Bazı Bilimsel Yazılardan Kısaltmalar

• Klor ile dezenfeksiyon halen ülkemizde en yaygın olarak kullanılan dezenfeksiyon yöntemidir. Bununla beraber suya klor ilavesi ile kanser yapan bileşikler dahil olmak üzere, zararlı bir takım maddeler meydana gelebileceği yeni anlaşılmaya başlamıştır. (Prof. Dr. Yılmaz Muslu, İTÜ Çevre Mühendisliği Bölümü, " Su Temini ve Çevre Sağlığı")

• Kimyasal dengeli havuz suyu ve 2.0 mg/L serbest klor oranına karşın, Cryptosporidium parvum'u nötralize etmek 4 gün kadar sürebilir. Cryptosporidium parvum şiddetli ishale yol açar ve havuz suyundan bulaşır. (CDC - Emerging Infectious Diseases)

• Tahlil edilen 282 havuzdan, klor düzeyi 2.0 mg/L dan fazla olan havuzların %50'sinden fazlasında, E. Coli ve Pseudonomas bakterileri bulundu. (Dr. Peter Gaffney, Professor of Microbiology at Georgia State University, "Microbiological Evaluation of Swimming Pools in Fulton County Georgia ")

• Illinois Halk Sağlığı Araştırmacısı, Linda Berrafato'ya göre: "Havuzlardaki yüksek bakteri ve virüs düzeylerinden dolayı, yüzücüler yüzmeyenlere göre, çok daha fazla göz, kulak ve cilt iltihaplarına maruz kalırlar." (USA Today)

• Yüzme havuzlarında kullanılan klorun yan ürünlerinin (trihalometanlar) teneffüs edilmesi, özellikle küçük çocuklarda Yüzme Astımına neden olmaktadır. (Reuters Health; Toxicology Letters, 72)

• Klor kullanımının yan ürünleri, karaciğer, böbrek ve merkezi sinir sistemi problemlerine yol açar. Ayrıca kanser riskini de artırır. (EPA - Safe Water Regulations)

• Sudaki klor (Cl_2 veya ClO_2) ya da kloraminler göz ve burun tahrişlerine, mide rahatsızlıklarına ve anemiye neden olur. (EPA - Safe Water Regulations)

• 2000 yılında havuz sularından doğan salgın hastalıkları 2 yıl öncesi ile karşılaştığında, %228 arttı. (Center for Disease Control)

• Havuzların dezenfeksiyonu için kullanılan klora karşı dirençli mikropların çoğalması, 1980'li yılların ortasından beri ishalin sürekli artmasına neden oldu. (Michael Beach, CDC medical epidemiologist)

• "Ciltten emilen klor, EPA (Çevre Koruma Dairesi) tarafından ilk 10 kanserojen madde takip listesine alındı." (The Washington Post, June 1994)

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Ek-1
The Swimming Pool and SPA Association

ABOUT SPASA NSW

The Swimming Pool and Spa Association of NSW is a non-profit organisation dedicated to maintaining and improving standards within the industry for the betterment of consumers, pool builders and suppliers.

What is SPASA?

The Swimming Pool and Spa Association of New South Wales Ltd (SPASA) is made up of individuals and businesses from the swimming pools and spa industry.

SPASA members set themselves apart from the rest of the industry by setting standards of skill, workmanship and ethical business behavior in the best interests of pool and spa owners.

What does SPASA do?

SPASA is committed to self regulation of the pool and spa industry and is represented on technical and government committees such as;

- Standards Association of Australia
- The National Registration Authority
- The Office of Fair Trading
- The Australian Pesticides and Veterinary Medicines Authority (APVMA)
- The Consumer Tenancy and Trade Tribunal (CTTT)

Setting Standards

By having representation on various government and Standards Australia committees, SPASA has been able to ensure that any changes to standards have been of maximum benefit to both industry members and consumers.

CODE OF ETHICS

1 . To uphold the concepts of free enterprise and service to the public.

2. To operate at all times in a manner that will enhance the swimming pool and spa industry.

3. To encourage research and development of new materials, products and methods.

4. To co-operate and assist where possible all levels of government in their dealings with the swimming pool and spa industry.

5. To comply with all applicable laws, ordinances and regulations.

6. To act fairly and properly at all times towards fellow members of the association.

7. To act in a professional and unbiased manner when called upon to advise, consult or take any action in relation to products, services or works on behalf of a consumer.

FACT SHEETS

SPASA offers a range of informative fact sheets on a complimentary basis. These are designed to make pool ownership and pool maintenance, understandable. They can be downloaded or hard copies can be acquired directly from us by contacting our office.

• Water Balance	• Heat Pumps	• Concrete Pools
• Pool Safety	• Ozone	• Algae
• Solar Heating	• Ionisers	• Winterising YourPool
• Sanitising the Pool	• Spa PoolMaintenance	• Langelier Index
• Gas Pool Heating	• Salt Chlorinators	• Automatic Chlorine
• Pool Blankets	• Saving Water	• Filtration

SPASA FACT SHEET No. 1

WATER BALANCE...

Untreated, or improperly treated water can be a health threat. Chemically balanced and sanitized water, on the other hand, will provide a healthy and visually appealing environment for you, your family and friends.

Balanced water means that chemical demands have been met. If the chemical levels are too low the water will aggressively seek the products it needs by attacking the pool surface and equipment. This may lead to severe corrosion problems. On the other hand, high chemical levels Out of balance water can, therefore, cause expensive damage to the pool and may also inhibit the sanitizing process. In simple terms, the pool owner should balance the following variables :

- pH
- Total alkalinity
- Calcium hardness

pH.

pH is a measure of how acidic or alkaline the water is. The pH scale ranges from 0 to 14, with 7.0 being neutral. Values below 7.0 are acidic, and values above 7.0 are alkaline. With pool water we are seeking a pH balance suitable to the pool user, the pool and sanitizer use. Australian Standard 3633 defines the operating range as 7.0 to 7.8 and the recommended range of 7.2 to7.6 (SPASA recommend 7.0 to 7.2 for fiberglass pools).

Topping up your pool, heavy rain, heavy bathing loads and chemical additions can all change the pH level of your pool water. Incorrect pH levels can have the following effects;

- Cause swimmer discomfort (itchy skin, red eyes etc)
- Interfere with the action of your pool sanitizer.

THE EFFECT OF pH ON CHLORINE

Effective sanitizing relies on pH values. Therefore, sanitizer and pH levels should be the measures you check and adjust most often. Regardless of the chlorine type or the chlorination process used, any pH drift above the recommended range (7.0 to 7.8) will inhibit the sanitizing effect of your chlorine.

TOTAL ALKALINITY (T.A.)

This is a measure of bi-carbonates, carbonates and hydroxides in your water. The

Australian Standard 3633 recommends a range of 60 to 200 parts per million (ppm). Your pool builder or pool shop will advise you of the recommended level for your pool.

Low T.A. will lead to erosion of the surface of concrete and painted pools. It will also cause the pH levels to be very unstable with small additions of chemicals resulting in major shifts in pH.

This is sometimes known as “pH bounce”. Total Alkalinity can be changed in the following ways;

- adding buffer (bi-carbonate of soda). This RAISES the Total Alkalinity.
- adding acid to your pool to lower pH will also LOWER Total Alkalinity.
- topping-up your pool will change the Total Alkalinity depending on the T.A. of the top-up water.

THE INTERCONNECTION BETWEEN pH AND TOTAL ALKALINITY.

It can be seen that acids will lower the pH and Total Alkalinity. There is an interconnection between these two chemical components and, because of this, they need to be adjusted together.

The levels you are seeking to maintain are;

- pH of 7.2 to 7.8 (7.0 to 7.2 - fiberglass pools)
- Total Alkalinity of approx 100 to 120 ppm (60-200 is the recommended range).

