Basic Pool & Spa Care

Module 1: Pool Maintenance

Exceptional People. Proven Methods

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Module 1: Pool Maintenance

This module should take approximately 5 hours to complete.

Objectives

1.0 Given a scenario, describe how a pool functions and is maintained according to an average pool's operation system.

1a Identify common pool contaminants.

1b Determine the parts of pool equipment and plumbing.

1c Describe the purpose, functions, and maintenance of the parts of pool equipment.

1d Identify the 5 keys to pool care.

1e Identify the most common causes of pool problems.

1f Identify factors that affect circulation.

1g Determine areas in the pool that are most likely to be dead spots.

1h Describe the different filter types.

1i Recognize the systems for which BioGuard® products are designed.

1j Identify conditions that can be caused by poorly filtered water.

1k Identify cleaning activities that must be incorporated into a pool care program.

1l Identify the primary function of a sanitizer.

1m Describe the primary function of an oxidizer.

1n Recognize the reasons chemical treatments are necessary.

1o Identify the factors that could affect water chemistry.

Purpose

This module gives an introduction to swimming pools and gives an overview of pool maintenance.

This module introduces the five keys to pool care, Circulation, Filtration, Cleaning, Chemistry, and Testing. The five keys to pool care are described as well as how they work, and their advantages. Cleaning tasks and products are presented in the Cleaning section and enhancing filtration and increasing filter efficiency are included in the Filtration section. General Chemistry and Testing topics are addressed, but both will covered in great detail in later modules.

An Introduction to Swimming Pools

This topic should take you approximately 45 minutes to complete.

Objectives

- Identify common pool contaminants.
- Determine the parts of pool equipment and plumbing.
- Describe the purpose, functions, and maintenance of the parts of pool equipment.

Topic Introduction

This topic describes:

1. An Introduction to Swimming Pools
2. Pool Anatomy

At the most basic level, a pool is simply a structure that holds water. Beyond that, every pool has its own unique personality.

A pool structure could be aboveground or in-ground. Its interior surface could be made out of plaster, vinyl, tile, or fiberglass.

Not all water is the same either. Though most municipal water is similar, regional differences in water quality and mineral content vary widely, based on its source.

Common contaminants come from a variety of outside sources:

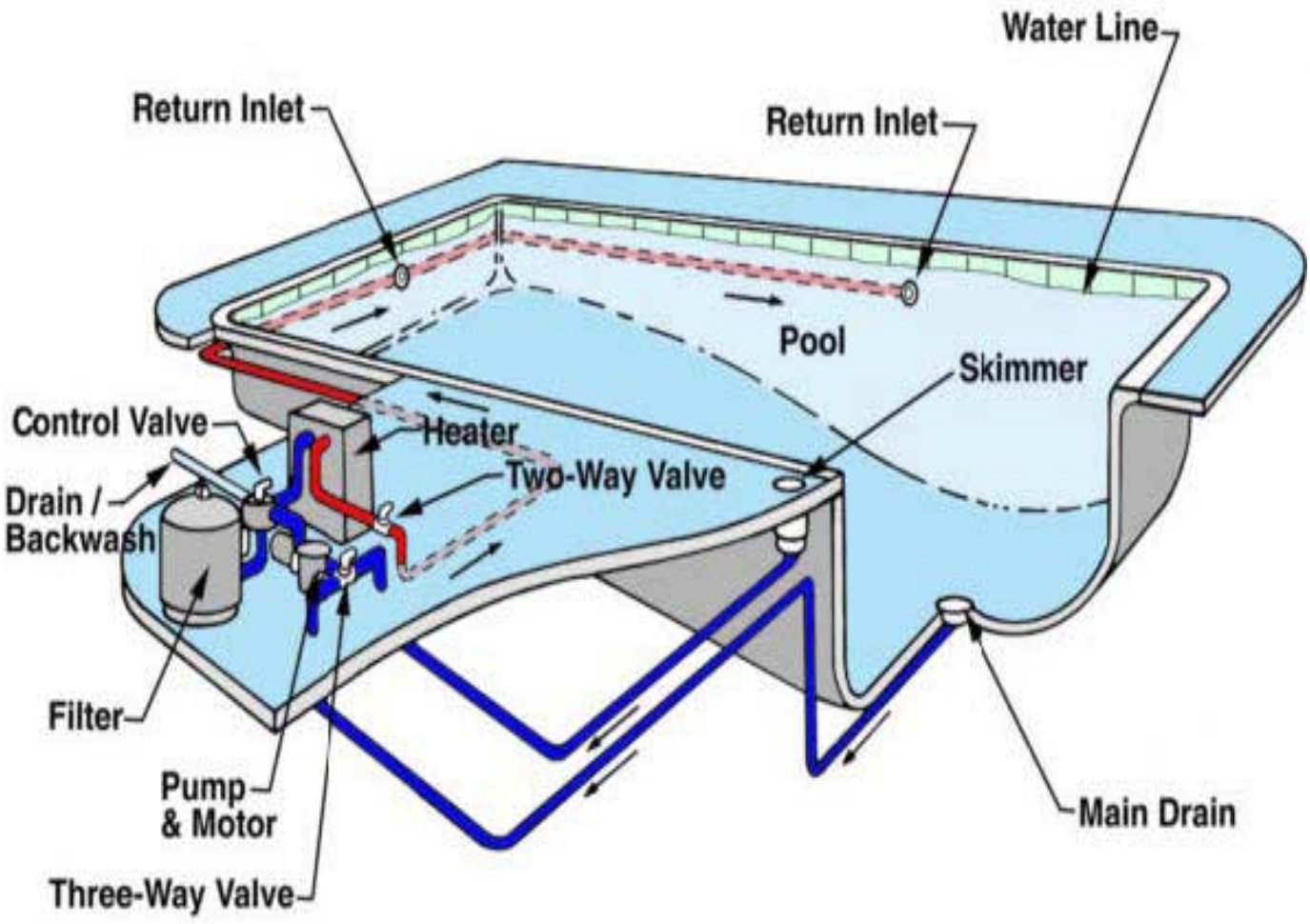
- Leaves, worms, insects and other wildlife that fall into the pool.
- Oils and cosmetics that wash off of human skin
- Perspiration and urine from swimmers
- Organisms like bacteria, algae, fungus and mold.
- Naturally occurring elements such as calcium, phosphorous, nitrogen and metals.

