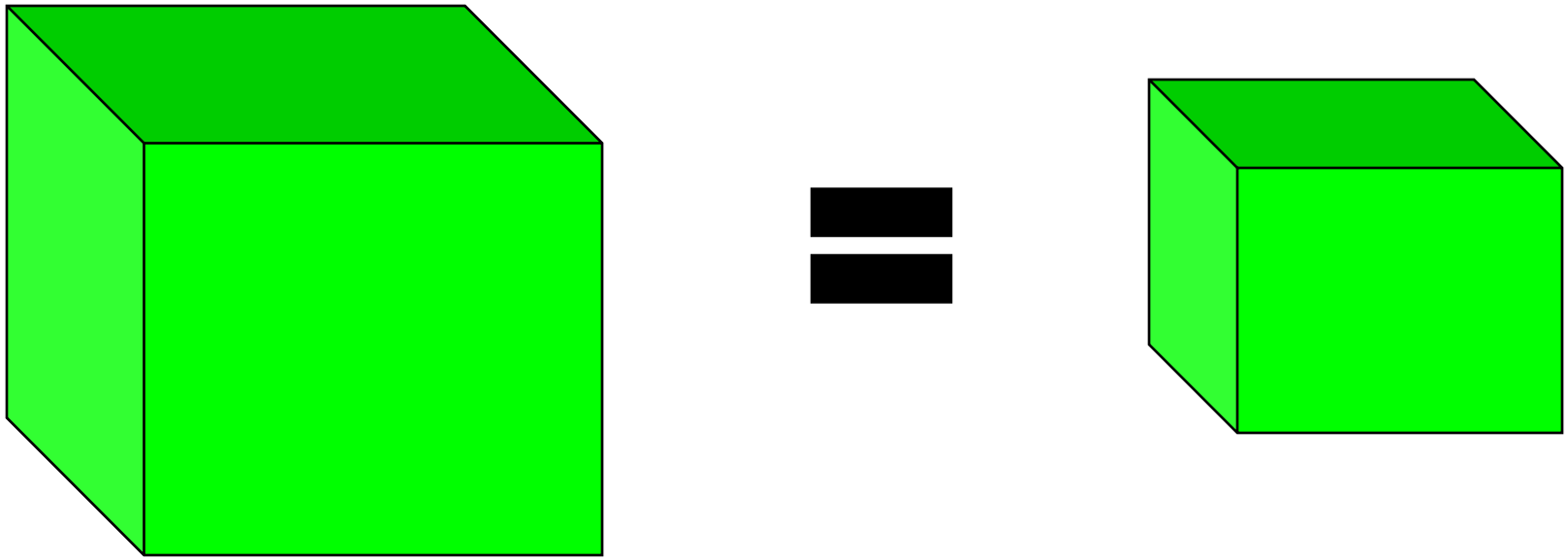
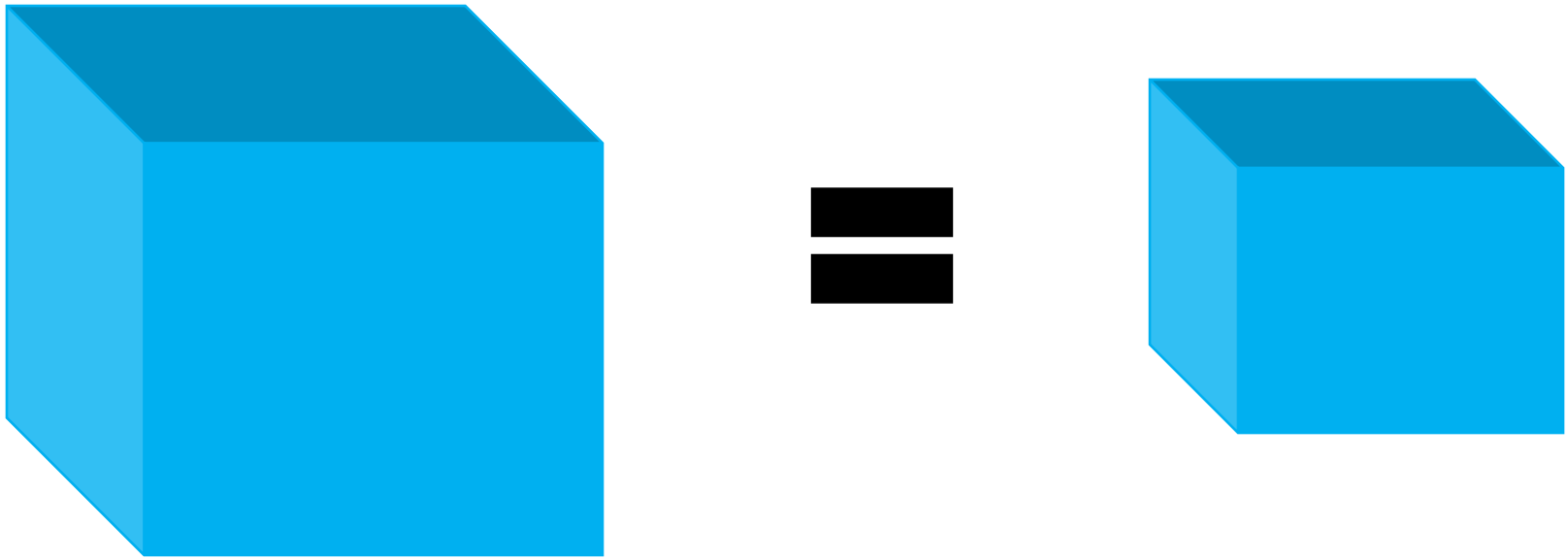
RULE #1: FUNCTIONALITY



