

# Sol+Guard™

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## What is GeoBubble™ technology?

GeoBubble™ is the geometric bubble design, developed specifically to improve the performance and lifespan of floating swimming pool covers. Traditional bubble covers have offered little design innovation since first being introduced to the swimming pool market. It is common for a traditional bubble cover to exhibit excessive thinning in the bubble profile, resulting in a material that is susceptible to premature degradation and with a significantly reduced useful lifespan.

The unique shape of our patented GeoBubble™ Technology eliminates these weak points, presenting a bubble profile that is 50% thicker at its thinnest point vs. conventional bubble covers. Inclusion of a larger air cell and supporting structural arch allows GeoBubble™ products to better withstand bubble collapse and allow greater room for internal air expansion. This means that the expected lifespan of GeoBubble™ products are up to 25% longer than any existing equivalent material incorporating a traditional bubble design.

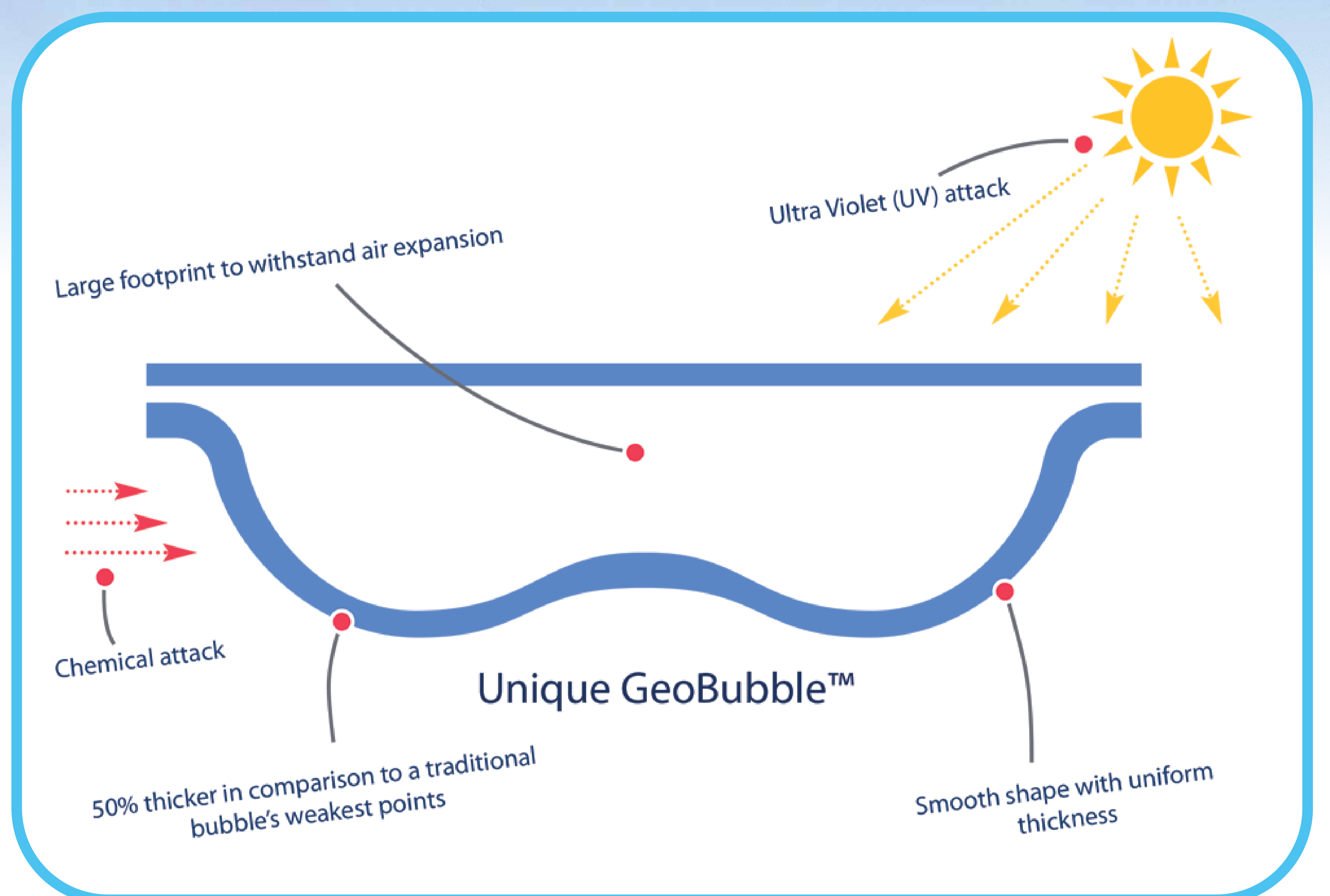


Figure 1. Patented GeoBubble™ Technology cross-sectional illustration

## What is Sol+Guard™?

Sol+Guard™ is our specialist transmission pool cover material scientifically engineered to transmit 80% of the Sun's energy in the visual and IR spectrum, utilising it to heat the water and basin of your pool. Our own testing has shown that Sol+Guard™ is capable of increasing the temperature of your pool by up to 7°C in the UK, whilst testimonials from hotter climates suggest temperature increases in excess of 8°C are possible. The solar heating effect of Sol+Guard™ can significantly reduce heating demands by as much as 70%.

As with all GeoBubble™ products, Sol+Guard™ pool covers prevent evaporation, the primary mechanism of heat loss from any pool. By providing a physical barrier, our Sol+Guard™ with GeoBubble™ Technology can reduce the rate of evaporation by 98% - helping you to preserve water and minimise heat loss.