Check with your pool builder or pool shop for the level required in your pool.

Lets assume that the pH is OK but the Total Alkalinity is low. To raise the level, add “buffer” (Sodium Bicarbonate) at the required rate. However Buffer is an alkali and will also raise pH.

Acid (Hydrochloric Acid or Sodium Bisulphate), which is used to lower pH, also lowers T.A. The trick is therefore to raise the T.A. artificially high so that when acid is added, to lower the pH to the correct level, the T.A. is also reduced to the correct range.

Note: Hydrochloric Acid must always be diluted (one part acid to ten parts of water) prior to adding to the pool. Always add acid to water, never water to acid.

CALCIUM HARDNESS

In simple terms, this measures the amount of dissolved calcium in your pool water. The recommended range is 80 to 500ppm according to Australian Standard 3633.

Both Total Alkalinity and Calcium Hardness need to be brought into balance. If not, low levels will mean the water is corrosive to the pool and/or equipment; high levels will lead to scale formation on pool and equipment.

Calcium hardness tests cannot us ually be performed with the standard test kit. We suggest a water sample be taken to a S.P.A.S.A. Accredited Pool Shop for testing. A

rough rule of thumb in areas where calcium levels are not naturally high is that testing annually will suffice after the initial adjustment. The only qualification to this is if you are using Calcium Hydrochloride to sanitize your pool. This chemical raises Calcium Hardness levels which may require more frequent testing and adjustment.

Adding chemicals

As a general rule you are far better off adding small amounts of chemicals, running the filter and testing the effect after several hours. Attempting **LARGE** chemical changes by adding LARGE amounts of chemicals can result in **BIG PROBLEMS.**

SPASA FACT SHEET No. 2

POOL SAFETY.....

The firs t requirement for pool owners is to be safety conscious. Being aware of the risks goes a long way towards eliminating them.

POOL FENCING.

The NSW Swimming Pools Act requires that all swimming pools be fenced unless specifically exempted.

Fences must be at least 1.2 m high and gates must be self closing and self latching. The fencing must separate the pool from residential buildings and neighbouring properties.

MAJOR POINTS;

- Fencing requirements must be met prior to filling the pool
- Fencing and gates should be checked periodically to ensure they continue to
- Fencing requirements must be met prior to filling the pool satisfy the regulations
- Don't leave furniture or other items that children can climb on near your pool
- fence or above-ground pool.

POOL COVERS

Swimming pool covers of various types are used to k eep dust and leaves out of pools and to retain heat within pools. Most pool covers do not provide protection against children getting into the pool, and may present a hazard in that if a child does get into the pool under the cover they cannot be seen.

Some pool covers may give the illusion of being solid and encourage a child to attempt to walk on it. This will cause the cover to sag and the child may drown in pool water or accumulated rain water.

When the pool is being used, the cover should be removed. The cover should never be left partially over the pool.

- Pool covers should never be considered a substitute for a fence or proper supervision

USE OF THE POOL

Most domestic pools are not designed for diving. Unless your pool has been specifically built for this purpose, you should not allow pool users to dive. You should

also ensure that obstacles which may be used as diving platforms are not placed near the pool.

Severe injuries can result from divers hitting the side or bottom of pools - you are therefore protecting your family and friends by adopting a “NO DIVING” policy!

The same can be said for “rough-house” play around or in the pool.

We suggest that you should display a “NO DIVING” sign in your pool area and affix depth markers on or near the pool. Diving boards, slippery dips, trampolines etc. can be dangerous and should only be used if your pool has been specifically designed for their safe use. Even then, constant adult supervision is important to prevent accidents.

Ensure that your pool is clearly visible from the house.

MAJO R SAFETY POINTS;

- Supervise pool users at all times especially children.
- Never leave a child unsupervised around the pool.
- Ensure the regular maintenance of fences and gates.
- Never leave a gate open or leave objects near the pool area that could be used by a child to climb over the fence.
- Place “N O DIVING ” signs near your pool unless it has been specifically designed to allow safe diving.
- Drinking and swimming don't mix - don't allow alcohol to be consumed by pool users.
- Keep glas ses and other breakables away from the pool area - using plastic can prevent injury.
- Obtain adult training in basic resuscitation techniques.

REMEMBER

there is no substitute for ADULT SUPERVISION of pool users at all times

SPASA FACT SHEET No. 3

SOLAR POOL HEATING.....

Installing solar pool heating can increase the use of your pool by up to four months. By using the heating energy from the sun, the cost to heat a pool in this way is very economical. The type of solar system may vary, however, the basic principal remains the same. Pool water is circulated through a series of tubes (the collector) usually mounted on the roof, where heat is absorbed and the heated water returned to the pool. The collector can be of either EPDM Rubber or PVC/TPR material and is usually supplied in multiple tube "strips". The amount of heat absorbed and the ultimate increase in pool water temperature depends on several factors which should be considered when deciding on a solar heating system for your pool. They are;

- Size or area of collector and number of tubes per sq.m

Naturally the major influenc e on the effectiveness of any solar system is its exposure to the sun,

therefore,

- Location or positioning of collector
- Control system

SIZE OR AREA

The amount of collector used in your solar system will have a major influence on the effectiveness of the system. The size of the collector is usually expressed in square metres, and as a general rule, directly relates to the surface area of the pool.

Australian Standard 3634 suggests a minimum collector area equal to 60% of the surface area of the pool, only in ideal* conditions, for systems in the Sydney, Newcastle and Wollongong areas.
*The area of collector generally needs to be increased depending on variables such as; local climate, shading of roof or pool, slope and orientation of roof, wind protection, type and colour of roof and collector type.

Larger systems will be needed where higher than average water temperature, or extended swimming season is desired.

In accordance with the above, SPASA recommend a minimum area of 80% for the majority of installations.

The "area" referred to in relation to collector size is the area of actual collector

strip NOT the roof onto which it is to be placed.

Australian Standard 3634 details the way in which the effective width of collector strip is to be determined for calculating collector area.

i.e. 

The formula is N x (W + D) where N = number of tubes, D = tube diameter and W = web width between tubes. (The maximum web width which can be used is no more than one tube diameter per tube).

LOCATION AND ORIENTATION

Collectors (other than those on flat roofs) should ideally be placed on north facing roofs. Deviation is allowable as long as collector area is increased accordingly. Collector should be located so as to avoid shade from objects ie; trees, neighbouring houses etc for at least six hours every day.

Remember, the following will all effect the size and location of your solar system;

- Pool surface area
- Roof orientation
- Shade on collector or roof
- Colour of roof and pool

PUMPING REQUIREMENTS

To circulate water through the solar system you can choose to use either the existing pump or provide a dedicated pump.

If the existing pump is to be used it must meet the following conditions ;

(a) the required rate of turnover of the pool water for filtration purposes shall be maintained,

(b) the operating pressure of the filter shall not be increased above the manufacturer's maximum pressure by the addition of the solar circuit and

(c) the pump shall have sufficient capacity to handle the static head and friction losses introduced by the addition of the collector circuit.

The average domestic solar installation requires a minimum flow rate of around 100 to 200 liters per minute to operate effectively. In most circumstances this would mean a dedicated solar pump would be required.

Always check that the minimum design flow rate of the collector is met when selecting your pump. This flow rate will vary with the diameter of the tubing used.

The circulated water needs to be strained to avoid blocking up the collector with dirt and debris, so when using a dedicated pump, some form of strainer must be provided.

Important points;

- make sure pool filtration requirements are met
- ensure correct flow rates are obtained
- circulated water should be strained

SOLAR CONTROLLERS

As nobody c an guarantee at what time of the day the sun will actually shine, time clocks are of little use in controlling solar heating systems. What is needed is a temperature sensing control device. These units will operate the solar pump system only when heat can be gained. This ensures that maximum heat gain is acquired.