RULE #2: WILL NOT COMPROMISE SAFETY



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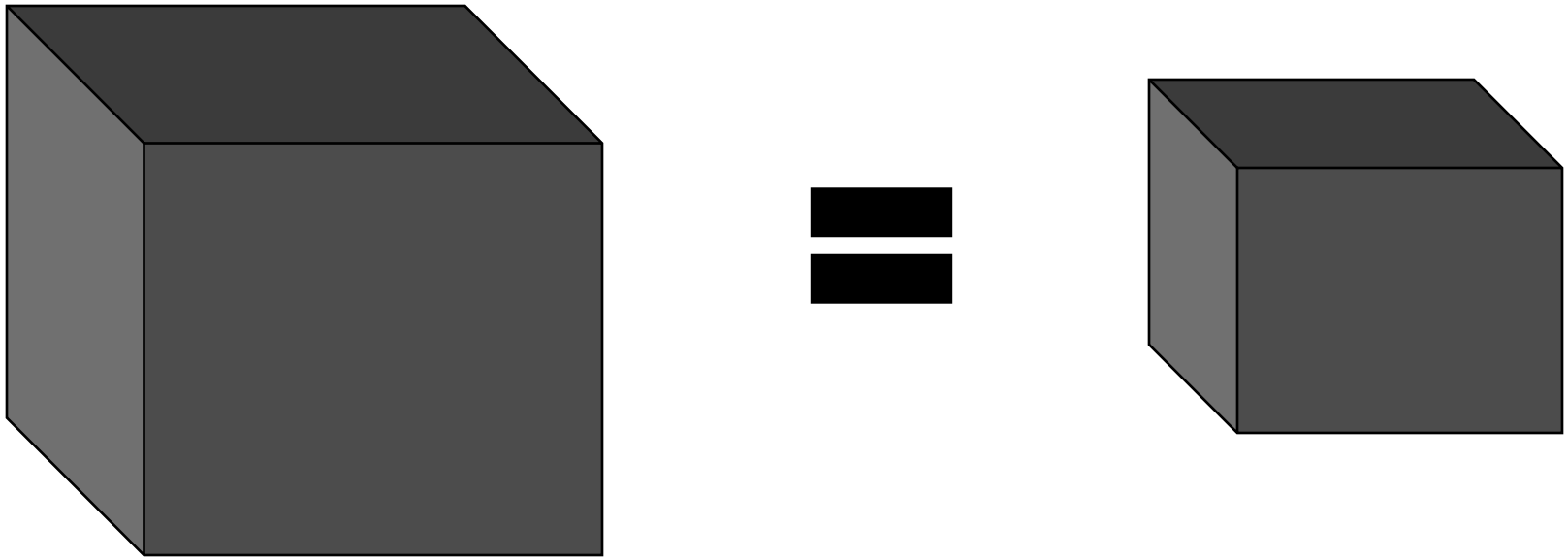
RULE #3: WILL NOT COMPROMISE REGULATORY POSITION