Figure 2. Sol+Guard™ cover on customer's swimming pool

## Sol+Guard™ Benefits:

- Increases pool temperature by up to 8°C
- Reduces energy consumption by over 70%
- Reduces chemical consumption by up to 40%
- Eliminates water evaporation by 98%+
- Reduces debris contamination
- Saves money & reduces the pool's carbon footprint
- 6 year+ expected lifespan
- With GeoBubble™ technology

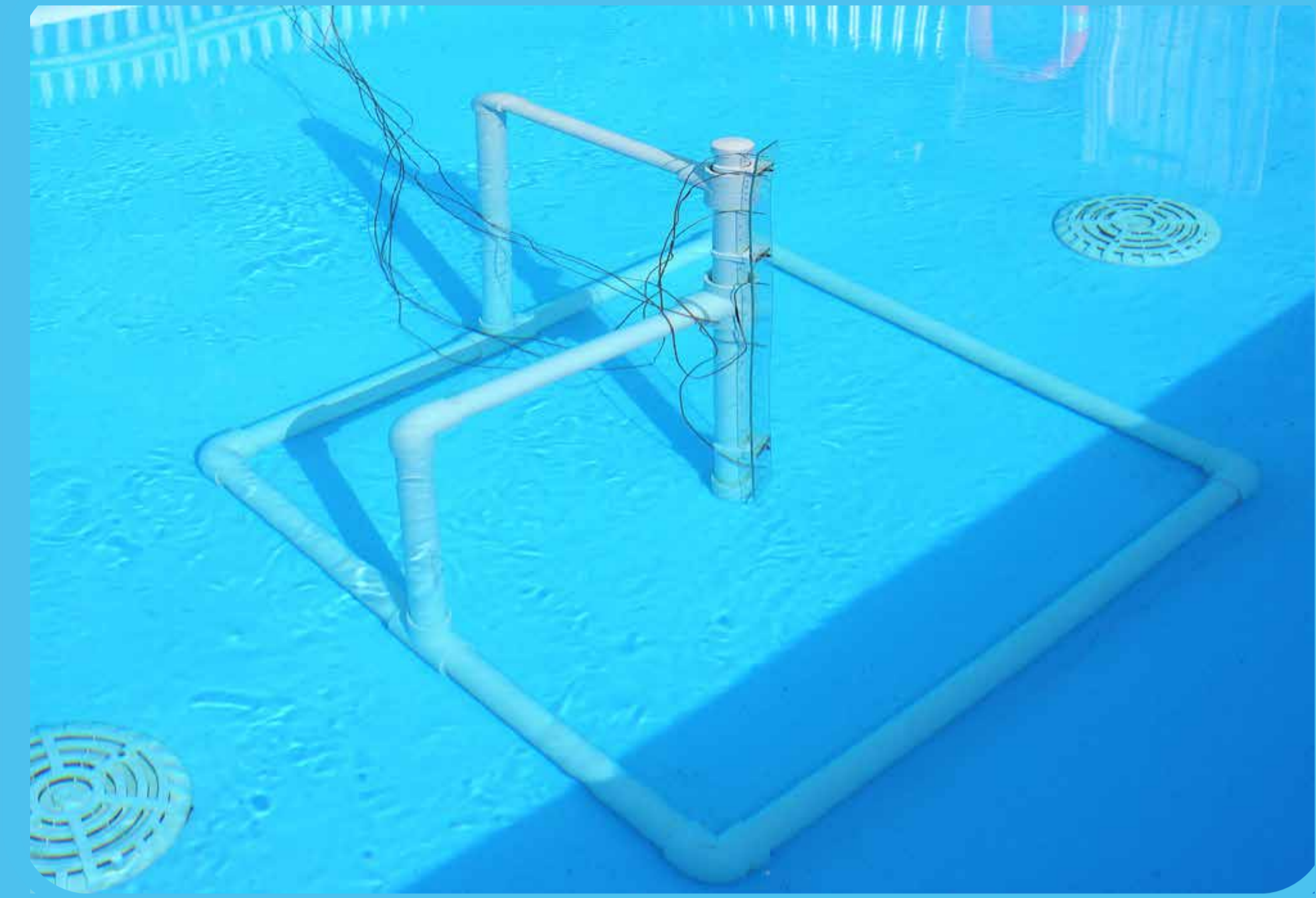


## Experimental Procedure



**Figure 3.** Bespoke testing facility, Plastipack Ltd, Hastings UK.

All test pools at our facility are unheated and measure 8m X 4m with a 1.3m depth, having been designed to be representative of an average sized, privately owned pool. The pools have a volume of 41,600L and each contain an array of 6 type-T thermocouples at their centre, continually logging water temperature at incremental depths and calculating average water temperature.