Circulating water through a cold collector will cool the pool at a faster rate than it can be heated.

MAJOR POINTS TO REMEMBER:

- Either EPDM or PVC/TPR material is suitable
- The size/area of the collector is critical to performance
- Be sure all pumping and filtration requirements are met
- A temperature sensing controller should be used

HANDOVER AND DOCUMENTATION

At the time of handover, the pool owner should be provided with an appropriate document certifying that the system has been installed and commissioned satisfactorily.

The owner should receive documentation covering;

(a) A list of all major components , including the size and make of solar collector, make and model of the control system, components and pump.

(b) Copies of all warranties as issued by the manufacturers of the components and any warranties issued by the installer should also be provided.

(c) Operating, preventative maintenance and service instructions describing start up, normal running and shut down procedures in an easily understood form.

(d) A record of the date of the installation and the name and address of the contracting installer.

Using a pool blanket can increase the benefits of solar pool heating. For more information see **Fact Sheet No 6. POOL BLANKETS**

SPASA FACT SHEET No. 4

SANITISING THE POOL.....

The primary reason for treating pool and spa water with sanitising chemicals is to prevent the growth of bacteria which would make swimmers and bathers sick.

These bacteria can cause infections in ears, nose and throat and possibly other more dangerous diseases like Meningitis.

Bacterial control is easily accomplished by adding a sanitiser (most commonly Hypochlorous Acid or simply “chlorine”) regularly, and then passing the water through a filter to remove the dead bacteria.

We then need to be sure that any additional bacteria entering the water is met by a “sanitizer residual” in sufficient concentration to kill this new bacteria as quickly as possible.

The primary source of bacteria is the swimmers and bathers themselves. Also top-up water and debris, such as leaves, grass, dust, etc. Animals can contribute significantly to bacteria levels. A large dog can contaminate up to twenty times the volume of water that a human can.

But don't worry! It is generally accepted that most harmful bacteria will be killed when exposed to a “free chlorine residual” as low as one milligram per litre or, in other words one part per million ppm). By regularly testing the water and adding the required amount of chlorine to the pool, a residual level of 1.0 or 2.0 ppm is easily maintained.

TYPES OF CHLORINE

Chlorine is available in a number of different forms. Granular, liquid, or tablet, and can also be stabilized* or stabilized*. Chlorine can also be generated by a salt water chlorinator. Each of these different forms has its own features and benefits. For instance, granular chlorine is convenient, easy to store and relatively cheap, however it cannot be dosed automatically. On the other hand, liquid chlorine is bulky and can't be stored for long periods, but can be dosed automatically. All are satisfactory sanitizers for your pool, so choose the type that best suits your budget and lifestyle. No matter which form you decide to use, the requirement for a residual of 1.0 to 2.0 ppm remains the same.

Safety Note: Never mix chemicals -

even different types of chlorine - fire and/or explosion may result

SALT CHLORINATORS

As the name suggests, these units generate chlorine in the pool water using a process of electrolysis to convert sodium chloride (salt) into hypochlorous acid. These units are available in different sizes to suit different size pools. Be sure the unit you select is capable of producing sufficient chlorine to meet your maximum requirements. No matter which one you choose, you may still need to add extra chlorine from time to time to make sure a satisfactory residual level is maintained.

- Stabilizing refers to the combining of isocyanuric acid with chlorine, to protect it from UV rays, which drastically reduce its effectiveness. Isocyanuric acid can also be added manually to the pool.

Please note that if you are using stabilised chlorine products or are adding stabilizer to the pool, the level of stabiliser(Isocyanuric acid) in the water should be checked periodically, as in doing its job, it does not get used up like other chemicals in the pool. If the stabiliser level gets too high, it can actually inhibit the effectiveness of the chlorine.

CHLORINE SMELL

Many people complain about the smell of chlorine and believe that the pool may have too much chlorine in it. In fact, the opposite is most likely the case. Not having enough chlorine in the pool will result in the chlorine smell and also lead to users suffering with sore eyes and itchy skin. The reason this is so, is that a by-product of chlorination is the production of chloramines. These chloramines are the smelly little beasts that cause all the hassle. To get rid of them, we need to add more chlorine. It is for this reason that, from time to time, the pool needs “superchlorination”

HEATED POOLS

A heated pool will require more chlorine than a non-heated pool.This is because chlorine is used up much more quickly in hot water.

Stabilized chlorine products should not be used in heated pools as their effectiveness is greatly reduced.

MAJOR POINTS

- Always maintain a chlorine residual of 1.0 to 2.0 ppm (milligrams per litre)
- Select the product that best suits you
- Chlorine smell generally means not enough chlorine
- A heated pool will require more chlorine
- NEVER MIX CHEMICALS

Alternative methods of sanitizing pools and spas are available and are covered in **Fact Sheet No 8. OZONE**, **Fact Sheet No 9. IONISERS** and F**act Sheet No 12. SALT CHLORINATORS**

SPASA FACT SHEET No. 5

GAS POOL HEATING.....

The ideal temperature for leisure swimming is around 25 to 26 degrees Celsius. This temperature is very rarely achieved naturally. For most of the swimming season, the normal water temperature would be around 18 to 20 degrees. Most of the temperature gained during the day is lost overnight, leaving the pool cold again in the morning.

Gas heating can quickly and efficiently heat your pool to a comfortable temperature for swimming whenever it is required. This means you can extend your swimming season for as long as you like, thus increasing the return on what was probably a fairly large investment in your pool.

The increased availability of natural gas and LPG has made it a popular form of swimming pool heating. The fact that it is always available and can be closely regulated makes it ideal for use on pools and spas where particular temperatures are required.

HEATER RATING (SIZING)

Gas heaters have an input rating which is expressed in Megajoules (MJ), which is a measure of fuel energy consumption, and an energy output rating expressed in Kilowatts (kW).

The smaller heaters are in the range of 60 to 100 MJ with larger heaters ranging through 250 up to 400 MJ. The output of heaters will range from 25 to 100 kW.

WHAT SIZE HEATER DO YOU CHOOSE?

Selecting the right size heater depends on a number of factors. The size of the pool and/or spa.

The maximum temperature you would like to achieve and the heat up time required.

When determining the size of the pool, consideration must also be given to whether or not the heater is required to heat the spa as well as the pool. Most people want to be able to heat their spa quickly and to a much higher temperature than the pool, so a heater should be selected with this in mind. If it is only the pool to be heated, remember, it does not really matter if it takes a little longer and also the temperature rise* will be less, so perhaps a smaller heater could be considered. T h e points to remember are;

- Amount of water to be heated (in Litres)

- The temperature you wish to achieve
- How long you are prepared to wait

*"Temperature rise" is the difference between the ambient or cold water temp and the required temperature

CONTROLS

It is preferable that all gas heaters be fitted with thermostatic controls. However, heaters connected to spas must have a thermostatic control with a maximum set temperature of 40 degrees.

Again there are various levels of controls available, with some heaters being fitted with in-built time clocks and other even more sophisticated controls. Choose the one that best suits your budget but also consider your lifestyle and the way in which you intend to use your pool and/or spa. Don't overlook the possibility of obtaining some long term benefits from a short term cost.

INDOOR OR OUTDOOR INSTALLATION

Gas heaters come in a number of configurations to suit particular installations. Be sure the heater you select is the one most suitable for your requirements. ie: Heaters to be installed indoors require special fluing and may require additional ventilation specifically designed to suit the size and type of heater to be used. Heaters designed to be placed outdoors should not be used inside without the appropriate flue or the manufacturers consent.

Safety note: Chemicals must not be stored in the same room as a gas heater. Spa blowers must be located a minimum of 1.5 m from a gas heater.