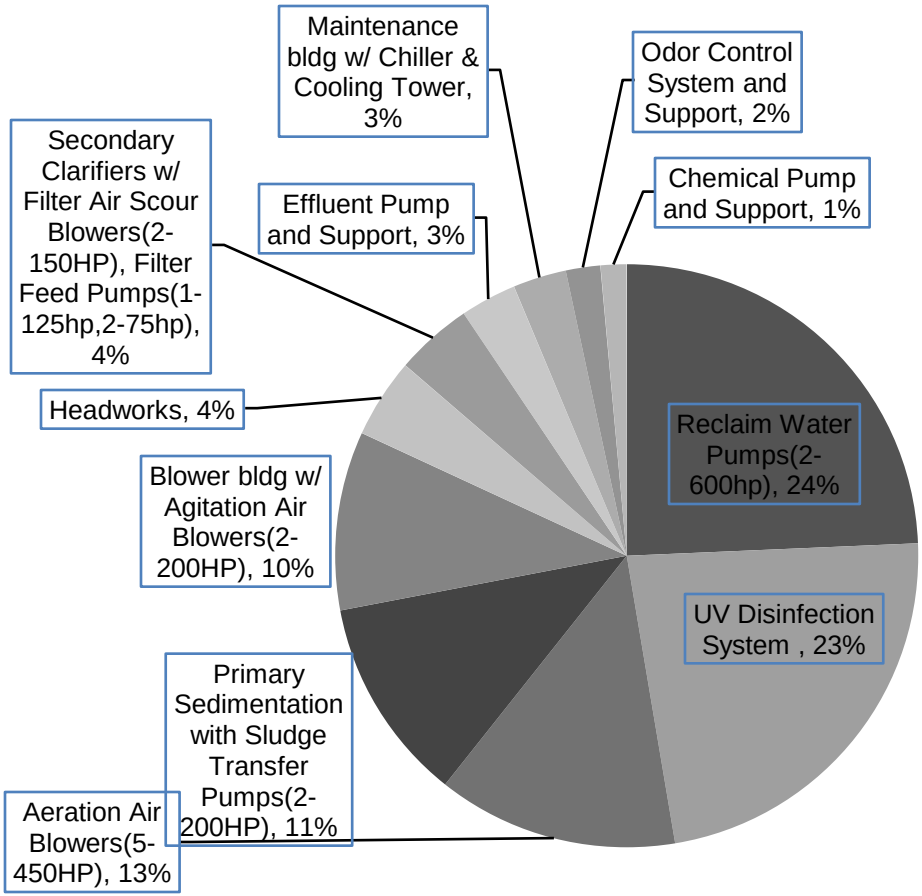


ENERGY UTILIZATION METRICS

- KWh = Amount used over a one hour period
- KWh (Demand)= Peak Use (Highest KWh over a specific period);

both used in Electric Bill Calculations!

Example- Energy Load Profile (Block Sizes)



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Energy Efficiency Conservation Opportunities- EECO (EECM)

- High efficiency motors
- High efficiency equipment
- Variable operation motors and drives
- Process optimization
- Process replacement
- Schedule modifications
- Water reuse

Lighting- Advanced Fluorescents- Controls

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Pumping (Pump Efficiency-Motor Efficiency)

- Poor Pump Efficiency
- Poor Motor Efficiency
- Poor Energy Utilization
- 10- 25% savings

Pump Water ONCE

- Double Pumping
- Installation of Jockey Pump and/or Variable Frequency Drives
- 15-20% savings

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Pumping System- Energy Saving Questions

- Constant speed vs. VFD?
- Proper System Pressure?
- Efficiency of Pump?
- Efficiency of Motor?
- Pump only once?
- Use of Pressure Reducing Valves?
- High Friction Loss Check Valves?

