Welcome to the 2017 FRPA Conference!

Learning Objectives

- Explore “green” technologies that can be applied to swimming pool operations and the benefits and cost savings they provide
- Define financial options that can help you turn your pool “GREEN”
- Learn how to estimate your return on investment by implementing green technologies

Marc Solomon, CPRP/AFO
Recreation Program Supervisor
Charlotte County Community Services Department
Marc.Solomon@charlottecountyfl.gov
941-627-1628


TURNING YOUR POOL GREEN
And why you want to!
6 IN

South County and Oyster Creek Regional Park Pools

What is a “GREEN” Pool?

- Green pools are energy efficient, environmentally friendly, and will save you money!

History

- In 2013, Charlotte County Government partnered with an innovative company to explore and implement energy efficient technologies and fixtures in County owned buildings and facilities in order to save money and become more environmentally friendly. Charlotte County Recreation Division, Aquatics Section was able to leverage that partnership and turn their pools GREEN.

Project Phase 1

- The project called for energy efficient and environmentally friendly technology replacements and upgrades to existing systems. These included:
- Lighting
- Water conservation
- Insulation
- Control systems
- Swimming pool systems

Costs and Savings

- The project costs were estimated to be $3,678,317.
- Savings on utilities estimate $224,910 per year
- Operational savings $40,704.00 per year
- Simple payback was estimated to be 13.8 years

Costs and Savings Swimming Pools

- South County Pool retrofits $418,665
  - ➢ Savings on utilities $22,974 per year
  - ➢ Simple payback 18.2 years
- Oyster Creek Pool retrofits $90,811
  - ➢ Savings on utilities $15,065 per year
  - ➢Simple payback 6 years

Operating Systems- Electricity

- Charlotte County Regional Park Pools each run on two 15 HP pumps 24 hours per day, seven days per week. The electric meter was tied in to the facility and as a result, the “actual” cost to operate the pool pumps was not identified.
- The retrofit for this system was to install Variable Frequency Drives and program them for maximum savings.

Variable Frequency Drive

Operating Systems-Heating/Cooling

- Built in 2004, South County Regional Park Pool was equipped with a 2000 BTU natural gas powered heater. When operating, this unit did a good job heating the pool in winter, but did nothing to cool the water during summer months. In addition, the unit required frequent repairs and was replaced twice in seven years.
- The dive well pool was added in 2006 and it too was equipped with a natural gas powered heater (400 BTU).
- Built in 2007, Oyster Creek Regional Park Pool was equipped with an energy efficient geothermal heating/ cooling system. This system required much less maintenance and repair and had the added bonus of being able to cool the water in summer months.

Operating Systems-Heating/Cooling

- The retrofit for this system was to remove existing natural gas heaters and install geothermal heating/cooling systems for the South County Pools thereby eliminating the use of natural gas.

Geothermal Units

Operating Systems-Water Quality

- Charlotte County Aquatic Facilities utilized Bec's System 5 chemical controllers and Stenner feed pumps to deliver chlorine and acid to the swimming pools.
- Sodium hypochlorite (liquid chlorine) was used for sanitation and sulfuric acid for pH control.
- The retrofit for this system was installation of saline chlorinators, replacing sulfuric acid with a relatively weak solution of muriatic acid and installation of a Pulsar (calcium hypochlorite) chlorinator.

Operating Systems-Water Quality

- The Bec's System 5 controllers were utilized with new operating systems
- Some of the Stenner feed pumps were also used for acid delivery.
- Three hundred gallon chlorine storage tanks were removed and replaced with pallets of salt.
- One hundred fifty gallon acid storage tanks were replaced with one hundred gallon storage tanks inside the pump rooms.

Operating Systems-Water Quality

- The large chemical storage tanks were stored in a secured area fifty to one hundred feet away from the injection points in the pump rooms and the hoses were run underground.
- When these lines failed due to clogs or breaks, the repair was difficult, time consuming and costly.

