ARTICLE FOR PUBLICATION

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Understanding the Relationship Between Horsepower and Speed

Selecting A Replacement Variable Speed Motor
By Mandy Pressel, Product Specialist

BELOIT, Wis., December 19, 2017 — When replacing a failed pool pump motor, proper selection of the replacement motor is imperative to ensure fit and that it's capable of carrying the load of the motor it is replacing. Traditional single-speed induction motors are designed to handle workloads at static motor operating characteristics like speed and horsepower. Overloading the motor will cause the motor's thermal protection device to trip, and, if not corrected, will eventually damage the motor.

However, variable speed replacement motors are designed to operate under dynamic conditions, allowing adjustment of motor speed (RPM) to optimize water circulation resulting in greatly reduced energy consumption. Adjusting the speed of the motor affects other operating aspects of the motor's operating conditions. When the speed of a motor is reduced, the horsepower (HP) required to run the pump is reduced as well. The Pump Affinity Laws state that horsepower will change as the cube of the change in speed. For instance, a motor operating at 1.25 HP will be reduced to .57 HP when the speed is decreased to 2650 RPM.

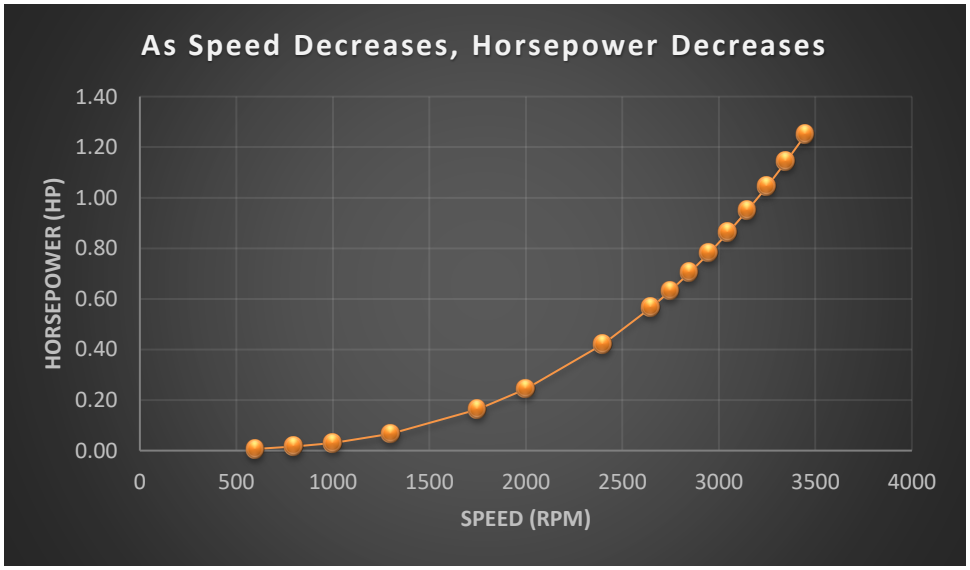

Figure 1: As the speed of the motor decreases, the horsepower required to run the pump decreases

Single-speed pumps typically run at high RPM's and for longer time periods than necessary, over-circulating water and wasting precious energy and money. Because variable speed motors are programmable and can be adjusted to lower speeds, the water can be circulated at the minimum turnover rate for water quality. As motor speed decreases, the flow, in gallons per minute (GPM), is reduced. This reduction in flow can be resolved by slightly longer programming times.