Aeration Diffusion (Fine vs. Ultra-fine)

Blower Selection-

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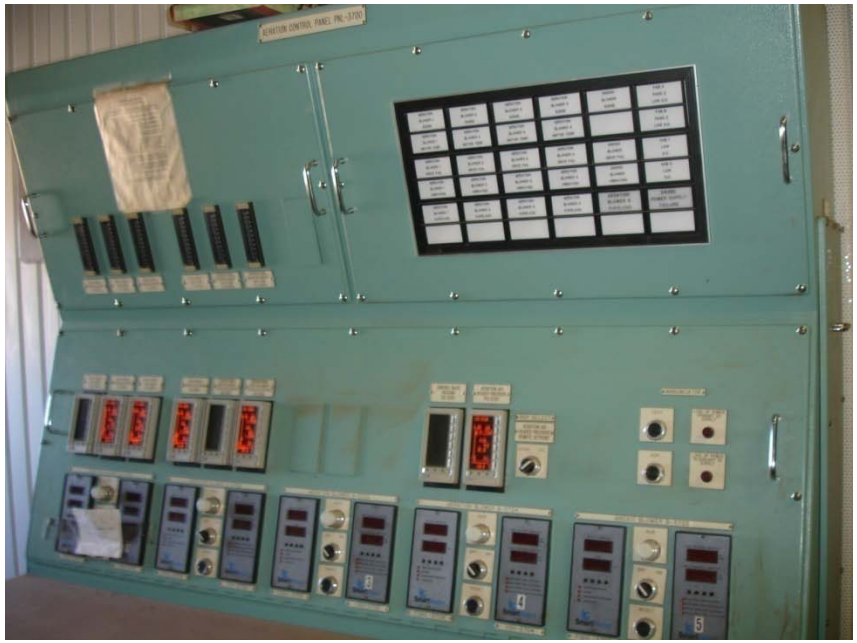
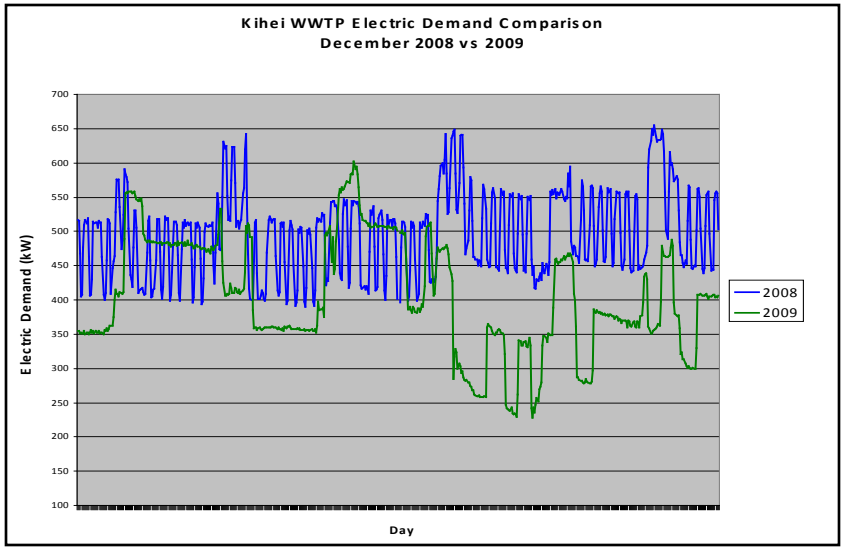
Aeration Controls- Dissolved Oxygen (DO) Instrumentation



Kihei Aeration Blower Retro Project

- What a difference a year makes!
- Install new Turblex blower
- Estimated demand savings ~100 kW
- Estimated electrical savings ~1,000 MWh/yr



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Motor Efficiency - > 94%

- High Efficiency Motor Replacement
- How often does the motor operate?
- O&M Cycle?
- Difference between 84% and 94%? $$$$