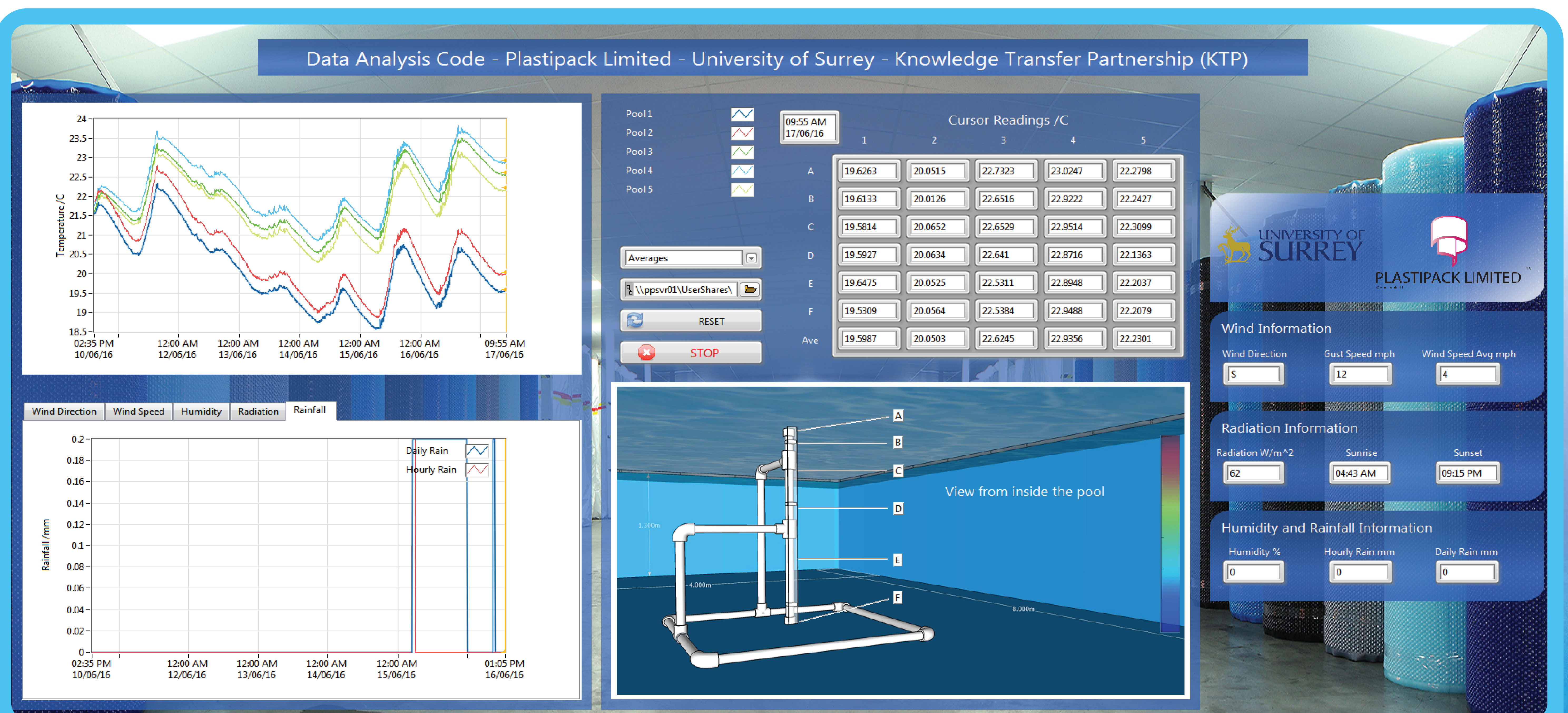


**Figure 4.** Type-T thermocouple array used in test pools.

Logging and compilation of the temperature data is completely autonomous, maximising accuracy and reproducibility of results. A bespoke computer programme was developed to achieve this and was coded using specialist LabView™ software. This programme was designed by Plastipack engineers in close collaboration with experts at the University of Surrey.

Each pool is serviced by its own 0.75hp filtration pump running for 8 hours each day (6 hours during the day, 2 at overnight), a pattern commonly accepted as best practice for filtration efficiency within the industry. Water samples were taken every other day to ensure that chemical concentrations remained within the accepted industry standard pH, free chlorine and combined chlorine concentrations of the pool water were logged manually using a specialist photometry device. Any chemical additions required to restore and rebalance water chemistry to within the acceptable limits were recorded. These records were used to build a detailed dosing regimen for each test pool to allow for comparison of 'chemical consumption'.

Further testing was conducted to determine the effects of GeoBubble™ products with respect to controlling evaporation from the surface of a pool. A test was devised whereby two unheated tanks, with a surface area of 1m x 1.5m were each filled to a depth of 0.435m. One tank was subsequently covered with a 400 Grade standard GeoBubble™ product, and the other left uncovered before being positioned outdoors in direct sunlight for 3 days during summer time. At conclusion of the test the water depths of both tanks were measured and used to calculate the water remaining in each tank. Percentage water lost by evaporation was subsequently calculated for comparison.



**Figure 5.** Bespoke temperature analysis programme (Screenshot).



## Results and Discussion

### Solar Gains

Experimental data was gathered from our testing facility over the course of 9 days in June 2018 (British Summer Time). It can be seen in Figure 6. that the pool covered with the Sol+Guard™ material was consistently 6°C warmer on average than the uncovered control pool for the duration of the test. Sol+Guard™ transmits highly in the visible and IR spectra and is able to efficiently transfer this energy into the pool for heating. Sol+Guard™ is also able to retain heat by acting as a barrier and preventing evaporative cooling at the surface. The solar heating effects and heat retention properties of Sol+Guard™ can significantly reduce bills associated with heating a pool by as much as 70%.

Not only was the Sol+Guard™ pool consistently warmer than the control, it can be seen that water temperature was continuing to rise steadily when the testing was concluded. Daily solar gains were being compounded by the insulating effects of the large air cells of our GeoBubble Technology™. The daily solar temperature gains exceeded any heat loss overnight, resulting in a net temperature increase.

The pool covered with the Sol+Guard™ achieved a maximum temperature variance of +8°C on the final day of testing. This shows that on the warmest days, and during extended periods of unseasonably warm weather, the solar gains achieved by using Sol+Guard™ can be significant. By retaining solar gains overnight or on cooler days, covering a pool with Sol+Guard™ can increase the length of the pool season by up to 2 months.

Observed temperature gains when using a Sol+Guard™ cover are highly dependent on the local climate. In the UK and other more temperate climates it would be rare to regularly see temperature gains exceeding 6-7°C outside of prolonged heatwave conditions.

