ENERGY SAVING GUIDE:

Residential pool owners want to lower their energy bills and now you can show them how

NIDEC MOTOR CORPORATION

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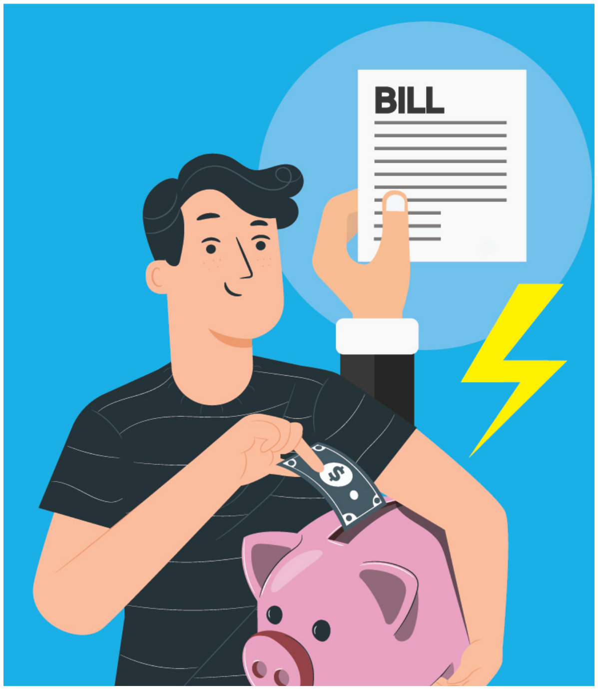
INTRODUCTION

If given a choice between spending MORE money on electricity or spending LESS, you know what most people will choose.

The chances are good that you've heard swimming pool owners bemoan the high cost of their pool's operation – especially the impact their filtration pumps' operation has on their utility bills.

The good news is, there are multiple upgrades pool owners can make that not only reduce their energy costs but also pay for themselves in as little as two months. And you can guide them through the process of choosing the best one for their situation.

For comparison, let's consider how these options might impact a 20,000-gallon pool that is currently equipped with a standard efficient, single-speed 2.6THP (Total Horsepower) motor-powered pump. The owner prefers to run their pump for only 16 hours per day to avoid energy cost premiums when running during peak usage times as deemed by the utility company. Let's also assume the pool owner lives in Arizona and pays an average residential rate for electricity of $0.117 per kWh.



There are four primary ways the owner of this pool might reduce energy consumption. The cost of implementing these changes – and the short- and long-term financial benefits each one delivers – will vary based on the age and condition of pool and pump, as well as other factors. But with all things being equal, here are how they stack up:

e-Chapter 1 THE GOOD METHOD

LIMIT PUMPING TO THE BARE MINIMUM NECESSARY.

The simplest way for a residential pool owner to save electricity is to pump only the volume of water needed each day to turn the pool water over twice. That's the rate of turnover generally required for safe operation.

How do you know how long that takes?

- First, take the number of gallons of water in the pool and double it. For a 20,000-gallon pool, in other words, it is necessary to pump 40,000 gallons of water each day to maintain adequate filtration.

- Next, check the pump's water output. Most pumps list a GPM (gallons per minute). The rate is listed in the pump manual if a GPM meter is not available.

- Divide the number of gallons by the motor's GPM to calculate the length of time it will take to turn the water over. A 100 GPM pump, for example, would take approximately 400 minutes to pump 40,000 gallons:

40,000 gallons ÷ 100 GPM = 400 minutes

In other words, a homeowner needs to run a single-speed pump a total of 400 minutes = 6 hours and 40 minutes – each day to maintain adequate filtration.

The Fix: To lower energy costs, the homeowner can invest in a simple on/off timer to control a pump's daily operation.