Operating Systems-Water Quality

- Charlotte County Aquatic Facilities became in effect “chlorine factories” eliminating chlorine delivery and storage (except required Pulsar “back-up” chlorine buckets).
- Sanitation provided by saline chlorinators does not have as dramatic effect on pH, thereby reducing the amount of acid used for pH control.

Controllers

Saline Chlorination System

Pulsar Chlorinator

The “Footprint”

The Charlotte County Experience "The learning curve"

- The Oyster Creek Pool struggled to achieve the 5000ppm salt content required for the saline chlorinators to run most efficiently.
- Staff at both pools struggled with finding that perfect level of stabilizer to produce the best results.
- Booster pumps needed to be added to heating/cooling systems because the flow rate to the heaters was reduced during VFD "ramp down" causing the system to shut down.

“The learning curve”

- pH and ORP sensors had to be replaced with new platinum tip
- Oyster Creek Pool was experiencing rust on all metal fixtures at the surface of the water.
- Oyster Creek Pool was struggling to maintain ORP and pool was looking “dull”.
- We learned that our salt consumption was higher than originally calculated due excessive water usage.

Problems solved!

- It turns out, Oyster Creek Pool had a pool leak and was losing approximately 2000 gallons per day. Once the leak was fixed, pool chemistry problems were solved.
- The Oyster Creek Pool was also not grounded properly. This was causing the rust on metal appliances at the surface of the water.
- It took approximately five months to discover and correct the problems. Since then, operation has been outstanding!

Project Benefits

- Water quality consistent with past performance. ORP between 780mv and 800mv with crystal clear water.
- Huge energy savings, approximately $16,000 per year in natural gas and $10,000 per year in electricity.
- Huge chemical savings, approximately $10,000 per year.

❖Based on comparisons from FY 2012, 2013, 2014, 2015 and 2016.

Benefits

- Customer experience-
  - ➢ Customers report water feels good on skin and hair.
- Related cost savings
  - ➢ Lifeguard uniforms seem to be lasting longer and fading less… especially Instructor staff.
  - ➢ Decrease in periodic maintenance and virtual elimination of chemical feed pump repairs.
  - ➢ Increased life span of pump motors.
  - ➢ Elimination of storing large amounts of chemicals and the hazardous materials storage permit requirements.

Operational Challenges

- Filling acid tanks. Because the muriatic acid solution is weak, acid tanks must be filled by hand. Previously, full strength sulfuric acid tanks were filled with a hose from the vendors truck.
- Filling the salt feed tanks. Bags of salt weigh 40 to 50lbs.
- Periodically, the salt feed tanks must be emptied and cleaned to remove pebbles and other debris that come shipped in the salt bags.

Return on Investment

- Return on investment will depend on many factors including:

➢Bather load

➢Water Use

➢ Temperature-Pool and air

➢ Efficiency of current systems

➢Hours of operation

Savings-Electricity

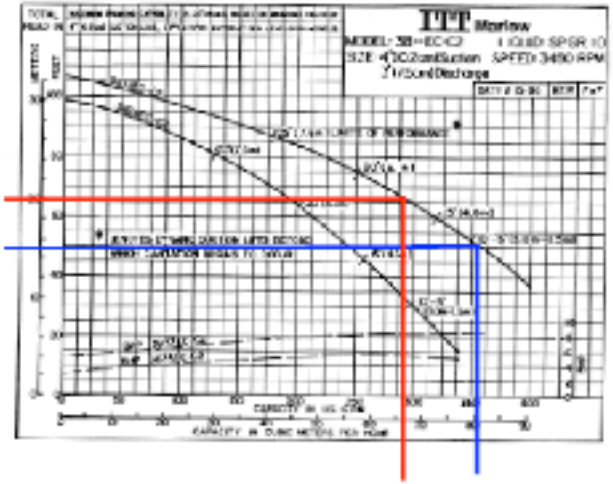
Electrical Savings - VFD

- Instead of turning OFF the pump, you can turn it down with a VFD.
- Variable Frequency Drives (VFD's) are a tremendous source of energy savings while not sacrificing pump longevity or performance.
- Major savings are expected in most applications as pool pumps are generally oversized by design, and must be trimmed back with proportioning valves.
- Very important as most pumps are oversized by design.