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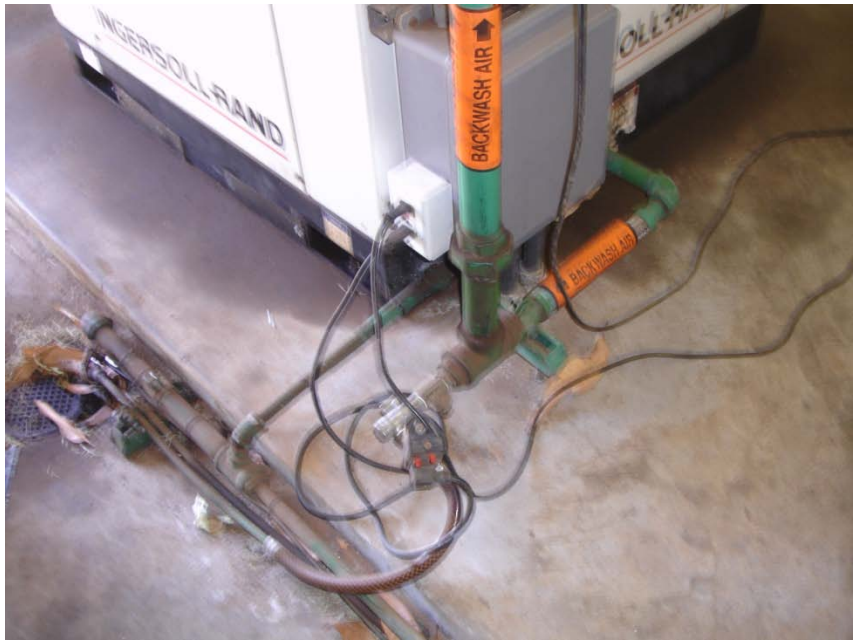
Service/Instrument Air Compression-



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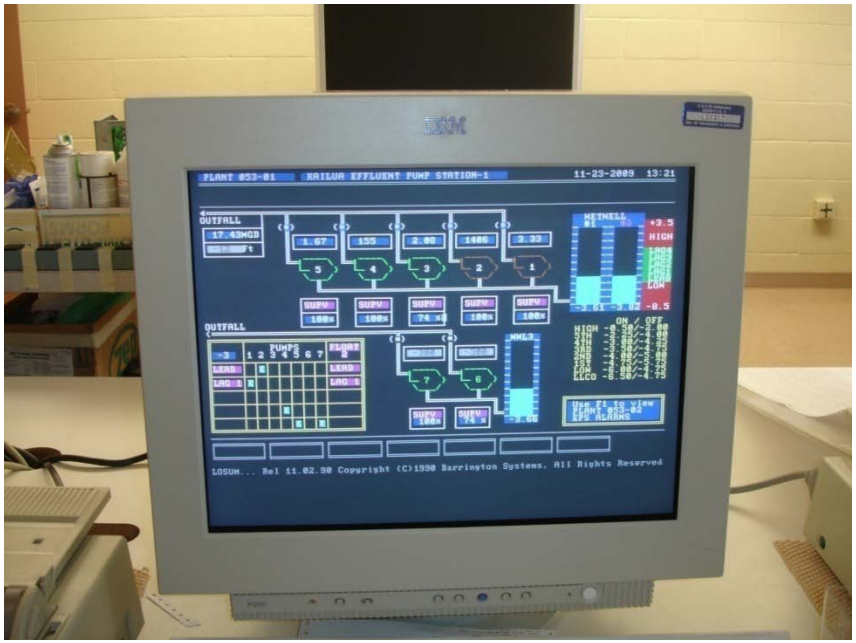
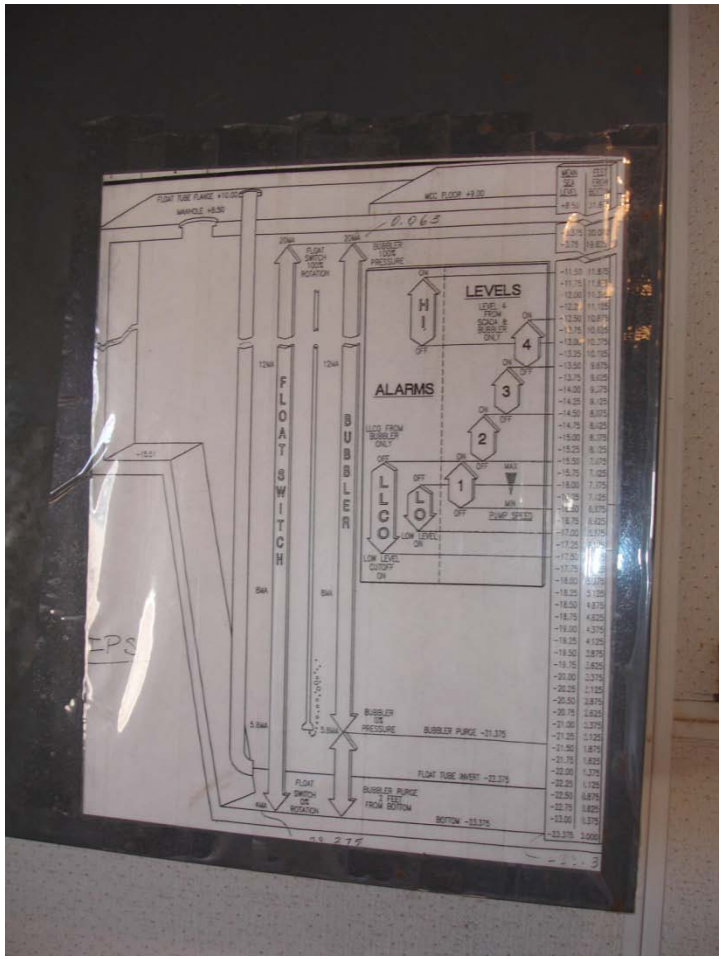
Facility Controls- Energy Management Systems (Digital vs. Old School)