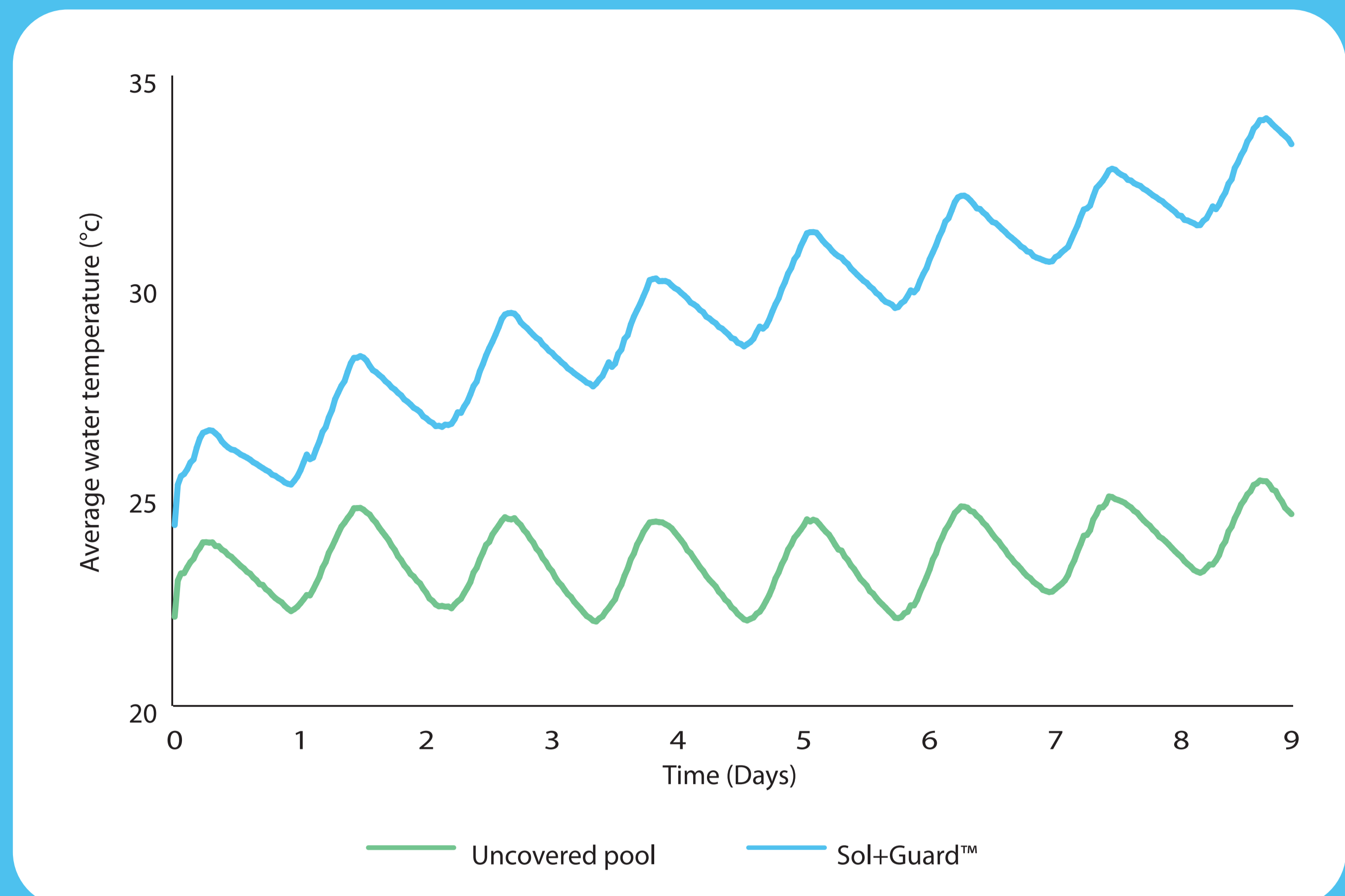


Figure 6. Average temperatures of a test pools over 8 days (June 2018).

