

Efficient pool vacuuming leads to positive effects on the chlorine consumption in swimming pools.

A study by the Division of Industrial Ecology at the Royal Institute of Technology (Stenling, H; 2004) carried out on behalf of Weda Poolcleaner AB has shown some significant results regarding the effects of frequent and efficient pool vacuuming.

A thorough and regular cleaning of the bottom decreases the usage of chlorine due to the avoidance of the chlorine activating on firm particles, according to the study.

Chlorine is still the most commonly used disinfectant for most swimming pools even though it may cause some rather unhealthy effects on the swimmers and the staff at the pool.

These effects are irritated eyes, skin rashes, swollen mucous membranes and a strong and irritating smell.

It is well known that the cause of the problem is mainly due to the combined chlorines (di and tri chloramines). Some recent studies have indicated that in an extended use of pools the chlorine may also be the cause of asthma and allergies (Carbonelle. S, 2000 and Thickett, K.M. et al, 2002).

The negative effects of the chlorine are generated when the chlorine forms bi products such as chloramines when it comes into contact with firm particles (organic materials), nitrogen and ammonium compounds.

To disinfect water chlorine normally is added in the form of chlorine gas, sodium hypochlorite or calcium hypochlorite. The amount of free chlorine must be high enough to kill the micro organisms but not so high that it leads to corrosion in the piping systems. If the concentration is at any point found to be too low additional chlorine must immediately be introduced in the water.

The free active chlorine contains both HOCl and ClO⁻ but the ClO⁻ has a far lower disinfectant speed than the HOCl. (Source: General rules for Public Swimming Pools in Sweden 88:2)

At a pH level of 7.5 the free active chlorine contains 50% ClO⁻ and 50% HOCl. The amount of free combined chlorine should at all times be kept to a minimum since it creates the negative effects mentioned above. It also has a far lower disinfecting capability. The amount of free combined chlorine increases over time and also with the amount of organic materials. This can be handled by draining of the pool and refilling with fresh water, check chlorination, minimizing of people using the pool and by making sure that swimmers are properly cleaned before entering the pool.

Vacuuming the pool with a pool cleaner means that small and large particles are removed from the pool bottom and most commonly saved in an on-board filter. This decreases the turbidity of the water and has several positive effects on the water:

- The effect of the free active chlorine is improved if there are no particles in the pool that encapsules the micro organisms and make them “hard to reach” for the chlorine. Killing micro organisms are obviously more efficient if the water is clear without any turbidity.

- The particles may also serve as food for micro organisms. Removal of the particles hereby decreases the risk for bacteria and viruses due to the absence of “food”.

The free combined chlorine is not affected by the pool cleaner. Possibly it may be affected since the nitrogen compounds, mostly organic, that have assembled on the bottom are removed which leads to a lower content of free combined chlorine. COD is affected in a similar way, organic materials that are dissolved in the water are not affected but the organic materials that have settled on the bottom are.

The ideal situation is to remove all or at least minimize the amount of organic materials, to remove it before it dissolves in the water and before the chlorine reacts with it. This requires well established routines for pool cleaning (vacuuming) and an efficient pool cleaner.

Other factors that directly or indirectly affects the chlorine usage are:

- The design of the pool. An intake in the pool bottom stirs up the water and creates turbidity and complicates the pool cleaning.
- The filtration system. A good system makes the water “recover” faster even without pool vacuuming. Some results show however that the recovery of the water last shorter if the pool is not regularly vacuumed.
- The amount of swimmers in the pool and their hygiene. Every person adds approximately 3 grams of particles like hair, skin and textiles, 0,7 grams of nitrogen compounds and 15.000.000 bacteria into the pool.
- The frequency of pool vacuuming
- The amount of added fresh water and its COD content.

In Conclusion

The main results of this study are:

- Pool vacuuming is essential for the water quality, it decreases the turbidity in the water. High turbidity decreases the effect of the chlorine.
- **Efficient** pool vacuuming decreases the amount of chlorine necessary to maintain the required free active chlorine levels in the pool.
- The lesser amount of chlorine used in a pool the lower the amount of chlorine compounds may be established which in its turn creates an improvement of the environment in and around the pool. Both for the swimmers and for the pool staff.
- Less chlorine also means cost savings for the pool owner.

It is obviously so that there are several important factors that affects the usage of chlorine in swimming pools.

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