Whilst most gas heaters these days are designed and constructed to last along time in all conditions, consideration should always be given to protecting the heater from the elements.

Heaters should always be installed on a stable, non-combustible base, preferably a minimum of 50mm above ground level.

Warning: When gas heaters are used on salt chlorinated pools, care should be taken to ensure the production of chlorine is adjusted to suit either the spa or the pool, as internal components operating for extended periods during heat-up.

COST EFFECTIVE AND CONVENIENT

Gas pool and spa heaters are cost efficient and relatively inexpensive as far as running costs are concerned. They provide the added convenience of being instantly available whenever you decide to heat the pool or spa. By utilising thermostatic control, the temperature of your pool can be maintained at the level you select, despite the weather conditions.

Using a gas heater to boost a solar heating system can also extend the swimming season and using a pool blanket will reduce operating costs.

For more information on heating see **Fact Sheet No 3. SOLAR POOL HEATING, Fact Sheet No 6. POOL BLANKETS** and **Fact Sheet No 7. HEAT PUMPS**.

SPASA FACT SHEET No. 6

POOL BLANKETS.....

Why should you consider purchasing a pool blanket for your pool or spa?

The answer is that it will substantially increase the value and return on the investment you have made in your pool or spa by achieving the following;

- Minimize the cooling of the pool by stopping evaporation and convection heat loss. This occures mainly during the night when the ambient air temperature drops below the temperature of the water in the pool. By creating a barrier between the water surface and the outside air, these losses are virtually eliminated.

- By keeping evaporation to a minimum, you not only save water, (approx 1.5 meters per year in the Sydney Metropolitan Area), but you also save on the cost of chemicals as you don't have to re balance you pool after topping up. It also reduces the amount of chlorine lost to the Suns' UV Rays.

- Blankets keep the pool cleaner - about 80% to 90% of debris is kept out of the pool. This reduces the work load of your pool cleaner. Most types of pool cleaners will work quite happily under the blanket.

- Reduces Pool Heating Costs By up to 50%. Even the cost of running solar system pumps is saved by reducing the amount of heat loss from the pool. Effectively 90% of heat loss is from the surface of the pool. By using a blanket in conjunction with Gas, Electric or Solar heating systems, significant energy cost savings can be made.

- Extend the swimming season. Even without other forms of heating on the pool, the addition of a pool blanket can result in a temperature increase of from 6 to 8 degrees in a pool that has a sunny aspect.

INSTALLATION

When having a pool blanket fitted, be sure it fits the pool exactly, as gaps around the edges will reduce the blankets efficiency

Consideration should also be given to purchasing a roller with the pool blanket. Using a roller to remove and store the blanket makes it an easy and efficient way off adding extra value to your pool.

CARING FOR Y OUR BLANKET :

Proper care and maintenance will ensure you get long service from your pool blanket. The following hints should help extend the life of your blanket.

- Don't superchlorinate while the pool blanket is on the pool. Leave the blanket

off the pool until chlorine level is back to normal.

- Always keep the blanket protected from sunlight while off the pool. The blanket should be covered as soon as it is removed from the pool, either on the roller or when folded , and stored.
- Don't leave your blanket on the lawn. The blanket may be damaged and the lawn will be burnt.
- Chlorine levels should not exceed 1.5 - 2.0 ppm for unstabilized pools, and 3.0 ppm for stabilized pools.
- Salt chlorinators and automatic chlorine dozers should be run at a reduced rate, particularly in winter time.

For more information on heating your pool see **Fact Sheet No.3 SO LAR PO OL HEATING** , **Fact Sheet No 5. G AS HEATING** and **Fact Sheet No 7. HEAT PUMPS**.

SPASA FACT SHEET No. 7

HEAT PUMPS.....

WHAT IS A HEAT PUMP?

Heat pumps are relatively new to the swimming pool market, however the technology incorporated in their operation has been used in the air conditioning and refrigeration industries for many years.

Heat pumps operate rather like a refrigerator in reverse - using the air surrounding it in order to gather heat for transfer.

Heat is gathered from air drawn through the unit, and transferred to the refrigerant carried in pipes through the Heat Pump, then the temperature is increased by compressing the refrigerant. The heat is then transferred to the pool water contained in adjacent piping.

ADVANTAGES

The major advantage of electric heat pumps is that they are extremely energy efficient.

In simple terms, the heat pump consumes very little energy by way of electricity to operate, compared to the amount of energy it produces in the form of heat. For example, if a heat pump consumes 2 kW of electricity it will produce 6 to 10 kW of heat energy. This efficiency ratio is referred to as a C.O.P. (co-efficient of performance).

SIZING:

Heat Pumps can be obtained in a number of sizes ranging from 2 kW to 200 kW output. The one to suit your application will depend on careful consideration of the following factors;

Location - local climatic conditions largely influence selection

Temperature - your choice, however as a guide:-

exercise and/or fun pool	- 24 to 28 degrees C
therapeutic exercise	- 28 to 35 degrees C
spa pool	- 34 to 38 degrees C

Size of Pool - determine the pool volume by multiplying the surface area in sq. metres by the average depth (including wading areas and spa). Select the appropriate unit for the volume of the pool.

Shading & exposure to wind - these can effect the heat losses and gains of heated water

Pool position - indoor or outdoor

Swimming season - do you want to swim all year round or just extend the season?

INSTALLATION

Heat Pumps can be installed indoors or outdoors. However, before deciding on the heaters position, consideration should be given to air flow and ventilation. The Heat Pump uses a fan to draw in air across a coil and then expels it. If positioned indoors, allow for this ventilation.

For outdoor installation the heater can be positioned at ground level (50mm plinth preferred), mounted on a wall or even sat on a roof.

Units can be included as part of the pump/filter network or plumbed as a separate heating circuit.

Average size domestic installations generally require a single phase electrical connection. Larger pools may require three phase power.

Where available off-peak connection is advantageous to further reduce running costs.

THINGS TO LOOK FOR :

All heat pumps should have some form of flow control device to prevent the unit operating without adequate water flow.

Heat Pumps are all thermostatically controlled. However these controllers may range from analogue dial type units to micro-processed digital devices. To the operator, all these types produce the same result, and that is to control the pool temperature to your desired setting. An advantage of the digital type is that the settings are displayed more clearly.

Naturally not all heat pumps are the same. Some may have features that others do not. Some manufacturers provide additional controls including time clock and/or pump interlock to ensure the most economical operation of the heat pump/pool pump.

Whatever your choice, make sure you deal with a SPASA member when the time comes to choose your swimming pool heat pump.

Warning: When heat pumps are used on salt chlorinated pools, care should be taken to ensure the production of chlorine is adjusted to suit either the spa or pool, as excessive salt and/or chlorine levels can damage internal components. This is particularly important when operating for extended periods during heat-up.

The addition of a pool blanket is strongly recommended. See **SPASA Fact Sheet No 6. POOL BLANKETS.**

SPASA FACT SHEET No. 8

OZONE.....

WHAT IS OZONE?

Ozone is a sky-blue gas and is formed naturally by the action of the suns UV (ultraviolet) rays splitting an oxygen molecule (O2) and one individual oxygen atom attaching itself to another oxygen molecule. This is ozone and is expressed as O3. It can also be formed when a large splitting an oxygen molecule (O2) and one individual oxygen atom attaching itself to another electrical discharge passes through oxygen.(eg.lightning). It is a relatively unstable, highly toxic gas which decomposes to re-form oxygen and is a very effective bactericide.

OZONE GENERATORS

Ozone generators produce the gas by one of two methods; Ultra Violet Light or Corona Discharge.

Ultraviolet light (UV)

Generation of ozone using UV is achieved by passing air over a UV light source and then mixing the gas with water.