Recognizing regional differences in pool types and water quality can make pool balance and maintenance easier for you and the pool owner.

The first thing you need to know is how a pool functions. Refer to the diagram accompanying this text to develop an understanding of how a pool system is designed to operate.

NOTE: The information presented in this section is not intended to depict all pools. We understand that pool design and plumbing methods vary widely. Accept this information on the basis of understanding an average pool's operational system.

The pool equipment and plumbing are designed to keep water moving. The *suction-side* of the system pulls the water from the pool to the pump. The *pressure-side* of the system delivers the filtered (and sometimes heated) water back to the pool.



The Suction Side:

- **Surface Skimmer(s)** draw water from the surface of the pool and capture floating debris into the skimmer basket.

- **The Main Drain** (Bottom Suction) draws water and debris from the bottom of the pool. Its primary function is to circulate the water in the deepest part of the pool

- **The Pump** is the transition point from suction to pressure. Positioned in front of the pump is a *hair and lint basket*. It captures debris that the skimmer basket missed or debris pulled from the main drain.

The Pressure Side:

- **The Pump and Motor** pull the water through the suction side of the system. Once through the pump, the water is forced (pushed) through the pressure side of the system.

- **The Filter** is the first piece of equipment to receive the water from the pump. The filter (Sand, Cartridge, Or Diatomaceous Earth (D.E.)) strains the water and captures both large and small particles. A properly sized and operating filter is critical to keep water clean.

- **The Heater** is an optional piece of equipment, which warms the water before it's returned to the pool.

- **The Return Valve(s)** allow you to control the flow of water returning to the pool.

- **Return Inlets** feed water into the pool. Ideally, these inlets should point slightly downward to achieve the most effective circulation.

Five Keys to Pool Care

This topic should take you approximately 10 minutes to complete

Objectives

- Identify the 5 keys to pool care.
- Identify the most common causes of pool problems.

Topic Introductions

This topic describes:

1. Five Keys to Pool Care

Many of the most common pool care problems can be avoided, or at least minimized, by simply mastering the five keys:

1. **Circulation** – The more the water moves, the harder it is for problems to take hold. Additionally, properly circulated water insures that chemicals are properly mixed throughout the pool.

2. **Filtration** – A filter removes insoluble particles that can cloud the water and reduce sanitizer efficiency.

