Reducing Pool Energy Consumption Using Two Big Advances in In-Pool Care: VS Pump & Water Quality Monitor

Variable speed pumps are a relatively modern invention with vast potential to reduce energy consumption dramatically. The energy savings are, in fact, so promising that the U.S. government has mandated their adoption when replacing aging equipment.

The unfortunate truth is these advanced pumps often fail to deliver the intended results. They often diverge from reality in real-world use, allowing them to be customized for each specific pool. This is important as each swimming pool is different, not just in size and shape but also with regard to the number and type of devices configured into each pool system. The more appliances, the greater the draw on the pump's energy.

The biggest advantage is that a VS pump can save you as much as 40-90% on your monthly energy bill by consuming less electricity. The range depends on how you use it and the resistance level in the plumbing and the filter system. Variable-speed pumps save the most money when they are run at low speeds most of the time, with higher speeds used only as needed, such as to increase filtration, run the pool cleaner, or heat the pool. The end goal of all this equipment remains the same – achieving sufficient water flow through filtration to enjoy clean, healthy water with the least amount of consumed energy.

Achieving the optimal balance point between minimizing pump energy while maximizing water quality has remained elusive despite the technological advances because of the common mistakes that pool owners make when using variable speed pumps and filtration scheduling.

By understanding the most common mistakes in using variable speed pumps, this paper serves as a guide to fully realizing the promise of energy conservation. Unlike its cheaper predecessor, the fixed, single-speed pump, and variable-speed pumps are comparatively expensive, so learning how to successfully use them for maximum cost savings without sacrificing water quality should be a priority for applying to new and retrofitted pools.

Often, pool owners aren't aware of the forced obsolescence of single-speed pumps, so they receive the latest generation variable speed pump when their old pump begins to fail. The new pump is typically specified and installed by the pool technician, often with little education to go along with its use. At other times, a new homeowner becomes the proud recipient of a pool for the first time, with no knowledge of the pool equipment's capabilities. With over a hundred thousand pool-equipped homes sold each year in the U.S. alone, new pool owners rarely get trained to best utilize these smart devices for their intended energy savings.

The good news is that despite the hefty price tag of modern, intelligent variable-speed pool pumps, the payback over time from their proper use is substantial. But the benefits go beyond energy conservation alone. It's also an intelligent, dynamic tool for filtration pumps, capable of adjusting to meet the specific demands of each element of your swimming pool. This means saving money on your monthly utility bill and improving your pool's operational effectiveness and water filtration.

Achieving the twin goals of best water quality and lowered energy consumption requires avoiding the common mistakes pool owners often make.

Let's begin by understanding how modern pumps work and what they don't do. Single-speed pool pumps were always compromised by poor design. They are uncomfortably loud, resulting from their high-speed operation, clocked at 3450 RPM. And running at this high speed consumes massive power.

Let's do the basic math. Halving the RPM translates into a flow rate commensurate reduction of approximately half. Yet the power consumed doesn't merely reduce by 50%. It produces a remarkable reduction of 8X. Science teaches us that filtering pool water with a single-speed, old-fashioned pool pump moves it inefficiently due to turbulence and friction as it travels through the pool's pipes. This becomes especially problematic when attempting to match the one-speed, overpowered pump with more modern-day equipment, such as in today's salt-water pools.

Let's examine some examples of this power-equipment mismatch. **A salt cell** that needs 20 GPM to function is poorly matched with a single-speed pump delivering only 80 GPM. A pool heater needing 30 GPM to operate is likewise poorly matched with a pump delivering 80 GPM.

As we see, pool systems dependent upon single-speed pumps were energy wasters and suffered from a compromised static design from a total pool system perspective. All of this changed for the better, with variable-speed pumps capable of varying the energy used and dialing in the water flows that optimize performance for each particular pool.

Now that we understand the deficiencies of traditional single-speed pumps and the technological leap delivered by modern variable-speed pumps let's examine the most common yet easily avoided mistakes made in the real pool world.