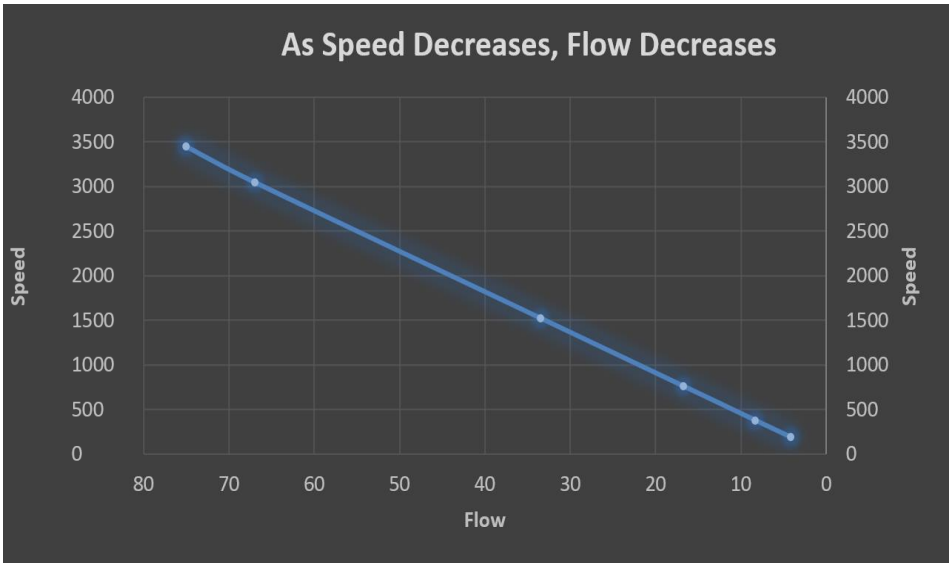

Figure 2: As the speed of the motor decreases, the flow decreases

SELECTING THE RIGHT VARIABLE SPEED MOTOR

Variable speed motors come in a variety of sizes and flange configurations. The Century® line of VGreen® Variable Speed Motors is even available in 115 volts with 0.85 total HP, making it a great fit for many residential pool applications.

What if the pool pump requires more than 0.85 HP? A costly solution would be to rewire the job to 220 volts. However, a few calculations can demonstrate that a lower HP variable speed motor may satisfy the load requirements along with the circulation needs of the pool.

Here is an example of a 12,000-15,000 gallon pool with 115 volt service. The failed 1.25 THP motor and a popular pump produced a flow of 75 GPM. To circulate the pool for the recommended two turnovers, the old motor would need to run for six hours and off for the remaining 18 hours.

When the motor is replaced with a VGreen® 085 variable speed motor with .85 THP, the motor will automatically derate speed, to avoid overloading the motor, to meet the demands of the pump. In this case, the motor will run at a high speed of 3050 RPM. As explained earlier, decreasing the speed will also lead to decreased flow. Running the motor at 3050 RPM will result in the flow decreasing from 75 GPM to 67 GPM. Programming the VGreen® motor to run at 3050 RPM for two hours and 1300 RPM for eleven hours will result in the same rate of circulation as the old single speed induction motor.

Example	
Electrical Service	115 Volt
Pool Capacity	12,000 Gallons
Recommended Circulation/ Full Turnover	2.25 Times/Day (27,000 gallons/day)
Old Motor THP	1.25 THP
Pump Flow (with old motor)	75 GPM
Timer Schedule (with old motor)	6 hours on/18 hours off *6 hours per day * 75 GPM * 60 minutes per hour = 27,000 Gallons per Day*
Pump Flow with VGreen® 085 motor	67 GPM at 3050 RPM 29 GPM at 1300 RPM
Timer Schedule (with VGreen 085 motor)	3 hours on 3050 RPM 11 hours on 1300 RPM *2 hours per day * 67 GPM * 60 minutes per hour = 8,040 Gallons per Day* *11 hours per day * 29 GPM * 60 minutes per hour = 19,140 Gallons per Day* *For a total of 27,180 Gallons per Day*

Furthermore, a variable speed motor is dramatically more energy efficient than a single-speed induction motor. A typical A/C induction motor will operate at around 70% efficiency and use 7.993 kilowatt hours per day. In contrast, a variable speed ECM motor is 80% efficient running at 3050 RPM and 70% efficient at 1300 RPM, using only 2.400 kilowatt hours per day. This will result in 75% energy savings for the pool owner.

The lower horsepower variable speed motor can deliver the same circulation performance of the old motor with higher horsepower without overloading the variable speed motor and with the added benefit of saving 75% on energy costs. Variable speed motors offer the flexibility of speed and time programming to not only meet the circulation demands of the pool but also to operate efficiently and quietly.

About Regal Beloit Corporation

Regal Beloit Corporation (NYSE: RBC) is a leading manufacturer of electric motors, electrical motion controls, power generation and power transmission products serving markets throughout the world. The company is comprised of three business segments: Commercial and Industrial Systems, Climate Solutions and Power Transmission Solutions. Regal is headquartered in Beloit, Wisconsin, and has manufacturing, sales and service facilities throughout the United States, Canada, Latin America, Europe and Asia. For more information, visit RegalBeloit.com

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