Corona discharge

In this method, air is passed through an electrically charged chamber. What could be called a miniature lightning storm is created in the chamber which electrically converts the oxygen into ozone.

Note: The concentration of gas produced in both types of systems can vary and care should be taken when selecting a unit to be sure that ozone output is appropriate for your pool or spa.

IS OZONE TREATMENT NEW?

No. Ozone treatment has been used for many years, particularly in Europe, for the treatment of municipal water supplies and also large commercial and Olympic pools. Developments in ozone technology over recent years has enabled manufacturers to produce smaller more economical generators, much more suitable for domestic pools and spas.

EFFECTIVENESS

Ozone is one of the most effective disinfectants and oxidisers available and once introduced into the water it starts to work immediately, killing bacteria and oxidising organic waste. As ozone is not highly soluble in water, the ozone must be injected into

the water by either a compressor or venturi system.

However, as ozone is also toxic, all traces must be used or removed prior to reaching the pool. As there can be no residual of ozone, some other form of residual sanitiser like chlorine or bromine must also be used in order to provide continuous protection when the ozone generator is turned off.

Naturally, using ozone as the primary oxidiser, means a much smaller amount of chemicals will be needed to sanitize the pool and provide the necessary residual.

HOW DOES IT EFFECT OTHER CHEMICAL LEVELS?

When using an ozonator in pools and spas treated with chlorine, always follow the manufacturers recommendations on maintaining pH.

In pools treated with ozone and bromine, the oxidising power of ozone will regenerate the inactive bromine, reducing the consumption of bromine product.

Ozone remains in the water for only a short time and therefore has no effect on pH or water balance, nor does it contribute to Total Dissolved Solids.

The use of a correctly sized and operated ozone generator with a pool disinfecting chemical (eg. chlorine), will keep a pool clean and reduce the need for shock dosing.

For more information on sanitizing and maintenance of your pool or spa see the following;

Fact Sheet No 1. Water Balance

Fact Sheet No 4. Sanitizing The Pool

Fact Sheet No 9. Ionisers

Fact Sheet No 10. Spa Pool Maintenance

SPASA FACT SHEET No. 9

IONISERS.....

BACKGROUND

The use of copper and silver ions for purifying water has been practiced for centuries. The ancient Greeks found that water kept in silver containers was mysteriously purified and that algae didn't grow in copper water pots.

Extensive research into the action of metals in the purification of water was not undertaken until the late 19th Century. This research resulted in the development of the 'Katadyne' water treatment process. This required that water be passed through various porous materials impregnated with silver. Some of the metal would become ionised and pass into the water as positive ions. As a result the water was purified.

It was discovered that over time 'Katadyne' porous filters become less effective and were difficult to clean. This resulted in the introduction of the 'Electro-Katadyne' process which involved an electric current being passed between silver coated sand beds and resulted in a better level of control over the ionising process.

The modern ioniser uses the same basic principle as the 'Electro-Katadyne' process except that the sand beds have been replaced with copper / silver electrodes and the ionisation control is accomplished with modern electronics.

IONISATION

The modern ioniser consists of two parts; the electrode assembly consisting of two (or multiples of two) bars of metal usually made of an alloy of copper and silver and the electronic control unit.

The electrodes are usually installed in the swimming pool's filtration system. The control unit supplies the necessary extra low voltage across the electrodes. The resultant current produces positively charged ions of the constituent metals which are carried into the pool and become partof the chemistry of the pool water.

Silver ions act as a disinfectant and copper ions act as an algicide. Although these ions kill algae and bacteria and provide a measurable residual, they do require an oxidiser to be present for the oxidation of organic wastes. Most manufacturers recommend the use of chlorine. But non-chlorine systems are also available.

RESIDUAL MAINTENANCE AND WATER BALANCE

Follow the manufacturer's instructions to prevent the possibility of discolouration of the pool surface. Maintain the pH and the copper residual within the manufacturer's recommended levels.

Consult with the manufacturer to check if the equipment is suitable for the desired application.

The ionisation of copper / silver alloy is a means of purifying pool / spa water, not chemically balancing it. Therefore normal procedures should be adopted to correctly balance the water.

See SPASA **Fact Sheet No 1. WATER BALANCE**

SPASA FACT SHEET No. 10

SPA POOL MAINTENANCE.....

If you own a spa pool or hot tub, it is important to understand that it requires a certain amount of owner maintenance to ensure it operates properly and that the water remains clean and healthy.

The water treatment requirements for a spa pool differ from those for a swimming pool, because you are dealing with hot water. Hot water requires different treatment to prevent the growth of viruses, bacteria and algae.

The correct use of chemicals will maintain the water in a clean and healthy condition. The parameters that need to be regularly checked are, total alkalinity, pH and sanitizer (Chlorine or Bromine) level.

Your spa retailer or local SPASA pool shop should be able to supply a suitable test kit and advise on its correct use. It is advisable to test the water on a daily basis.

Special note:

Do not mix chemicals

Do not add water to the chemicals, only add chemicals to the water

CHANGING THE WATER

The spa water should be changed every three to four months, or remove and replace approx 30% or 1/3 of the volume of water every three to four weeks.

TOTAL ALKALINITY

The total alkalinity should be in the range of 90 - 150 ppm (parts per million). A spa or hot tub with low total alkalinity would require constant adjustment of the pH.

To raise total alkalinity, add sodium bicarbonate in small quantities. To lower the total alkalinity, add acid (Hydrochloric Acid) in small quantities. Test in one hour.

THE pH LEVEL

pH is the measure of the acid/alkaline level of the water. It is important to maintain the correct pH level asit effects the action of other chemicals.

The pH is measured on a scale of 1 to 14. Seven is neutral, below seven is acidic, and above seven is alkaline

Incorrect pH levels can cause poor chlorine or bromine efficiency, eye and skin irritations, corrosion of metal fittings, cloudy water and formation of scale on the pool walls and fittings. The pH should always be above 7.0 (measured at room temperature, not hot) to avoid possible corrosion of equipment. However, it should

not be higher than 7.8, as this would reduce the efficiency of the sanitizer.

If the pH level needs to be increased, add soda ash; to reduce the pH level, add acid. Wait for one hour and test again.

SANITISING THE SPA

Sanitising your spa is essential for safe, healthy water, free of harmful micro-organisms. The most common forms of sanitiser are chlorine and bromine. Ozone may also be used, but because there can be no residual, chlorine or bromine must be used in conjunction with it. Salt Water Chlorinators must be of sufficient capacity to maintain the recommended chlorine residual.

The amount of disinfectant required depends on a number of factors, including, water temperature, the frequency of use and the number of people using the spa. It is most important to always keep the sanitiser level at 2.00 to 3.00 ppm. In very hot water the sanitiser can be used up very quickly, and should be checked regularly whilst the spa is being used.

After heavy use of the spa or on a weekly basis, the water should be shock dosed with chlorine or bromine. Be sure to check the level again before use.

If the spa or hot tub is not being used, add sanitiser every day to prevent contamination.

RECOMMENDED LEVELS

Total alkalinity	90 - 110 ppm
* pH	7.4 - 7.6
Chlorine	2.00 - 3.00 ppm
or	
Bromine	3.00 - 4.00 ppm

It is important to note that if the right pH and sanitiser levels are maintained, viruses and bacteria should not survive in the water.

In terms of general hygiene, it is important to keep the filter and pump clean. Clean the filter regularly and empty hair and lint from the pump as often as required.

FOR SAFE AND ENJOYABLE USE

- Children should be supervised at all times when either in or near the spa or hot tub.
- Alcohol should not be drunk while using the spa.
- Be sure the temperature does not exceed 40 degrees. An ideal range is 35 to 38 degrees.