Problem #1: Always Running Your VS Pump at One Speed

Operating a variable-speed pump at a single speed, especially if running at higher speeds 24x7, is a slight improvement over having a single-speed pump; however, that is what so many of these pumps get set at during installation. Whether by poorly trained technicians or service companies whose main task is cleaning pools, they often need more technical training and manufacturer certifications to install new equipment properly. As noted previously, single-speed pumps are notoriously inefficient due to their high RPM operation. Operating a VS pump at high speed all or most of the time is equivalent to using a single-speed pump. Worse, you have squandered the efficiency potential and overpaid for this intelligently controlled pump by not smartly using it as its manufacturer had intended.

If overlooking the programmable speed changes (set and forget) that allow for varying the speed during times of the day or week, then at a minimum, reduce the pump speed from its maximum setting. As noted above, this slight reduction in RPM will yield considerable energy savings. To best overcome this common installation mistake, and achieve the greatest energy efficiency and overall system operational effectiveness, set a dynamic filtration schedule varying between two or more speed settings that are matched to your pool size and type of equipment in use.

Problem #2: Always Operating Your VS Pump at the Lowest Speed

It's tempting always to operate your VSP at the lowest speed to maximize energy savings and minimize your utility bill. Yet running solely at the slowest speed fails to produce sufficient water flow for your water filtration system to function well. Further, pool heaters won't heat a pool consistently when the hotter water can't be evenly distributed throughout. Finally, it's a good idea to increase pump speed when adding substantial amounts of chemicals into the water all at once. In other words, running your variable-speed pump at too low a speed might maximize energy and financial savings. Still, it won't produce the desired water quality for swimmer comfort and avoidance of bacterial-caused problems like algae blooms.

Most pools, especially those with added appliances such as pool heaters and salt-water conversion systems, will require more than the minimum flow rates of 10, 15, or 20 GPM produced (dependent upon pump horsepower) when a variable-speed pump is run on a low RPM all day. At low-speed pump operation, ensuring sufficient water flow is moving throughout your system to clean the water is crucial. With inadequate flow, water quality suffers, which is counterproductive to achieving a desirable outcome. Avoid compromising your pool investment and your family's health and enjoyment by trading off water quality for energy savings, particularly when both goals are simultaneously achievable.

What does the smart use of a variable-speed pump look like?

Avoiding a single high-speed or single low-speed setting using the dynamic programmable settings of your intelligent variable-speed pump will vary water flow for periods of the day. Most swimming pools require periods of time at both low and medium settings. Low for maximum energy conservation and medium for pushing enough water through the filtration system.

Knowing how to set that right setting to hit the sweet spot for your particular pool is the key to complete success. So, what are the tools that can help a pool owner do just that?

Problem #3: Using a VS Pump Without a High-precision Water Monitoring Device

A flow meter is one tool that can help measure the flow rate in different areas of the pool. Another valuable tool is an automated pool water monitoring system which acts as an early warning system, detecting chemical imbalances that can result when pool systems aren't operating at their optimal best. Even better is when the flow meter is designed for the water monitoring system.

Finding the 'sweet spot' where maximum energy savings and perfect water quality is attained.

Smart homeowners have turned not only to home automation systems like the Nest thermostat, the Ring smart security system, MyQ-compatible garage door monitoring/control systems, smart appliances, or smart lighting systems. They are increasingly turning to two smart pool technologies - variable-speed (VS) pumps and highly precise water-monitoring systems that automate the testing of pool water every single day. These 'water test lab in the pool' systems are transforming pool ownership by eliminating the drudgery and inaccuracy of water quality care. Other than the VS pump, nothing has

changed the pool ownership experience. Pool water volatility is at its highest during the summer swimming months when the sun's UV rays and warmer temperatures can cause sudden swings in water quality, endangering swimmer health or allowing algae blooms to overtake once healthy water. These high-precision 'water lab in the pool' systems, hidden from view in the skimmer, transmit detailed water quality readings every morning, seven days a week, to the pool owner's mobile phone app. This more precise measurement system, particularly those that test for a broad array of chemicals such as chlorine, pH, alkaline, calcium hardness, and CYA, eliminates the need for weekly, often inaccurate manual testing. With daily measurements at hand each morning, pool owners report having the confidence to set their variable speed pumps on lower (but not too low) energy settings without compromising water quality or swimmer health.