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Disinfection- Chemical vs. UV

- Use of Chemicals
  - less facility energy intensive
  - transportation and storage safety issues
  - cost (O&M) dependent on area

Disinfection- Chemical vs. UV

- Discharge Permit Requirements
- Selection of Bulb Type
- Selection of system configuration
- Resulting Energy Impact

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Kailua UV Disinfection

- Currently off-line pending re-design
- Energy estimates at 15 MGD flow:
  - Old UV ~250 kW
  - New UV additional ~75 kW
- Payback < 2-3 years
- More efficient = less lamps to do the same job!

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Odor Control and Fans

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Digester Heating- Boilers/ Cogeneration Waste Heat

- Poor Efficiency <60%
- Results in using more gas to provide same thermal source

- Savings 15-25%

Leave the Bugs Do the Work!- Aerobic Digestion

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All Building Blocks Open for Review!

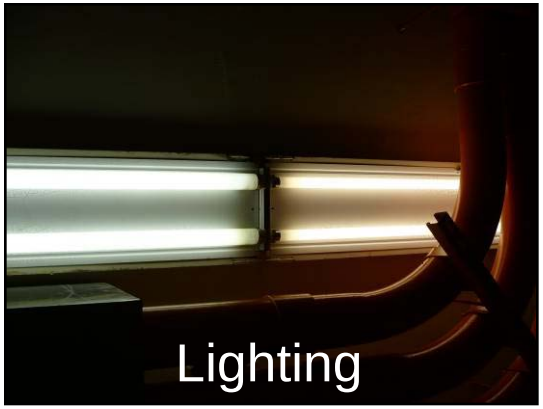
Compressed Air

Odor Control


City Water & Site Booster

Controls & Auto.