- Spa use should be restricted to approx 20 minutes to avoid heat stress.
- If you have any physical ailments you should see your doctor before using the spa or hot tub. People with heart or blood pressure problems and pregnant women should seek a doctors permission before use.
- Do not put your head under the water
- Store chemicals in a cool dry place, OUT OF THE REACH OF CHILDREN.

SPASA FACT SHEET No. 11

SALT CHLORINATORS.....

Salt Chlorinators, or if you like, chlorine generators, are an alternative means of sanitising your pool with chlorine using the process of electrolysis.

The electrolysis process is achieved by passing the salt water solution through an electrolytic cell which converts sodium chloride (salt) in the water into chlorine gas which, when dissolved in water becomes sodium hypochlorite (liquid chlorine). So you are in fact producing your own chlorine to sanitise the pool.

THE CELL

The cell usually consists of a clear plastic housing containing the electrodes, made up of an anode, and a cathode made from or coated with exotic metals like platinum, titanium and iridium.

The cell and electrodes may differ in size and configuration depending on the brand of chlorinator, however the principals of their operation remain the same.

CONTROLS

Most chlorinators these days are equipped with controls to regulate the amount of chlorine produced, depending on individual requirements, and are fitted with a gauge to show the set level.

Some units come with timeclocks and in-built facilities for pool lights, and other more sophisticated options. Remember, choose the one that best suits your requirements and budget but also consider your lifestyle and how you intend to use the pool.

SELECTING A SUITABLE UNIT

A number of factors will effect the selection of a salt chlorinator.

1. Size of the pool or spa - larger pools need larger chlorinators.
2. Bathing load - heavy loads consume more chlorine.
3. Size of the filtration system - poor water flow will require longer running time.
4. Summer water temperature - high temperature and strong sunlight cause faster loss of available chlorine.

HOW MUCH SALT?

The amount of salt needed for the salt chlorinator to produce sufficient chlorine varies, depending on the type of chlorinator. Most models require only weak salt

solutions of between 0.3% to 0.7% (3000 ppm to 7000 ppm) to effectively chlorinate a pool. These levels are between one fifth to one tenth the level of salt in sea water.

The manufactures recommendations should be strictly followed to avoid damage to the chlorinator and to insure adequate chlorine production.

Replacement salt is only required to replace normal consumption, and loss from filter backwashing, splashout and any overflow due to rainfall

MAINTENANCE

Although there are some maintenance free cells available, most brands of cells will require cleaning periodically, to remove calcium deposits which build up on the electrodes as a result of the electrolysis process. This cleaning is usually accomplished by soaking the electrodes in a weak acid solution. NB. The manufacturers instructions should be strictly adhered to regarding cleaning, to avoid damage to the assembly.

OTHER CHEMICAL REQUIREMENTS

The requirements for chemical balance are the same for electrolytic chlorination, as for traditiyonally chlorinated pools. Total Alkalinity, pH, Calcium Hardness and chlorine levelsshould be checked regularly. Chlorine stabiliser (isocyanuric acid) should be added to the pool and maintained at approx 30-50ppm, to reduce chlorine loss due to UV rays.

During periods of high bather load it may be necessary to manually supplement with sodium hypochlorite (liquid chlorine) to maintain correct chlorine levels, and regular superchlorination or shock dosing should be carried out.

Warning: When using salt chlorinators with gas or electric heaters and heat pumps, care should be taken to ensure the production of chlorine is adjusted to suit either the spa or pool, as the heaters internal components can be damaged by excessive salt and/or chlorine levels. This is particularly important when operating for extended periods during heat-up.

For more information on pool maintenance see

F**act Sheet No 1. WATER BALANCE**

SPASA FACT SHEET No. 12

SAVING WATER.....

The average domestic swimming pool holds somewhere between 22,000-60,000 litres of water.

This amount is usually a once-only fill quantity and from then on the pool needs only to be topped up from time to time. Savings can be made both in costs and water usage by limiting the frequency and water quantity used in topping up.

Keeping the pool properly filtered and chemically balanced are just two of the ways of ensuring against unnecessary emptying of the pool and frequent backwashing. This will help save water.

Looking after the pool is really very simple. It is a combination of adequate filtration time and correct chemical treatment.

Adequate Filtration

During the summer it is recommended that the filter should run for 8 to 10 hours a day and certainly whenever people are using the pool. While ever the filter is operating, the surface of the water will be skimmed off, removing things like leaves and dust before they sink. To remove the dust and dirt collected by the filter, the filter must be “backwashed”. This procedure reverses the water flow through the filter and flushes the dirt down the drain. Only continue backwashing until the water in the sight glass provided, or at the drain point is clean and clear. This should take no more than one or two minutes. Excessive backwashing can waste up to 2,000 litres of water.

Chemical Balance

You don't have to be a scientist to correctly balance your pool. There are three basic rules to follow. Firstly, adjust the Total Alkalinity level. Secondly, adjust the pH and lastly, ensure the required amount of sanitiser is added either by manually dosing or via an automatic chlorinator.

By continually maintaining correct water balance the need for emptying your pool and the subsequent topping up can save thousands of litres of water annually.

Correct Water Level

Making sure the water level is only half way up the skimmer opening ensures the correct skimming action and also saves water. Do not overfill your pool. It reduces the effectiveness of the skimmer and wastes water.

Covering the Pool

More and more pool owners are discovering the advantages of heating their pools. With water heated to a subsequent need to top-up, a pool cover is a wise investment. Covers not only save water but help keep the pool clean and reduce the energy costs by reducing heat loss. The availability of rollers for covers makes it a quick pleasant 25oC, the pool can be enjoyed for another three months at least. To reduce evaporation and the and easy way of lowering costs and saving water.

Leaks

Many pools in the Sydney area are now twenty or thirty years old and may be in need of attention. Make a point of thoroughly checking around the pool for any damp spots. Check the plumbing for leaks and valves or pipe joiners.

One drip per second can waste up to 7,000 litres of water per year. A steady dribble could waste hundreds of thousands of litres per year – and add to your water bill.

Safety Saves Lives and Water

Safety is one of the most important factors of Swimming Pool & Spa ownership, particularly where small children are concerned. When ever groups of children are in the pool, “bombing” and “horseplay” can get out of hand so it is a good idea to make sure children are well supervised. By restricting this type of behaviour you not only avoid accidents but prevent water loss due to excessive splashing.

SPASA FACT SHEET No. 13

CONCRETE POOLS
STEEL FIBRE / STEEL BAR .....

WHAT IS THE DIFFERENCE?

The basic difference between a steel fibre and a steel bar swimming pool is the way in which the concrete is reinforced.

Steel fibre pool

In a steel fibre pool the reinforcement is provided by means of thousands of tiny steel needles premixed in the concrete prior to being sprayed. These needles are probably best described as looking like a pin with a head at both ends.

Steel bar pool

In a steel bar pool the reinforcing is provided by a grid of shaped steel rods over which the concrete is sprayed. The steel bars used are generally about as thick as a man's finger.

IS STEEL FIBRE CONCRETE NEW?

No. It has been used in swimming pool construction for the last fifteen years or so, and has been used extensively in other forms of construction for more than twenty years.

SUITABILITY FOR POOL CONSTRUCTION

Both steel fibre and steel bar reinforced concrete are suitable for domestic swimming pool construction and the Australian Standard AS 2783-1992 Use of reinforced concrete for small swimming pools provides details of the amount of reinforcement material and minimum concrete strength for both forms of pool construction.

Both methods of construction, when completed in accordance with the Standard, will provide a good, strong swimming pool shell. Under NSW State legislation the Contractor must provide a seven year structural warranty on the pool shell, it is therefore very rarely that anyone, particularly a SPASA member, builds a pool to anything less than the Standard requires.