Further, by tightly controlling the water quality in the pool, with fewer weekly variations, a fully automated water monitoring system that tests the water quality every day protects the owner's investment in a new VS pump by extending its useful life. This is more significant than most pool owners realize because highly acidic pool water (low pH) or algae blooms can reduce the lifespan of a VS pump from its expected 8-12 years down to just 1-2 years in some conditions.

These two smart technologies, VS pumps and in-pool water monitoring systems, work together to create a 'smart pool system' that gives unprecedented control to modern-day pool owners. Each plays its unique role in the smart pool ecosystem. The VS pump varies and lowers overall pump speeds and hence energy use. At the same time, the invisible in-pool water monitor serves as an early warning system, ensuring the desired results are achieved. It's a powerful combination in the modern pool owner's essential toolset.

VS pumps are available from trusted brands, including Pentair, Hayward, Waterway, Raypac, and Jandy. A fully automated in-pool water testing/monitoring system is available from WaterGuru, a pioneer in the high-precision, in-pool, water test lab, smart pool category. The WaterGuru Sense™ smart water-monitoring system gauges water flow (giving a warning alert when pump flow is too low), gives an-app water temperature readout, plus analyzes pool water chemistry on a daily basis to provide a highly accurate reading that alerts the app user should the slower variable-speed pump setting begin to affect water quality adversely.

Used in tandem, these two modern pool care advancements deliver the sweet spot of saving on energy utility bills while enjoying the healthiest pool water quality.

Most swimming pools will benefit from operating a 24-hour variable speed run schedule where the pump runs slowly and with several hours of medium-speed operation. Some pool owners, having pools without additional appliances, get by with running their pumps at 1100 RPM achieving 20 GPM most of the day with short periods of time operating at mid-speed RPM range. This is exactly what Justin Downs of Dallas, Texas, did after years of running his VS pump solely on the maximum speed it was set at during installation prior to purchasing his house, a most common circumstance. His pool energy bill dropped by an astonishing 90% in financial savings by switching to lower speeds. Yet his pool water quality is better than ever, thanks to his installation of the WaterGuru Sense™. His daily morning readings on water quality mean he is always aware of how to keep his water pristine throughout the seasons and through varying swimmer loads, especially following a pool gathering with neighbors and friends.

Every swimming pool is unique, so using an advanced water quality testing/monitoring system is the best way to gauge which pump speeds are most effective at producing pristine water quality. It's working backward. The pool water's pristine quality (not just in appearance but in safe, chemical balance for swimmers) is the unchanged target as the pump speed varies to achieve that and reduce energy use. The more peripheral devices your pool has, like salt chlorinators, heaters, and heat pumps, the more dynamic your ideal filtration schedule will need to be. Without these added pool appliances, as Justin learned, the less demanding and hence less energy-consuming your pool filtration schedule needs to be.

Problem #4: Avoid Installing an Oversized VS Pump

It is extremely common to find oversized pool pumps that overpower the pool systems in which they are installed. Too many pool owners, or pool technicians making the selection, have a bigger is the best mentality which leads to inefficiencies in the pool system. Selecting the right pump size for the specifics of each pool is essential for optimal performance and energy efficiency.

When a pool pump is overpowered, it fails to operate efficiently and can lead to early failure of the pump. If the goal is moving greater volumes of water, larger pipes are the right method, not larger pump sizes. It may sound counter-intuitive, but fast-moving water could be more efficient. It creates avoidable turbulence in the water flow. Over-powered pool pumps can produce excessive water velocity creating unsafe conditions for swimmers. Most pool owners would be better advised to go a step or two down in pump power. This is an important decision best made with a competent pool technician who can help calculate the optimal pump sizing for your overall pool size and system.