Cost: Approximately $100 + installation

Long-term Savings: Actual energy savings will depend on the number of hours the pump PREVIOUSLY operated each day. A pump that formerly ran 16 hours/day and will now run just 6 hours and 40 minutes/day can expect to reduce the homeowner's energy cost for pump operation from about $1,455/year to about $630/year, a savings of $825, or 57 percent, each year of operation.

Annual Operating Cost = (Motor THP *.746 KW/HP* $/KWH*Hours/day*365 Days *Months of Operation/12 Months)/ Decimal efficiency

Annual Operating Cost Without Timer = (2.6*0.746*0.117*16*365*10/12)/0.759 = **$1,455/year**

Annual Operating Cost With Timer = (2.6*0.746*0.117*6.67*365*10/12)/0.759 = **$630/year**

Savings: $825/year

e-Chapter 2 **THE BETTER METHOD**

UPGRADE TO A TWO-SPEED MOTOR

Pool owners can alternatively reduce their energy costs by replacing the single-speed motor on their existing filtration pump with an energy-efficient two-speed motor.

To calculate how long would it take a two-speed motor to turn over the same 40,000 gallons:

- As previously mentioned, the pump running at full speed achieves 100 GPM. If we run the pump at high speed for 2 hours to ensure proper filtration of the entire pool, we will pump 100*120 = 12,000 Gallons. Then if we run the motor at low speed, which is 50% of the available RPM of the motor, we will pump 50 GPM for each minute run. We need to pump another 28,000 Gallons, so 28,000 / 50 GPM = 560 minutes or approximately 9 hours and 15 minutes to run at low speed.

In sum, a homeowner who runs a two-speed motor will most efficiently turn the pool water over two times a day by operating a two-speed motor on high speed for 2 hours/day and low speed for 9.33 hours/day. The energy-saving Affinity law takes effect with motors running at lower than standard speeds, and the two-speed motor qualifies. This changes the formula mentioned previously as the low-speed cost THP is now the cube root of the change in speed multiplied by the full speed THP rating. On a two-speed motor the THP is 2.6THP * 0.50^3 = 0.325THP. As noted in the formula below.

The Fix: Invest in a two-speed motor for their existing pump.

Cost: A two-speed motor of the needed size, which includes the timer, costs approximately $551. Two-speed motors can be purchased with or without a timer. The adder for the timer approximates $100, but then the homeowner must pay for installation. Thus, we picked the two-speed motor with the factory-installed timer for economic and simplicity reasons.

Long-term Savings: A homeowner with a two-speed pump motor can expect annual energy costs of about $272, compared to $1,455/year for a single-speed pump that operates 16 hours each day. That is a savings of $1,175, or nearly 80 percent, a year.

Annual Operating Cost Hi-Speed = (2.6*0.746*0.117*2*365*10/12)/0.802 = **$172.13/year**

Annual Operating Cost Low Speed = (0.5^3*2.6*.746*.117*9.33*365*10/12)/0.75 = **$107.33/year**

Total Annual Operating Cost = $172.13 + $107.33 = **$279.47**

Savings: **$1,175/year**

e-Chapter 3 THE EVEN BETTER METHOD

UPGRADE TO A VARIABLE-SPEED POOL PUMP MOTOR

While an even more efficient motor will require a more significant up-front investment, it can result in an even lower total cost of ownership over the life of the pump.

The Fix: Replace the current single-speed pump motor with a premium-efficient variable speed pool pump motor. These brushless permanent magnet (BPM) motors are designed to run ultra-quiet at low speeds and include the time clock functionality with the onboard user interface. This makes it possible for pumps to change speed and maintain peak efficiency when output demand changes.

For maximum efficiency and savings, the new variable speed motor on a 20,000-gallon pool would need to be set to run at high speed for two hours each day and at 30% of rated speed or approximately 1,035 RPMs for 12.63 hours each day to pump the required 40,000 gallons each day. The Affinity law takes effect for variable speed motors as well so the THP = 2.6 * 0.3^3 = 0.07THP. This formula adjustment is included below.