SPECIAL CIRCUMSTANCES

In some areas and in certain circumstances, a change to normal construction requirements may be required. Things like the pool being partly out of ground, or in reactive (clay) soils, or perhaps the site is subject to mine subsidence. In all of these cases either form of construction may be used, as long as the pool meets the engineering requirements imposed by the conditions. This may include the thickening of the walls, the addition of extra reinforcing and/or piering. This will be determined by the contractor's Engineer.

SPASA FACT SHEET No. 14

ALGAE.....

Many pool owners have problems from time to time with algae. What is it and what can be done to get rid of it? What can we do to avoid the problem recurring?

The following may help answer these questions and help dispel some of the misunderstandings about the how and why of the appearance of algae in swimming pools.

ALGAE. WHAT IS IT?

Algae is a small plant growth which can take on many forms and is closely related to seaweed which itself is a form of algae. As in the case of seaweed, it can come in many shapes and sizes but for the most part Algae found in swimming pools is very small and resembles moss. These tiny microscopic plants feed on nutrients contained in the water. The algae spores, or seeds if you like, are either already present in the water, transported to the pool by wind or are attached to other debris which finds its way into the pool.

The algae plant requires only air, sunlight, water and a good supply of nutrients to grow. They normally grow most profusely in the shallowest water and are usually found in areas around swimouts and steps.

HOW DO WE GET RID OF IT?

By removing any one of the elements mentioned above ie. air, sunlight, water or nutrients, the algae will not grow. The simplest way of ridding your pool of algae is to remove the nutrients required for algae growth. Shock dosing of the pool will usually overcome the problem by starving he algae of its nutrients, causing it to die.

However they are extremely hardy little organisms and, in some cases the algae becomes so resistant to the normal sanitiser that treatment with an Algaecide is required. There are many of these available and your SPASA Pool Shop or Serviceman can advise on which is the best one for you to use.

Once the algae dies, the residue will need to be brushed from the pool surface so it can be removed by the filtration process or vacuumed out, leaving the pool clean and clear.

KEEPING THE POOL ALGAE FREE

Maintaining correct water balance and sanitiser level (see Fact Sheets No 1 & 4), and not allowing the pool to “go off”, along with occasional shock dosing, will usually keep algae under control. Add to this the regular use of an Algaecide and you can be sure the pool remains clean and free from algae.

SPASA FACT SHEET No. 15

WINTERISING YOUR POOL.....

A SIMPLE PROCEDURE FOR CORRECTLY MAINTAINING YOUR POOL DURING THE OFF SEASON.

1. Don't simply turn the filter off and forget the pool for 3 or 4 months. This is false economy because the time, effort and money needed to get the pool water correctly adjusted next season, will be far more than the little needed to maintain it during winter.

2. Thoroughly backwash the filter and clean it with a recognised filter cleaner and degreaser. Ensure that the skimmer basket and hair and lint pot are free of debris. Lubricate all o-rings with a silicone-based lubricant. If there is not a strong flow of water returning to the pool when the filter is turned on, ring your local SPASA pool shop or service company.

3. Adjust the total alkalinity level with bicarbonate of soda, if the level is below 80 – 120 parts per million.

4. Adjust the pH to 7.2 to 7.6 by adding acid if the level is too high or soda ash if it's too low. It is a good idea to mix all chemicals with a full bucket of water before adding to the pool. Remember, always add the acid to the water and never in amounts more than 500 mls.

5. Mix 500 grams of granular chlorine or 750 mls of liquid chlorine with a bucket of water and add it to the pool.

6. Mix 750 mls – 1 litre of a long life algaecide that is specifically designed for winter and add it to the pool.

7. Adjust the timer to allow the filter to operate for 2 to 3 hours each day.

8. If the pool is equipped with a salt chlorinator, clean the cell with a recognised salt cell cleaner. Adjust the control to the ½ production setting. It will be necessary to check the chlorine level in the pool for the next 2 weeks, to ensure that there is a constant level of 1- 0.2 ppm free available chlorine at all times. The production control on the salt chlorinator may have to be adjusted to increase or decrease its output.

9. Having carried out these procedures it should only be necessary to check the chlorine level every 2 weeks and empty the skimmer basket if it has a build up of leaves etc.

10.Check occasionally to ensure the water level is half way up the skimmer box opening and that the pressure gauge on the filter is not indicating backwash.

This simple procedure will ensure that your pool will be ready for the first warm days of next summer.

SPASA FACT SHEET No. 16

THE LANGELIER INDEX .....

The formula for the Langelier Index or Langelier Scale was originally developed by Dr Wilfred Langelier as an accurate method of determining water balance.

The Langelier Saturation Index is often referred to by pool builders and pool equipment manufacturers as the recommended method of maintaining balanced water. i.e. Non-corrosive and non-scale forming.

There are four major factors considered for water balance, which effect the Saturation Index.

1. pH
2. Total Alkalinity
3. Calcium Hardness
4. Temperature

Three of the four factors are given numerical values which are then applied to the formula.

Total Alkalinity	referred to as AF (Alkalinity Factor)
Calcium Hardness	referred to as CF (Calcium Factor)
Temperature	referred to as TF (Temperature Factor)

The actual pH reading is used in the formula and therefore is not given a value.

The formula for determining the Saturation Index, using the four factors is;

pH + AF + CF + TF - 12.1 = Saturation Index (The required Index is 0.0)

A minus figure is under saturated and corrosive. A positive figure is over saturated and the tendency will be scaling. The accepted limits for the index are -0.5 to +0.5.

Factor Tables.

Note: Temperature is in Degrees Celcius.

Temperature	Factor	Alkalinity	Factor	Calcium Hardness	Factor
0	0,0	5	0,7	5	0,3
3	0,1	25	1,4	25	1,0
8	0,2	50	1,7	50	1,3
12	0,3	75	1,9	75	1,5
16	0,4	100	2,0	100	1,6
19	0,5	150	2,2	150	1,8
24	0,6	200	2,3	200	1,9
29	0,7	300	2,5	300	2,1
34	0,8	400	2,6	400	2,2
41	0,9	800	2,9	800	2,5

Alkalinity and Calcium Hardness expressed in ppm (parts per million)

The following are examples of how the formula is used to determine the Saturation Index and what would need to be done to change the index.

Example 1.

We have tested a pool and obtained the following readings;

pH 7.3 / Alkalinity 60ppm/Calcium Hardness 50ppm/Temperature 28 Degrees C.

Using the factors from the tables and applying it to the formula we have,

7.3 plus 1.7 plus 1.3 plus 0.7 (total 11.0) minus 12.1 = -1.1

An Index of -1.1 is under saturated and corrosive. To correct this we add bicarbonate to the pool water with the following results;

pH 7.8 / Alkalinity 200ppm/Calcium Hardness 50ppm/Temperature 28 Degrees C.

Again applying the factors from the tables we have,

7.8 plus 2.3 plus 1.3 plus 0.7 (total 12.1) minus 12.1 = 0.0

An index of 0.0 is balanced water.

Example 2.

We have a spa pool with the following readings;

pH 8.2/Alkalinity 200ppm/Calcium Hardness 800ppm/Temperature 40 Degrees C

Applying the factors from the tables we have,

8.2 plus 2.3 plus 2.5 plus 0.9 (total 13.9) minus 12.1 = 1.8

An index of 1.8 is over saturated and the tendency will be scaling.

As the temperature reading is fixed, we want to reduce the numbers by 1.8 spread across the other three factors.

i.e. 1.8/3 = 0.6 This figure must be taken from each of the three factors.

We would then have,

7.6 plus 1.7 plus 1.9 plus 0.9 (total 12.1) minus 12.1 = 0.0

Using the factor tables in reverse, we find the actual readings required to achieve this balanced result are,

pH 7.6/Alkalinity 50ppm/Calcium Hardness 200ppm/Temperature 40 Degrees C.

