

2009 GCSAA EDUCATION CONFERENCE AND THE GOLF INDUSTRY SHOW

Energy Efficiency Management for Golf Courses

Presenter: Andrew Staples
astaples@golfresourcegroup.net



Research Solutions: Science for your Golf Course

Energy Management for Golf Courses

Presented by :
 Andrew Staples



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Hole Pictured – The Golf Club at Sand Hollow Resort Championship Course #15

Energy Management for Golf Courses

- Explain Energy Management and why it matters to Golf
- Explain what's going on in today's market and what is coming in the future
- Present Energy Savings measures and a Success Story
- Give you some tools to act

Energy Management for Golf Courses

- **Basis of Presentation:**
 - GRG performed a Utility funded outreach program to 320 golf courses in Southern California
 - Program identified areas of energy savings opportunities for each golf course facility
 - Focus #1 – G.C. Irrigation system including pump station
 - Focus #2 – Clubhouse, maintenance building, cart charging, etc.
 - Utility paid customers a cash incentive to make the upgrade
 - Incentive was tied to amount of energy that was saved

Energy Management for Golf Courses

- **Findings:**
 - Golf courses were eager to act, but had little knowledge (and little funds)
 - Water Pumped = Energy Used (relationship of kWh to Ac. Ft of water pumped)
 - Some new pumping systems were being over designed and therefore energy savings was minimal
 - Buildings including Clubhouse, cart charging, etc. present an easy way to improve efficiency
 - 30% efficiency gain is possible – Opportunity exists!

Energy Management for Golf Courses

- **Partners in Program:**



What is Energy Management?

A systematic way of planning, organizing, implementing, monitoring and controlling energy use in a facility, with the aim of being an efficient user of this energy

Quick Facts

- A golf course (including buildings) can use up to 5,000,000 kWh per year – the equivalent to over 333 houses. That's \$450,000.00 per year!
- Al Gore's house uses over 220,000 kWh – the equivalent of running a 3,500 gpm pump station for 1000 hours
- A pump station can account for up to 50% of a golf course's energy use
- Experts suggest that pumping systems account for 20% of the world's energy demands



Why does Energy Management matter to Golf?

- Expenses are continuing to Rise
- There's very little understanding of energy use in the golf industry. With little understanding comes waste
- Governments and Utility Companies are on the fast track to monitor/regulate/tax the end user
 - California Assembly Bill AB32

Why does Energy Management matter to Golf?

In the end, it comes down to how motivated you are to understand your energy use

An introduction to Energy Use, Billing Methods and Price

- **Energy Use:**
 - Energy Use equals the needed energy draw to run the equipment (load) multiplied by the amount of time that energy is being drawn
 - 1,000 watts (W) = 1 kilo watt (kW)
 - watts (W) or kilo watts (kW) times amount of time in hours = kilo watt hours (kWh)

An introduction to Energy Use, Billing Methods and Price

- **Billing Methods:**
 - Energy is billed by the Kilo Watt Hour (kWh)
 - 1kW (1,000 watts) used for 1 hour = 1 kWh
 - 1 horsepower (hp) = 0.7456 kW
 - 75 hp motor = 55.9 kW
 - 55.9 kW run for 1 hour = 55.9 kWh
 - Other equipment loads:
 - » Light Bulb – 60-100 watts
 - » Window Air Conditioner – 500-1440 watts
 - » Golf Cart – 2-3 kW



How much Energy does a golf course use?

- Typical 18 hole golf course with Clubhouse, other uses, etc.:
 - Low End – 250,000 kWh (14 -17 houses*)
 - High End – 5,000,000 kWh (278-333 houses*)
 - Typical pumping systems account for 25%-50% of a golf course's energy use

*Typical 2,500 s.f. house uses 15,000 – 18,000 kWh per year

How much Energy does a golf course use?

- Golf Course Pumping System
 - (4) 75 hp pumps, (1) 25 hp jockey pump (+/- 3,500 gpm), running at MAXIMUM efficiency (242 kW total load)
 - 1,000 hours – 242,000 kWh (\$21,789* per year)
 - 2,000 hours – 484,000 kWh (\$43,560* per year)
 - 3,000 hours – 727,000 kWh (\$65,430* per year)

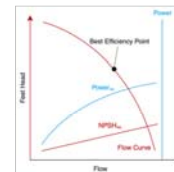


*Calculated using the US average of \$0.09/kWh

What is Pump Efficiency?

- Definition:
 - Ratio of water power produced by a pump to the power delivered to the pump by the motor (In other words, how efficiently does a motor power a pump to deliver water to your system)
- Called "Wire-to-Water" Efficiency
- To be calculated you need to know:
 - Total energy draw corresponding to amount of flow
- Can only be calculated by a pump test
 - Anything 76% and over is generally considered acceptable
 - Anything below 70% is grounds for improvement

What is Pump Efficiency?

