

# Swimming Pools - Application Note

## Energy Saving in Pools

In these times of increasing energy costs and greater understanding of personal and business responsibility for reducing CO<sub>2</sub> emissions, any actions that can reduce energy usage need to be investigated, and if appropriate, instigated.

The CRIUS 3600PS from PI can be used, not only to control the pH and chlorine dosing in a pool, but also to control the main re-circulating pump speed.

## Theory

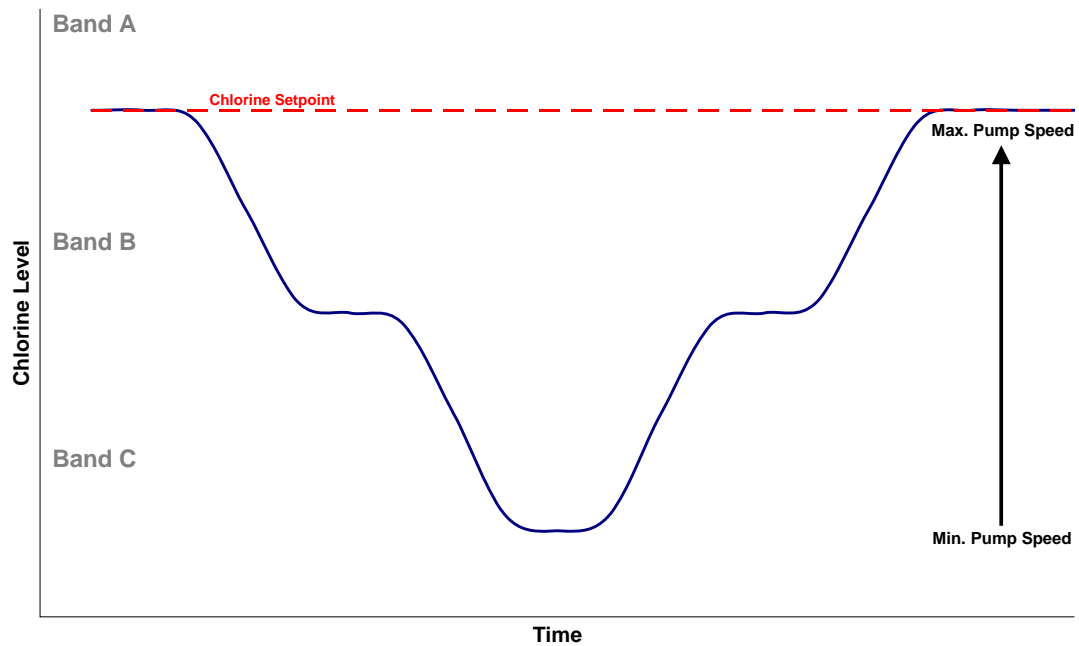
The main re-circulating pumps provide the motive force for circulating the water in the pool through filters and past the chemical dosing points. These pumps are normally specified to provide sufficient flow rate to maintain the minimum recommended number of turns per hour (pool volume pumped per hour) plus an additional capacity. Often these pumps are run at a single speed providing far greater flow rate than actually required in order to maintain water quality.

By turning the pumps down when they aren't required to operate on 'full', significant savings can be made both in monetary and CO<sub>2</sub> emissions terms. For most installations this will require the purchase and installation of invertors to be able to turn down fixed speed pumps from their maximum.

## Implementation

The CRIUS 3600PS controller provides two control mechanisms for the pumps. The first is an overnight setting. Most pools have 'downtime' overnight when it isn't necessary to run the pumps above the 'minimum'. It is important to determine the minimum pump speed that results in the minimum acceptable flow rate for the pool. Various factors will need to be taken into consideration including the filter type. In doing this pool operators may be advised to install an accurate flowmeter whose output can be fed directly into the CRIUS 3600PS pool controller. Alternatively the CRIUS 3600PS allows the operator to input this minimum flow as a percentage power reduction, and also the times at which this reduced pump rate applies. The second control mechanism is based on the control output from the controller to the chlorine dosing pump. During normal pool usage there will be times when the pool is almost empty and during these times we want to turn the pump down and during times of heaviest pool use we want to turn the pumps up again.

The times of heaviest pool usage is effectively measured by the chlorine demand in the pool. The controller provides the operator with three bands 'A' 'B' and 'C' with user settable boundaries.



When the chlorine residual is at its set point (within band A) the pump is set to run at the minimum flow rate. When the residual drops into Band B (indicating greater use of the pool), not only does it increase the chlorine dose but also the circulating pump rate. As the chlorine dips into Band C (indicating even greater pool use) the pump is turned up again to its maximum setting. By optimising these bands the pool operator can ensure that the circulating pumps are always operating at the minimum flow rate required to maintain pool water quality thereby minimising energy costs and CO<sub>2</sub> emissions.

## **Results**

Implementation of this style of control of the pumps can greatly reduce the power consumption of the pumps (10% - 50%) providing a payback of any thing from 9 months to 2 years. This calculation does not include the savings from reduced wear and tear, reduced maintenance, and the resulting longer pump life.