By making the necessary adjustments to the pool water (see Fact Sheet No. 1. Water Balance) the required balanced water index can be achieved.

Whilst the use of Langelier Index may seem rather complicated, it is an accurate measure of water balance and is therefore the preferred method of many companies involved in the pool industry.

To ensure your swimming pool and/or spa is correctly balanced we recommend regular testing by your S.P.A.S.A. accredited pool shop or service technician.

SPASA FACT SHEET No. 17

AUTOMATIC CHEMIAL DOSING.....

METHODS

Automatic dosing, of chlorine in particular, can basically be achieved by either of the following two methods. Erosion tablet or stick feeders, and electronically controlled liquid chlorine feeders. The latter may use either peristaltic or diaphragm pumps, or suction solenoids to control the injection of chlorine.

EROSION FEEDERS

Erosion feeders in their simplest form are a floating canister, which is usually a cone shaped plastic container, with large numbers of holes in the body. They will normally have a screw on, or clip on lid to allow chlorine or bromine tablets to be placed into the body of the container.

When the container (feeder) is placed into the pool or spa, water enters through all the holes, slowly eroding the tablets, and depositing chlorine or bromine into the water.

The size and shape of the containers can vary. This will dictate the size and number of tablets that can be used, and will also determine how often they will need to be refilled. There is little or no control over the rate at which the tablets dissolve.

There are however, more sophisticated erosion feeders. These products usually consist of a moulded canister designed to hold either chlorine tablets or bromine sticks, and are mounted in the return-to-pool line. They are usually fitted with barrel unions to aid installation.

Most commonly they will be fitted with some type of adjustment, to regulate water flow through the canister. This controls the rate of erosion of the tablets or sticks, and thereby the amount of chlorine/bromine in the pool.

NOTE: NEVER MIX DIFFERENT TYPES OF CHLORINE IN EROSION FEEDERS

ELECTRONICALLY CONTROLLED FEEDERS

Electronically controlled feeders utilize either small peristaltic or diaphragm pumps, or suction solenoids to feed liquid chlorine, bromine or hydrochloric acid from a storage drum, into the pool.

The most basic of these feeders can be adjusted to add small amounts of the desired chemical to the pool at regular intervals. They may also be coupled with time clocks to operate only at specific times.

More sophisticated versions may include probes to sense and control chlorine or bromine levels in the pool and automatically adjust the amount of chlorine or bromine being added to the water.

Some units also incorporate a probe to test and control the pH level of the pool. These units incorporate a second pump to automatically add acid.

Top of the range models may include many extra items, such as digital readouts, warning lights and/or buzzers to indicate low chlorine levels, transformers for lights, time clocks, and some even provide printed data sheets to record the units operation.

No matter which unit you choose, remember that liquid chlorine loses its effectiveness the longer it is stored. Make sure the storage drum has a properly fitting lid, and the size of the drum allows for reasonably short turnover times, say 30 to 60 days.

It should be pointed out that any of these feeder pumps should only operate when the filtration pump is running.

If the chemical doser is to be used in conjunction with a gas heater, it is important that the injection point be located downstream of the heater in accordance with the Gas Installation Code, AG 601.

Always follow the manufacturers instructions when installing your automatic chemical feeder, or have it installed by a SPASA accredited technician.

WARNING!

- **NEVER MIX CHEMICALS. EVEN DIFFERENT TYPES OF CHLORINE SHOULD NOT BE MIXED.**
- **STORE CHEMICALS AWAY FROM DIRECT SUNLIGHT AND PETROLEUM BASED PRODUCTS.**
- **HANDLE CHEMICALS WITH CARE AND WEAR PROTECTIVE CLOTHING.**

For more information on sanitising and maintenance of your pool or spa see the following;

Fact Sheet No.1 Water Balance
Fact Sheet No.4 Sanitising The Pool
Fact Sheet No.8 Ozone
Fact Sheet No.9 Ionisers
Fact Sheet No.10 Spa Pool Maintenance
Fact Sheet No.12 Salt Chlorinators

SPASA FACT SHEET No. 18

FILTRATION.....

A swimming pool must be filtered to remove insoluble particles and to produce clear water. Clear water is desirable not only for aesthetic reasons, but for hygiene and safety.

The quality of filtration depends on the size of the filter media. The finer the media, the higher the purity of water obtained.

Pool water filtration is a balance between water quality and water quantity. Either quality or quantity must be sacrificed to enhance the other. The finer the filter media, the faster the increase in pressure across the filter bed, and the more frequent the need for backwashing or filter replacement.

There are three types of filters in common use in the marketplace today, these are High Rate Sand, Diatomaceous Earth and Cartridge.

HIGH RATE SAND FILTER

The high rate sand filter is the most commonly used filter on both domestic and commercial pools.

The high rate sand filter has one grade of sand - either 16:30 or the finer grading of 18:30 and the sand bed is 200-310mm (8-12 inches) deep, depending on the size of the tank.

Water is forced through the sand bed at such a high rate that a form of mechanical flocculation takes place. The electrical charges are literally scrubbed off allowing the dirt particles to agglomerate and form larger particles. On the next pass through the filter these larger particles are collected.

One of the benefits of the sand filter is its simplicity. When the bed of sand is clogged with dirt, the pressure inside will register on a gauge which indicates the need to flush it out or backwash.

This means switching off the pump and turning the valve to 'backwash'. When the pump is switched back on, the flow of water is reversed and washes up through the sand bed and removes the dirt. After backwashing the valve can be returned to the 'filter' position for normal operation.

The dirty water from the filter is normally discharged into a sewer gully or it can be used to water lawns or shrubs.

Sand filters will normally remove particles down to about 15 microns in size. The sand in the filter will normally only need changing approximately every 5 years, though this will depend on factors such as pool usage, size etc.

DIATOMACEOUS EARTH (DE) FILTER

Diatomaceous Earth is a powder made up from finely crushed coral-like rock.

Inside the DE filter are a series of hollow plastic frames which can be square, round or tubular,depending on manufacturer. Over these frames is stretched a polyester covering or pad.

Water from the pool is forced into the filter tank and through the pad. The water then runs through the centre of the filter and returns to the pool.

To begin filtration, the Diatomaceous Earth is mixed into a slurry and tipped into the skimmer box (with the pump running). It is sucked into the filter, forming a cake on the outside of the pad. As water passes through the pad it must also pass through the cake of D E, where filtering takes place. The DE cake drops from the pad when the pump is stopped, then reforms again when the pump is started.

Since the grains of DE are so fine, this type of filter has superior filtration qualities. It can remove particles down to approximately 5 microns in size. When the pressure rises it is an indication that the DE cake is clogged and the filter needs backwashing.

This is carried out by turning off the pump and turning the valve to the 'backwash' position. What must be remembered is that the used DE cake is also flushed away. Therefore it must be replenished following every backwash.

CARTRIDGE FILTER

The cartridge filter in some ways incorporates the benefits of both sand and diatomaceous earth. The filtering medium is a concertina shaped cartridge providing a large filter surface within a relatively small housing. This large filter area means the filter cycle, or period between cleaning, is increased.

Unlike other filters, there is no provision for backwashing. When the cartridge is clogged, it must be removed for cleaning. Filter cartridges are generally hosed off. However, those used in a heated pool or spa may need to be soaked in a cleaning solution.

One of the advantages of the cartridge filter is that the method of cleaning makes it ideal for use in unsewered areas or where disposal of waste water is a problem.

The filtering ability of this type of filter is somewhere between sand and diatomaceous earth and will remove particles down to approximately 8 – 10 microns in size.

Always refer to the manufacturer for installation and maintenance of filters.