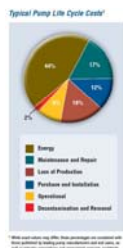


Best Efficiency Point

The Best Efficiency Point is the point at which effects of head (pressure) and flow converge to produce the greatest amount of output for the least amount of energy.

What is the true cost of Efficient pumping?

- Experts suggest the cost of a pump is 12% of the life cycle cost (Life Cycle = 20 years)
- Energy and Maintenance account for over 60% of a pump's life cycle cost
- So, if you purchase a pump for \$35,000, your life cycle cost for that pump is \$292,000.00!
- Which means you are spending \$178,120.00 for Energy and Maintenance over the life cycle of ONE pump



What is the true cost of IN-efficient pumping?

- If you will spend \$178,120.00 over the life of one pump, you will spending \$1,424,960.00 for 8 pumps
- If your pumps are 10% IN-efficient, you will spend an extra \$142,496 over the life of those pumps (or \$7,125.00 per year)
- Not to mention, 10% more motor, bearing, shaft and impeller wear
- and 10% faster replacement

What is the true cost of IN-efficient pumping?



What is the true cost of IN-efficient pumping?



What is the true cost of IN-efficient pumping?



What is the true cost of IN-efficient pumping?



Opportunities to Save Energy

- Maintain your pumps and motors!
- Install a Variable Speed Drive (VSD), even on your well pumps
- Ensure your pipe sizes can handle the amount of flow you're asking them to handle. If not, upsize the pipes OR down size the output of your pump
- Hire a Professional to program your system
- Identify different pressure zones, verify the right amount of pressure
- Install Premium Efficient Motors (verify they are really PREMIUM efficient motors)
- **WATER LESS!** (Water pumped = Energy Used)



Case Study

Desert Mountain Golf Club

Scottsdale, Arizona

Chiricahua Golf Course



Desert Mountain Golf Club Scottsdale, Arizona
Chiricahua Golf Course

What happened?

In 2006, their energy costs had risen 40% from 2004.
An increase of \$110,000.00

DM created an Energy Management Plan for how the golf course handles their energy and water use.

(Since DM has a total of 6 golf courses, The Club realized something needed to be done)

Desert Mountain Golf Club Scottsdale, Arizona
Chiricahua Golf Course

Existing condition:

Hardware: 4 total pump stations

3 Transfer pump stations

- (6) 200 hp pumps, (3) 250 hp pumps

1 Golf Course pump Station

- (7) 75 hp pumps (2) boosters

2,225 Total horse power or 1,659 kW of Demand

Desert Mountain Golf Club Scottsdale, Arizona
Chiricahua Golf Course

What did they do?

- Reduced their 1,659 kW demand by taking some pumps completely off line during some periods of the year
- Increased the length of their golf course watering window

	<u>Winter months</u>	<u>Summer months</u>
- 4,000 gpm	4.5 hours	7 hours
- 3,000 gpm	5 hours	8 hours
- 1,800 gpm	6.5 hours	10.5 hours
- Increased time it took to fill lakes
- Programmed system to stage pumping, minimizing multiple pumps being run at the same time

Desert Mountain Golf Club Scottsdale, Arizona
Chiricahua Golf Course

The Result

This plan resulted in a reduction of their cost of energy by 27%
(billing rates increased 20% during same period)

Keys to Managing Energy

- Plan
- Organize
- Implement
- Monitor
- Control

Keys to Managing Energy

- **Plan**
 - ✓ Meet and converse with your utility representative
 - ✓ Discuss rates, time of use, etc.
 - ✓ Develop options as to how you can be billed vs. how you use your energy
 - ✓ Set goals

Keys to Managing Energy

- Plan
- **Organize**

- ✓ Understand what you use
- ✓ Track usage by month
- ✓ Understand when equipment is being operated, split up if possible
- ✓ **Understand your kWh per Ac.Ft. relationship**
(Total kWh's / Total Ac. Ft. = kWh/Ac.Ft.)
- by month, quarter, year

Keys to Managing Energy

- Plan
- Organize
- **Implement**

- ✓ When upgrading, choose energy efficient measures
- ✓ Check for utility incentives
- ✓ Change operations, if possible
- ✓ Educate employees

Keys to Managing Energy

- Plan
- Organize
- Implement
- **Monitor**

- ✓ Check monitored data against prior months
- ✓ Test regularly
- ✓ Check for new energy efficient upgrades

Keys to Managing Energy

- Plan
- Organize
- Implement
- Monitor
- **Control**

- ✓ Stick to your goals
- ✓ Use these goals when making upgrades – communicate them to your vendors
- ✓ Seek assistance from your utility representative
- ✓ Bonus Time!!

Keys to Managing Energy

- Plan
- Organize
- Implement
- Monitor
- Control

This isn't rocket science.
It's just a matter of paying attention.

Questions?