Pool pumps are oversized by design!

- Pools may be designed to operate at 65 TDH, or stock pump is selected (next size up).

Example of pool designed At 60-65 TDH, per DOH, in order to provide adequate flow for filters, heaters, etc.



Real operating TDH due to efficient piping runs, clean filters, and/or pump-assisted heaters and chemical feeders.

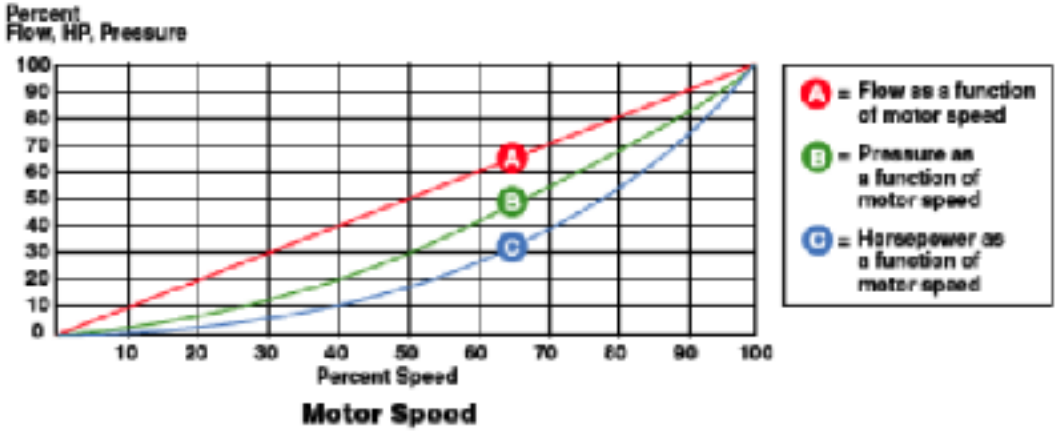
Pump must then be trimmed (with additional restriction) to prevent "over-pumping", but that is inefficient.

Electrical Savings - VFD

- In comparison to trimming pumps by adding restrictions, VFD's work by varying the "speed" of the motor to provide the desired flow rate.
- VFD's also reduce the power company "Demand Charges" - the surcharge paid by larger power customers. So you will pay less for your electricity.
- This savings is applied to your entire electric bill, not just the swimming pool or spa portion.

Electrical Savings - VFD

The use of a VFD device has a verifiable savings pattern that is more significant than shutting down pumps at night or even under-sizing pumps to use less horsepower.



A motor running at 50% of full speed capacity has a motor torque of 25% of full speed. In addition, electricity required to operate the motor at 50% of full speed is 12.5% of the amount of electricity required if the motor was running at 100% full speed capacity. Thus, reducing motor speed can significantly reduce the electrical energy consumption.

Example of VFD Savings

- During normal operations, some pumps can be operated at 80% of peak capacity due to more efficient piping runs, and/or oversized pumps.
  - ✓ During this time period the electrical consumption would be .8 x .8 x .8 or 51.2% of normal power.
- During off-peak operations, some pumps could be operated at 50% of peak capacity while still circulating, filtering, and heating.
  - ✓ During this time period the electrical consumption would be .5 x .5 x .5 or 12.5% of normal power.

Variable Frequency Drive Savings Analysis
prepared for:

Sample MCC VFD ROI 25 Yd Lap Pool

With 15 HP pump conservative savings, and night time turn down

Pool pumps have traditionally been designed to operate at full motor speed 24/7 while utilizing a proportioning valve to restrict flow to desired levels. This is normally not an efficient use of energy. Pumps are oversized by DOH Codes to allow for temporary additional restrictions such as heaters, and soiling pool filters. The installation of a CES MCC VFD will allow you to operate the pump motor only at the precise speed required to provide the desired flow with little waste in energy. Additional "Soft Start" and "Phase Protection" features helps protect pumps and provide significant electrical "demand charge" savings.