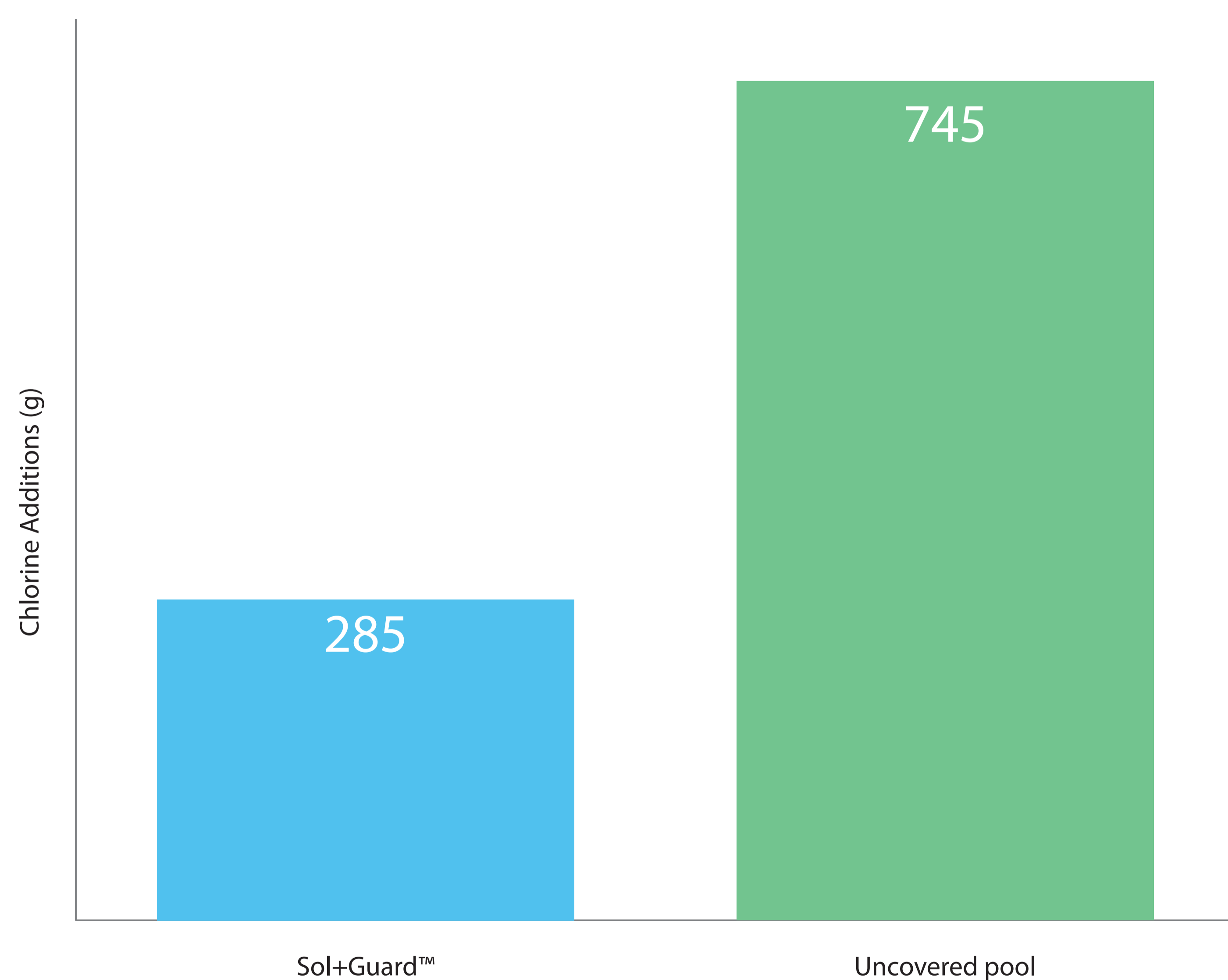


Figure 7. Chlorine additions to test pools (June 2018).

This significant reduction in chlorine consumption was largely due to the abnormal ambient conditions during the test. The unseasonably hot weather during the heatwave caused chlorine to be more readily consumed in the uncovered pool. Under normal environmental conditions in the UK a chemical saving of 30-40% is expected and will vary depending on how frequently the cover is removed for bathing, how frequently the pool is shock dosed and how heavy the bathing loads are.

### Chlorine Consumption

Chemical additions to the test pools were closely monitored over 2 weeks at the end of June, during the heatwave of 2018. This allowed the performance of the Sol+Guard™ to be assessed with respect to chemical savings. Pool water samples were taken on alternating days and stabilised chlorine was added accordingly to balance the water concentration to within industry standards (2-4 parts per million). The chemical 'consumption' of each pool was assessed by recording the additions of stabilised chlorine each pool required to remain within this range. During this test, granulated chlorine was added to a test pool if water concentration of free chlorine dropped below 3.5PPM.

It can be seen in Figure 7. that over the course of the test, 745g of stabilised chlorine granules was added to the control pool, whilst only 285g was added to the pool covered with Sol+Guard™. This represents a 62% reduction in chlorine additions when Sol+Guard™ is used.