Aeration Blowers


Lighting

ECO Results – Hilo WWTP

ECO No.	Recommendation	Potential Energy Reduction (kWh/yr)	Potential Demand Reduction (kW)	Potential Water Reduction (Gal/yr)	Potential Cost Savings ($/yr)	Estimated Implem. Cost ($)	Simple Payback (Years)
No-Cost Measures							
1	Operate Dewatering Odor Control Fan Only During Dewatering Periods	69,850	0	0	$19,100	$0	0.0
Low-Cost Measures							
2	Eliminate 1 Of 3 Primary Tanks In Use And Optimize Primary Sludge Pump Operations	39,900	14	0	$11,200	$5,000	0.4
Investment Grade Measures							
3	Electrical Demand Management	0	26	0	$6,600	$50,000	7.6
4	No. 2 Water Pumping System Improvements	35,000	0	6,500,000	$35,700	$100,000	2.8
5	Replace Lower Efficiency Motors With Higher Efficiency Motors	136,400	27	0	$44,300	$175,000	4.0
6	No. 3 Water Pumping System Improvements	94,800	10	0	$28,600	$220,000	7.7
Total Potential Electrical Energy Savings		**375,950 kWh/yr**					
Total Potential Electrical Demand Savings			**77 kW**				
Total Potential Water Savings				**6,500,000 Gal/yr**			
Total Potential Cost Savings					**$145,400 $/yr**		
Total Estimated Implementation Cost						**$550,000**	
Total Simple Payback							**3.8**

ECO Results – Kailua WWTP

ECO No.	Recommendation	Potential Energy Reduction (kWh/yr)	Potential Demand[1] Reduction (kW)	Potential Water Reduction (Gal/yr)	Potential Cost Savings ($/yr)	Estimated Implem. Cost ($)	Simple Payback (Years)
Investment Grade Measures							
1	Electrical Demand Management	0	100-350 (738)[2]	0	$115,800	$75,000	0.6
2	Lighting System Improvements	122,100	25	0	$24,700	$154,000	6.2
3	Disinfection System Upgrades	438,000	50	0	$88,500	$500,000	5.6
4	Cogeneration	4,000,000	500	0	$658,000	$3,750,000	5.7
Total Potential Electrical Energy Savings		**4,560,100 kWh/yr**					
Total Potential Electrical Demand Savings			**675-925 kW**				
Total Potential Water Savings				**0 Gal/yr**			
Total Potential Cost Savings					**$887,000 $/yr**		
Total Estimated Implementation Cost						**$4,479,000**	
Total Simple Payback							**5.0**

ECO Results – Kihei WWTP

ECO No.	Recommendation	Potential Energy Reduction (kWh/yr)	Potential Demand[1] Reduction (kW)	Potential Water Reduction (Gal/yr)	Potential Cost Savings ($/yr)	Estimated Implem. Cost ($)	Simple Payback (Years)
Investment Grade Measures							
1	Effluent Water Management	26,000	10	0	$7,000	$25,000	3.6
2	Lighting System Improvements	22,700	4	0	$5,000	$43,000	8.6
3	Compressed Air System Improvements	105,700	6	0	$20,500	$130,000	6.3
Total Potential Electrical Energy Savings		**154,400 kWh/yr**					
Total Potential Electrical Demand Savings			**20 kW**				
Total Potential Water Savings				**0 Gal/yr**			
Total Potential Cost Savings					**$32,500 $/yr**		
Total Estimated Implementation Cost						**$198,000**	
Total Simple Payback							**6.1**

ECO Results – Waimea WWTP

ECO No.	Recommendation	Potential Energy Reduction (kWh/yr)	Potential Demand Reduction (kW)	Potential Water Reduction (Gal/yr)	Potential Cost Savings ($/yr)	Estimated Implem. Cost ($)	Simple Payback (Years)
Investment Grade Measures							
1	Lighting System Improvements	9,140	3	0	$2,650	$7,000	2.6
2	Effluent Pumping System Improvements	8,000	10	0	$2,320	$17,500	7.5
3	Replace Lower Efficiency Motors With Higher Efficiency Motors	9,600	5	0	$2,800	$23,000	8.2
4	Install New Direct Drive, Higher Efficiency Blowers With Automated Process Controls	34,000-84,000	>6	0	$9,900-$24,400	$99,000-$244,000	10.0
Total Potential Electrical Energy Savings		**60,740-110,740 kWh/yr**					
Total Potential Water Savings				**0 Gal/yr**			
Total Potential Cost Savings					**$17,670-$32,170 $/yr**		
Total Estimated Implementation Cost						**$146,000-$291,500**	
Total Simple Payback							**8.3-9.1**

ENERGY TECHNOLOGIES! IMPROVEMENTS EVERYDAY

- Use smaller more efficient blocks
- Monies available to purchase smaller blocks
- Staff energy awareness leads to efficient use of blocks
- Look at “all” building blocks

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