Pump Usage Variables		Speed	% of Hrs	Hrs
Pump Voltage	230	100%	0%	0
Pump HP	15	90%	34%	2,978
Utility Rate $/KWH	0.090	80%	33%	2,891
Motor Efficiency	0.90	70%	0%	0
Annual Hours	8760	60%	0%	0
		50%	33%	2,891
Full Load Input (KW)	12.43	40%	0%	0
Annual Increase:	1.005	30%	0%	0
		20%	0%	0
Original Electrical Cost	$10,156	10%	0%	0
Updated Cost w/ VFD	$6,018	0%	0%	0
Annual Elect. Savings	$4,437		100%	8,760
MCC-VFD Cost:	$3,800	Installation Cost:		$650
Lease Multiple:	0.035	Mo. Lease Cost:		$156

5 Year Savings Analysis

Time Period	YR 1	YR 2	YR 3	YR 4	YR 5	Total
Orig Electric	$10,156	$10,308	$10,461	$10,617	$10,775	$52,805
Prop Electric	$6,018	$6,049	$6,079	$6,109	$6,140	$30,395
Savings	$4,437	$4,400	$4,482	$4,504	$4,527	$22,410
Optional Lease	$1,869	$1,869	$1,869	$0	$0	$0
Cash Flow	$2,568	$2,591	$2,613	$4,504	$4,527	$16,803

This Payback Illustration is based on historical industry field data and represents a best guess illustration of the potential costs and possible savings that could be realized through the installation of a CES MCC VFD or a PFD System. CES makes no claims as to the accuracy of the estimated savings or annual increases nor guarantees that any savings will occur.

* denotes input variables

Heating/Cooling savings

- The amount of savings realized by replacing your gas heater with geothermal will greatly depend upon the efficiency of your current gas heater.

Symbiont Service Corp.

Go Green • Go GeoThermal

4372 North Access Road, Englewood, Florida 34224

941.474.9306 • 800.881.4328 • Fax 941.473.9306

GeoThermalFlorida.com • Info@SymbiontService.com

Pool Heating • Air Conditioning

"One Company, One Call, Complete Comfort!"

Pool Heating Comparison

Type	Performance	Green	Operation Cost	Durability Serviceable Life	Reliability Mechanical	Cost Effective	Cooling
GeoThermal Well & Lake (SYMBIONT)	Excellent Constant controllable 85F Pool and 104F Spa temperatures 12 months per year	Excellent According to the US Department of Energy, studies in 2005 a goal of 400,000 annual installations will save consumers over $100 million per year in energy and reduce greenhouse gas emissions by over 1 million metric tons of carbon each year	Excellent EPA states, Geo Thermal can reduce energy consumption 25% to 75% compared to older or conventional systems.	Coastal - 20 years Inland - 20 years The DOE states, 95% of all GeoThermal users would recommend a similar system	Excellent SYMBIONT services their own products. Additionally, Geo-Thermal has fewer mechanical components and are sheltered from the elements - salt air and wind blown sand	Excellent Typically a 70% to 80% savings compared to gas systems According to the EPA, Geo Thermal systems are the most energy-efficient, environmentally clean and cost effective systems available	YES
Gas	Excellent	Poor	Poor Highly dependent on the price of Gas	Coastal - 2 to 4 years Inland - 6 to 8	Somewhat	Poor	NO
Heat Pump, Air-Source*	Somewhat Excessive overnight pool temperature swings due to poor nighttime air heat pump performance	Somewhat	Somewhat however because of lower air temperatures at night, the system works overtime to keep pool temperatures at the desired level resulting in higher operation cost	Coastal - 3 to 4 years Inland - 6 to 8 Because HP use the outside air to transfer heat they are very susceptible to the elements.	Somewhat however owner must rely on local contractor for service	Somewhat typically will need to replace the Heat Pumps 3 to 4 times during 20 year period	YES Optional feature usually at an additional charge.
Solar*	Poor Not practical for year-round swimming	Excellent	Somewhat usually because the system does not operate at night	NA information is unavailable because of the multitude of manufacturers and wide variety of system designs	Somewhat	Somewhat usually because the system does not operate at night	NO