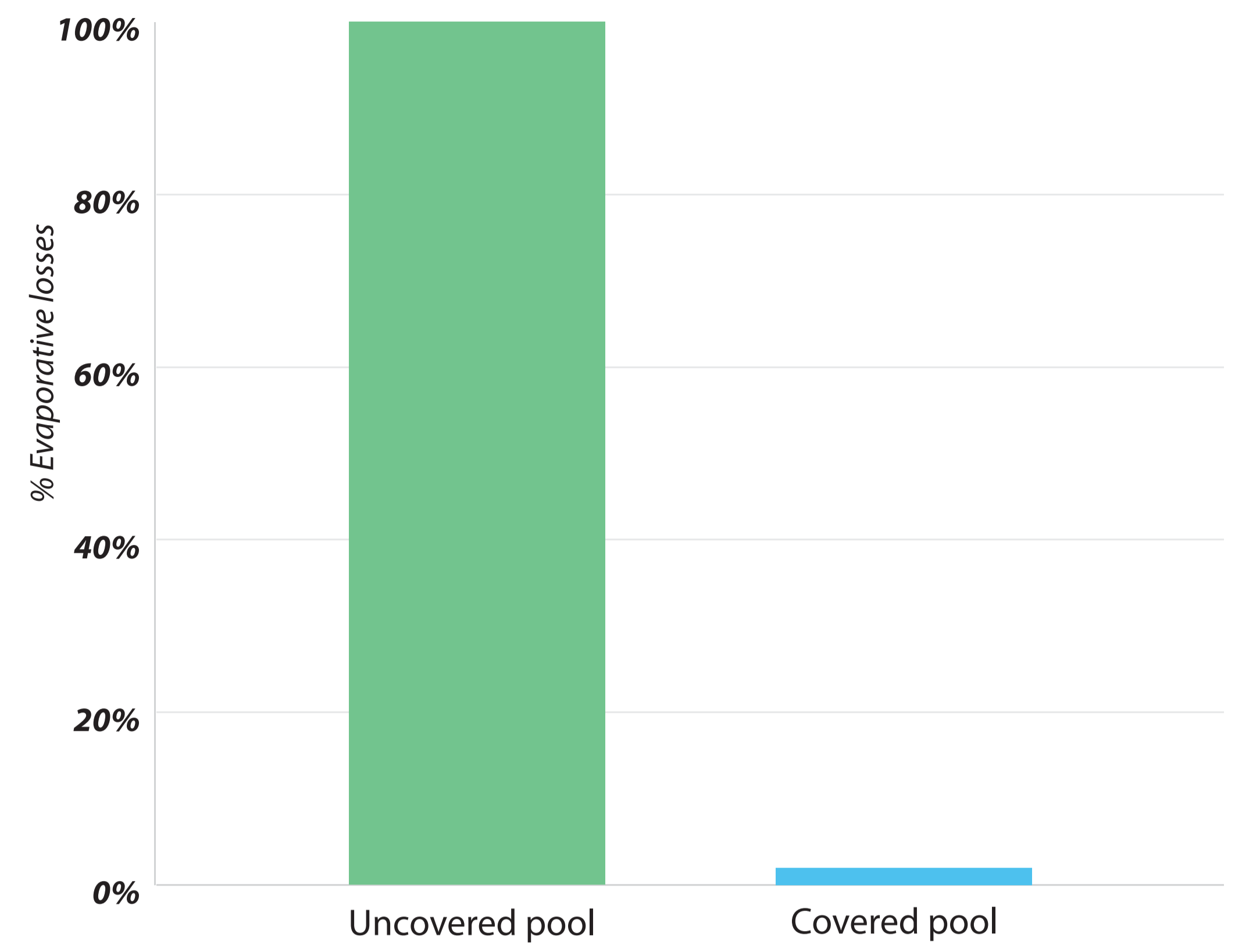


## Evaporation Prevention

It was found that the covered tanks exhibited a 98% reduction in water loss over the course of the test, when compared to the uncovered tank. This means that for an average sized pool of 4m x 8m in the UK, covering it with GeoBubble™ equates to a water saving of approximately 32,000 litres per year versus leaving it uncovered. This saving is greater in hotter climates or regions subject to high winds.

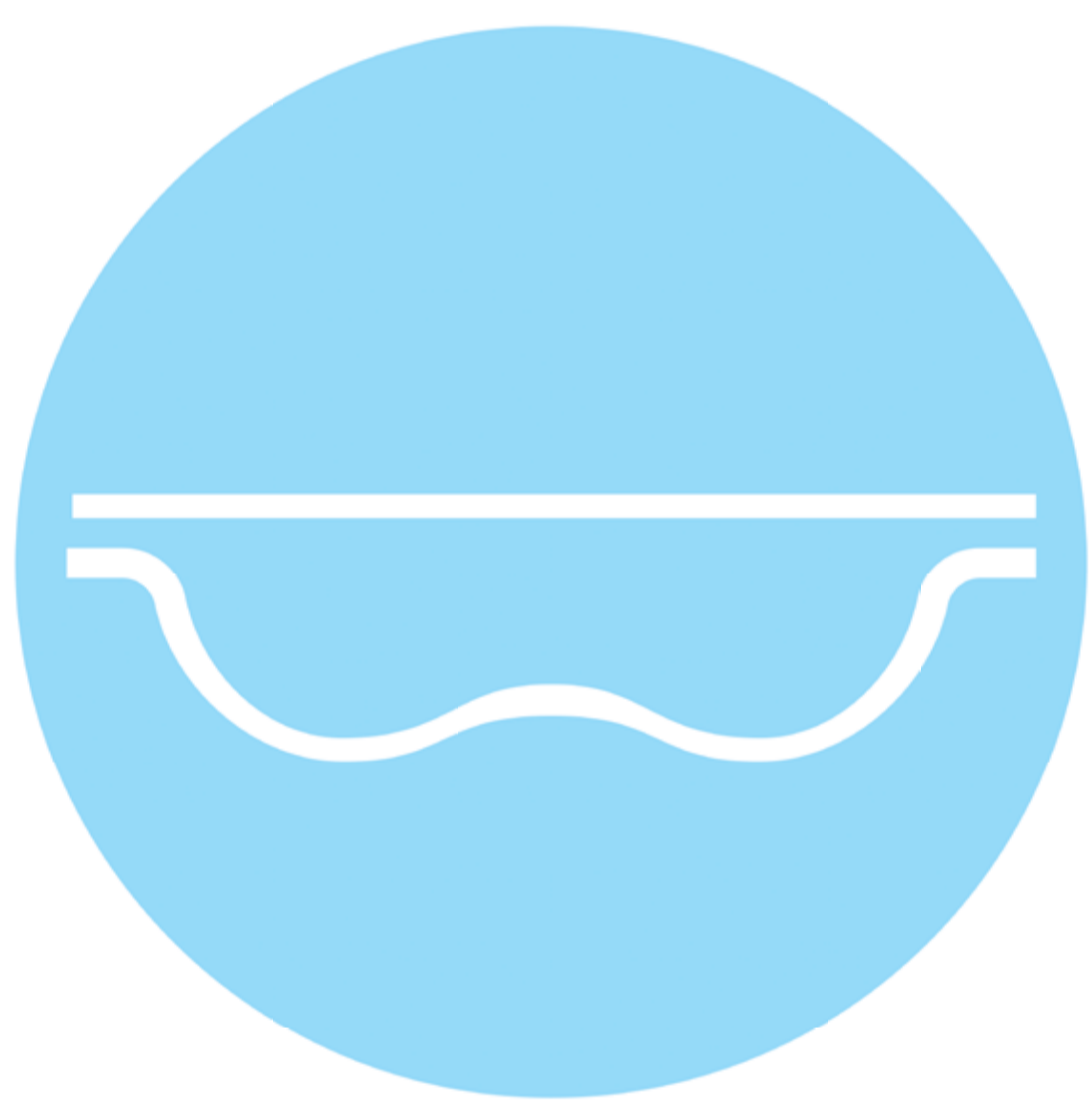
A GeoBubble™ pool cover eliminates almost all evaporation (98%) by acting as a physical barrier. Evaporation is a resource and an energy consumptive process responsible for 70% of the total heat loss from an outdoor pool. Covering the pool removes this energy deficit reducing the workload required by heating systems and holding the energy within the pool.

Water is a strained resource around the globe vital for humanity. By covering a pool whenever it is not in use pool owners can enjoy an aquatic leisure activity while minimising water waste, reducing energy consumption and sustaining chemical levels. This ultimately reduces the running cost and the carbon footprint of the pool while preventing waste of a vital resource.