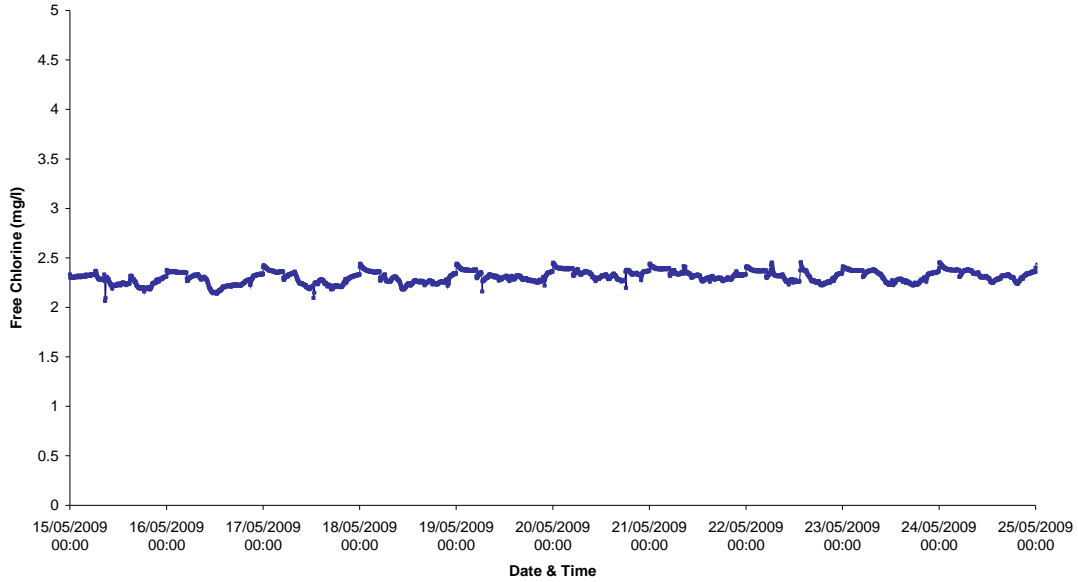
## **Case Study**

Crow Wood Leisure in Burnley, Lancashire is a high quality private leisure facility running a pool and a spa. In a drive to increase bathing water quality and to reduce CO<sub>2</sub> emissions. Crow Wood installed two CRIUS 3600PS controllers and after eight months of exemplary control Crow Wood implemented the inverter control option to reduce circulation pump power usage. Initial results show that conservative settings within the control algorithms have produced an average power saving of 24% over 3 weeks. This equates to an average saving of 38 kWh/day or approximately £1500/year. Tuning of the system is currently underway and initial results suggest a 33% power reduction should be easily achievable (£2150/year).

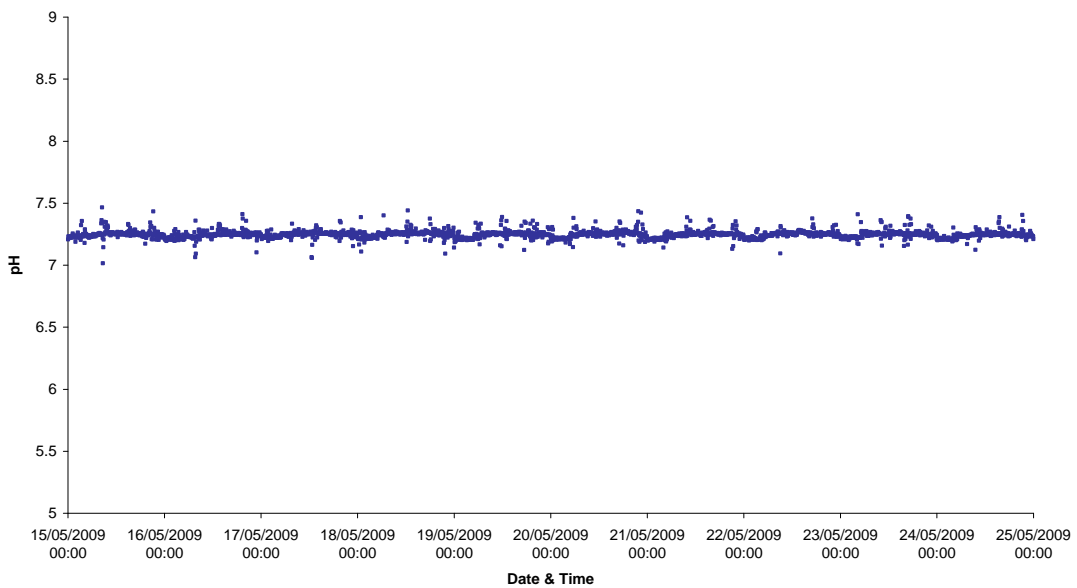
During this initial period Chlorine and pH control was monitored closely. Peak pool usage occurs during Friday (15/05) mornings with Aqua-aerobics class

and Saturday (16/05) mornings when the pool is heavily used by families. The graphs below show that even in these high demand situations Chlorine and pH control have been easily maintained.

Free Chlorine Control



pH Control



Ron Sykes of Crow Wood Leisure said 'we are extremely please with both the Pool and Spa control provided by the CRIUS 3600PS and now with the inverter control function not only are we maintaining the highest quality bathing water but we are saving money and the planet at the same time!'