*To achieve consistent year round swimming an additional backup source of heat not affected by ambient air temperatures would be required.

Chemical savings

- Remember-You have turned your pool into a chlorine “factory”
- Sodium hypochlorite costs approximately $1.25 per gallon
- Rock salt costs approximately .13/lb.
- Initial “salting” of your pool will depend on salt content already in the water.
- For the system to work most efficiently, you must keep 5000ppm salt in your pool.

CES Saline Chlorinator Investment Analysis

Prepared for:

Sample Saline ROI

DOH Required 67 lbs, provided 45 lbs with Redundant Feeder

Input Variables

Pool Gallonage	337,000	Cost / KWH	$0.1200
Pool Loading Factor	3.2	CO $ / Lb	1.3
Length of Swim Season	365	Balancing Costs	0.85
Filter Flow Rate	930	Saline Balancing Costs	0.45

Sizing Guidelines

Sizing Factor	1.0	1.2	1.4	CDC/DOH	4.0
lbs/Day	33.7	40.4	47.2	67.4	134.7

Financial & Power Variables

Total Lbs (day)	36	Unit Size (lbs/day)	45
Amp Draw	39.4	Budget Installed Price	$45,000
Annual Increase	1.12	Maintenance Factor	0.01
Hours/Day	12	Lease Multiplier	0.0315
Voltage	240	Lease Term (Yrs)	3
Sizing Percentage	0.95	Monthly Lease Cost	$1,418

Potential Savings Analysis

Category	Year One	Year Two	Year Three	Year Four	Year Five	Total
Chlorine Cost	$17,057	$19,103	$21,396	$23,963	$26,839	$108,359
Balancing Cost	$11,152	$12,491	$13,990	$15,668	$17,549	$70,850
Maintenance	$5,370	$5,774	$6,227	$6,735	$5,003	$21,109
Total Chemical	$31,579	$35,369	$39,613	$44,366	$49,690	$200,617
Electrical Cost	$4,970	$5,566	$6,234	$6,983	$7,821	$31,574
Backup Cost	$853	$955	$1,070	$1,198	$1,342	$5,418
Balancing Cost	$5,901	$6,613	$7,406	$8,295	$9,290	$37,509
Maintenance	$1,011	$1,132	$1,268	$14,920	$1,691	$19,923
Tot Saline Cost	$12,736	$14,267	$15,979	$31,396	$20,044	$94,424
Saline Lease	$17,010	$17,010	$17,010	$0	$0	$51,030
Cash Flow	$1,831	$4,092	$6,624	$12,970	$29,647	$55,164

This Payback Illustration is based on historical industry hold data and represents a best guess illustration of the potential costs and possible savings that could be realized through the installation of a ChlorKing Saline Chlorination System. CES makes no claims as to accuracy of the estimated savings or annual increases, nor guarantees that any savings will occur.

GREEN POOLS= EASY CHOICE!

- Given the economic and political climate today, retrofitting your pools to more efficient technologies that save money and move away from the use of fossil fuels should be a very attractive option for any organization.

This is especially true when you can partner with companies that will:

✓ Guarantee savings based on projections

✓ Validate savings and offer lease programs that pay for the retrofits from savings realized.

- QUESTIONS?

75TH ANNIVERSARY
1942 2017
FRPA
FLORIDA RECREATION & PARK ASSOCIATION

For more information about the Florida Recreation and Park Association visit www.frpa.org.