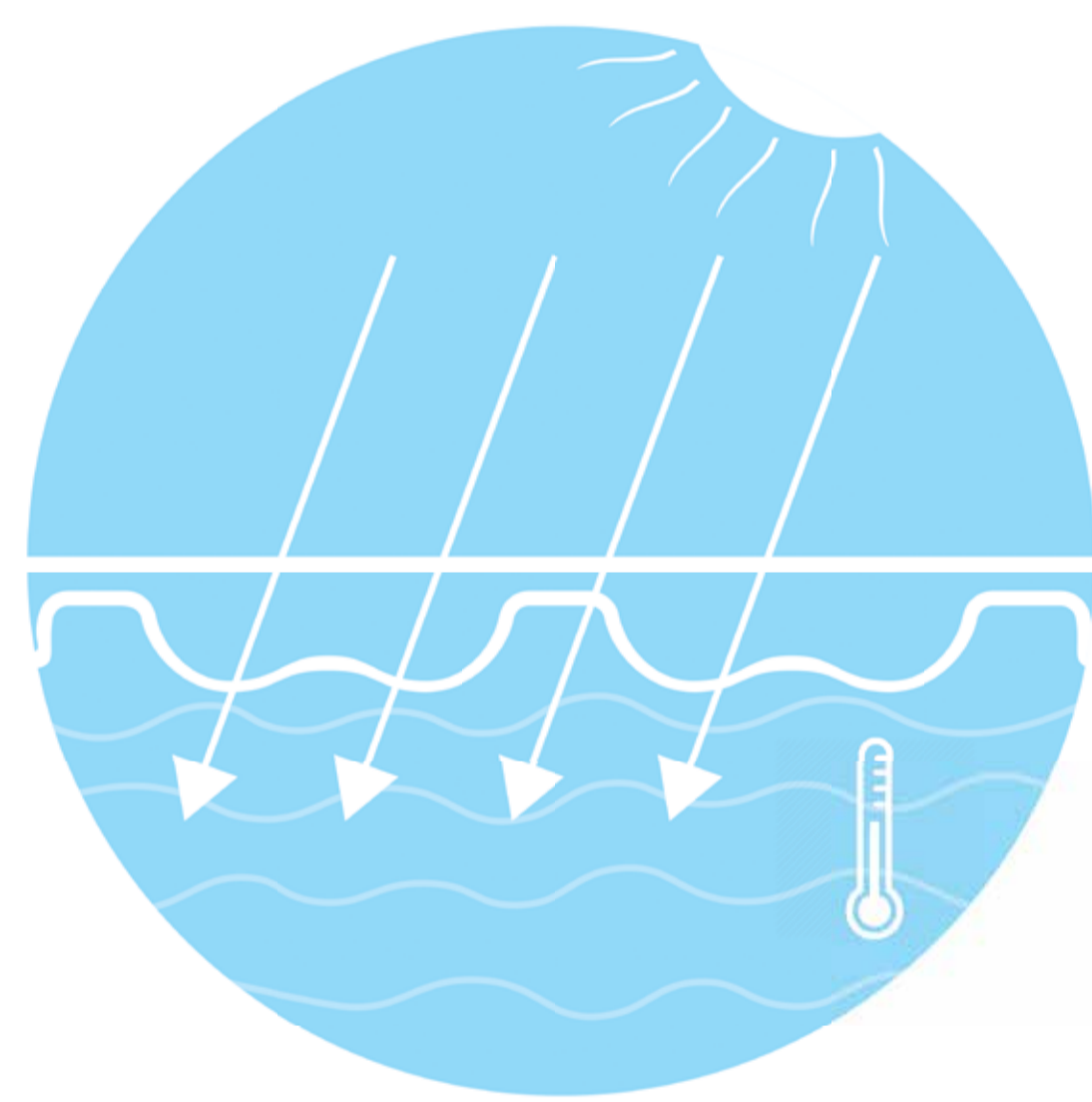


**Figure 8.** Evaporative losses from covered vs. uncovered pool

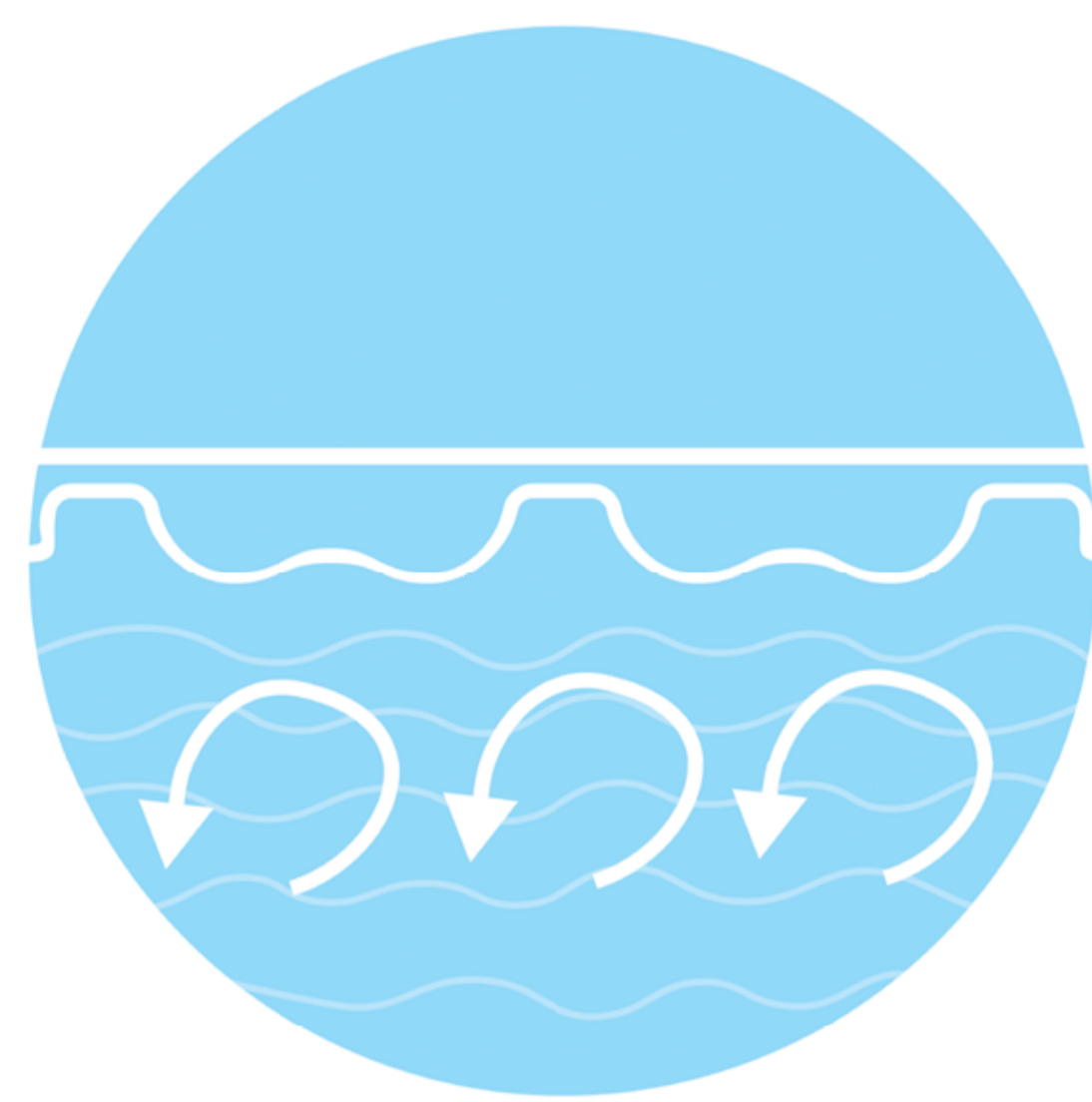
For more information on our standard products and our premium Guard product range, please visit [www.geobubble.co.uk/products](http://www.geobubble.co.uk/products) or to find out where you can buy a GeoBubble™ cover, please go to [www.geobubble.co.uk/where-to-buy](http://www.geobubble.co.uk/where-to-buy)