Cost: A variable-speed pump motor costs approximately $575. These motors generally include the motor, a drive or controller that adjusts motor speed or RPM, and a user interface that functions as a very high-end timer to control pumping times.

Long-Term Savings: A homeowner with a variable-speed pump motor can expect annual energy costs of just $205, compared to the $1,455 annual electrical cost for a single-speed pump. That represents annual savings of approximately $1,250, or 86 percent. If the customer operates this pump and motor for the next five years, the homeowner’s savings is $1,250 * 5 = $6,250!

Annual Operating Cost Hi-Speed = (2.6*0.746*0.117*2*365*10/12)/0.845 = **$163.47/year**
Annual Operating Cost Low Speed = (0.3^3*2.6*.746*.117*12.63*365*10/12)/0.563 = **$41.71/year**
Total Annual Operating Cost = $163.47 + $41.71 = **$205.08.**

Savings: $1,250/year

e-Chapter 4 AN ADDITIONAL METHOD

UPGRADE TO A VARIABLE-SPEED PUMP

This final option is the most popular choice in today's residential pool market.

The Fix: Replace the current pool pump with a new variable speed pump. The combination of a new pump and the variable speed motor makes this option a smart choice for many pool owners – especially those whose existing pool pump has aged eight or more years and is close to the end of its useful life.

Cost: A new variable speed pump costs approximately $1,349. These pumps include a variable speed motor, the drive or controller, a user interface, and a new wet-end or pump assembly. Utilities often offer to provide rebates on the purchase of these pumps. You'll want to alert pool owners about the availability of these rebates and help facilitate their application for them. Energy savings closely approximate that of the variable speed replacement motor as the variable speed replacement motor drives any efficiency gains.

Annual Operating Cost Hi-Speed = (2.6*0.746*0.117*2*365*10/12)/0.845 = **$163.47/year**
Annual Operating Cost Low Speed = (0.3^3*2.6*.746*.117*12.63*365*10/12)/0.563 = **$41.71/year**
Total Annual Operating Cost = $163.47 + $41.71 = **$205.08.**

Savings: $1,250/year or 86%

Energy-Saving Guide for Pool Owners

Option	Initial Cost	Savings Potential[1]	Payback Period
Add a Timer	$100	$825 annually	About 1.5 months
Two-Speed with timer upgrade	$551	$1,175 annually	About 5.5 months
Variable Speed Motor	$575	$1,250 annually	About 5.5 months
Variable Speed Pump	$1,349[2]	$1,250 annually	About 13 months

[1]Savings based on a 20,000-gallon pool and an average residential electrical rate of 0.117 per KWH.
[2]This cost does not factor in applicable rebates.

e-Chapter 5

Tips for making a final recommendation

As you can see, each of these four options provides your customers with an opportunity to reduce the energy costs associated with their pool pump's operation. Your recommendation – and their final selection – will depend on other factors you can often ascertain through conversation. These factors include:

- The customer's interest in making an upgrade
- Pool size
- The existing pump's flow rate
- The current pump's condition
- The homeowner's energy cost per **kWh**
- The customer's aptitude for technology
- Current pricing for each of the options

The availability of energy efficiency rebates should also factor into your recommendation. If a rebate is large enough, the variable speed pump alternative will usually deliver the highest long-term value to the pool owner. Based upon the above example, every $100 in rebate reduces the payback period by approximately one month on the variable speed pump option.

Be prepared to share the Energy Saving Guide for Pool Owners reference chart (see Figure One) with your customers. And be prepared to calculate the savings they might expect, based on their pool size. If you are not a mathematics wizard, there are many excellent energy calculators available, and they are easy to use. As an example, go to the Nidec Motor Corporation website and select the Swimming Pool Energy Calculator:

www.usmotors.com/poolcalculator

However they choose to upgrade, your customers will win with lower energy costs, but your guidance can lead them to the best choice and the most significant savings.

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