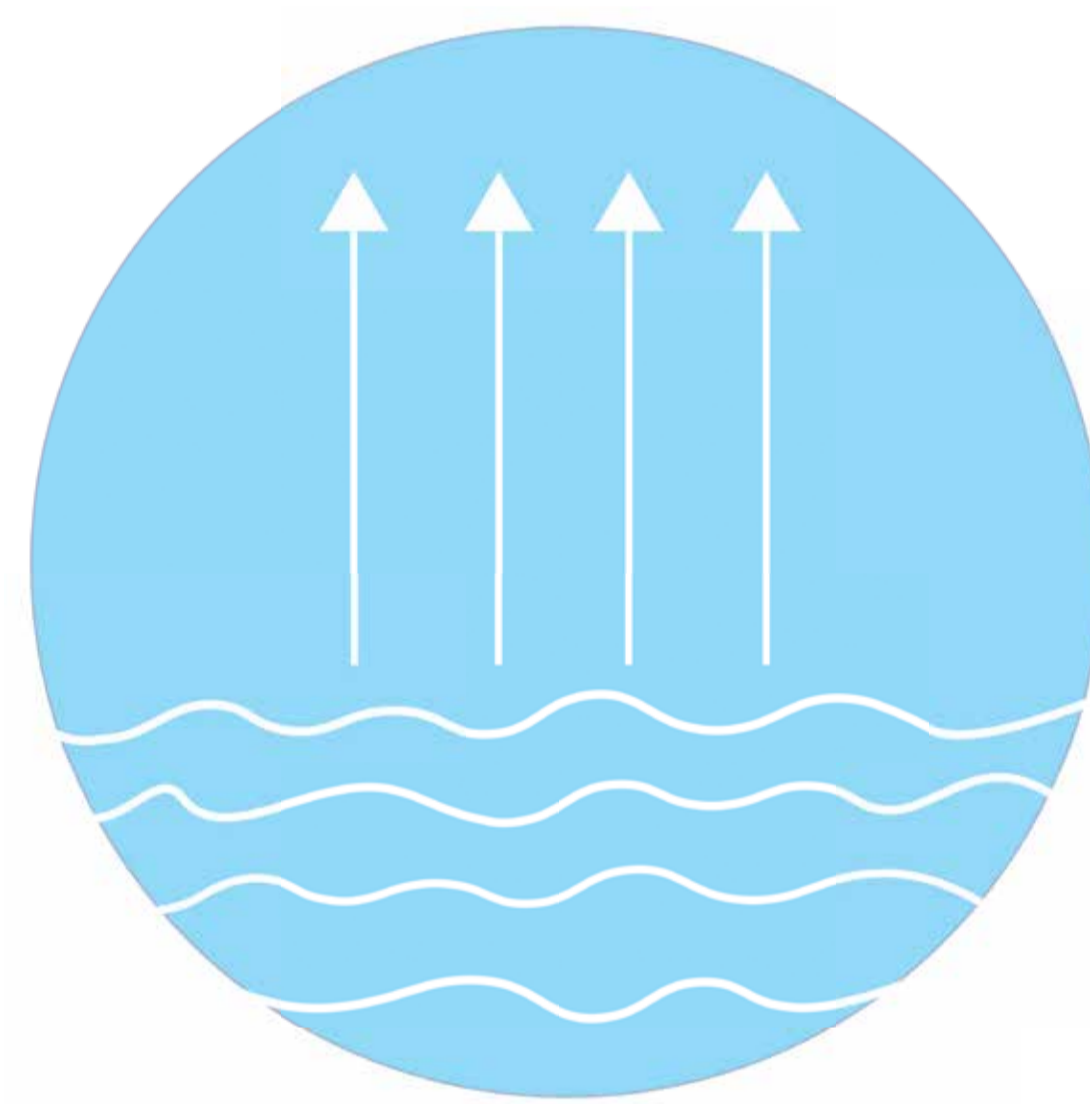
**Unique GeoBubble™ design**



**Solar Gains**



**Heat Retention**



**Evaporation Control**



**Debris Control**