3. **Cleaning** – Vacuuming and brushing debris and biofilm in the pool and on the surfaces prevent the growth of bigger problems, making it easier to keep the water clean. Routine use of a skimmer net is helpful in removing floating debris to prevent it from settling to the bottom of the pool.

4. **Chemistry** – Adding the proper amount of the right products at the right time insures that the water stays clear, clean and at its best.

5. **Testing** – By measuring critical water factors, you can make sure the water is balanced and an adequate sanitizer level is being maintained.

Paying attention to these five keys helps maintain the beautiful water your customer expects. It should also be understood that poor filtration or inadequate circulation would not be overcome simply by adding more chemicals. ***The vast majority of water problems are related to poor or inadequate filtration and/or circulation. Before you begin to treat water quality problems with chemicals, be sure to check the operation and maintenance of the pump and filter.***

Let's look at each of these keys in more detail.

Key #1 - Circulation

This topic should take you approximately 30 minutes to complete.

Objectives

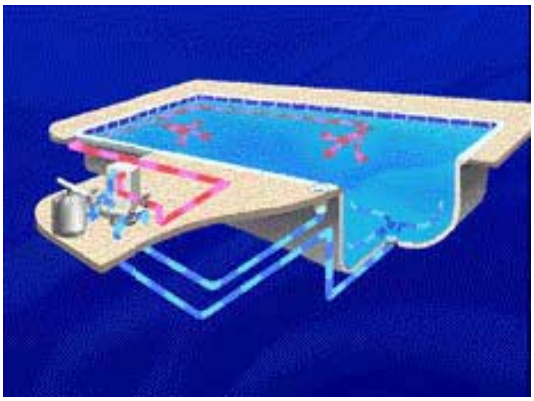
- Identify factors that effect circulation.
- Determine areas in the pool that are most likely to be dead spots.

Topic Introduction

This topic describes:

1. Circulation
2. Dead Spots
3. Routine Brushing

Pool Care Key #1 – Circulation



The circulation system has a dramatic affect on the health of a pool. When water is in motion, it's harder for bacteria and algae to find a surface on which to grow and the chemicals are more thoroughly distributed. In addition, as the water passes through the filter, debris is captured for easy removal.

Several things affect circulation:

- Pump size and run time
- Angle of return jets
- Swimmer Activity
- Pool shape
- Brushing and dead spots

Dead Spots

In every pool, there are dead spots. *Dead spots* are areas where water is isolated or trapped due to pool design, ladder and step placement, or improperly positioned return inlets. By being trapped, this water is neither filtered nor properly replenished with sanitizing and oxidizing chemicals.

Common dead spots include:

- Corners
- Recessed walk-in pool steps
- The wall area behind pool ladders
- The inside of a light niche
- The deep end or bottom of certain pools

The solution to maintaining a pool with inherent dead spots is BRUSHING! The entire surface, pool walls and pool bottom, should be brushed at least once a week.

Routine Brushing

Even when a pool's circulation system is in top working order, dead spots will still occur. These spots require extra cleaning attention, which is why routine brushing is so important.

Routing brushing insures:

- The debris accumulating in these dead spots is moved back into the circulation pattern of the pool water for removal by the filter.
- The debris is now exposed to the sanitizing and oxidizing chemicals.
- The sanitizer and oxidizer are redistributed in these dead spots.

There are several different types of brushes, each specifically designed to clean particular types of pool surfaces. Vinyl bristle brushes can be used safely on all pool surfaces. The blended bristle brush, with stainless steel and nylon bristles, is for gunite pools only. Algae brushes, with multiple rows of stainless steel bristles, are also for gunite pools only.

Key #2 - Filtration

This topic should take you approximately 120 minutes to complete.

Objectives

- Describe the different filter types.
- Recognize the systems for which BioGuard® products are designed.
- Identify conditions that can be caused by poorly filtered water.

Topic Introduction

This topic describes:

1. Filtration
2. The Sand Filter
3. The Cartridge Filter
4. The Diatomaceous Earth (D.E.) Filter
5. Chemical Cleaning
6. Enhancing Filtration
7. Water Enhancer Summary

Pool Care Key #2 – Filtration

The filter is one of the most important pieces of equipment in a pool. A clean, properly functioning filter removes debris you can see as well as some you can't see. Pool water that is not filtered properly can appear dull and cloudy. Debris places demand on the sanitizer, making it hard to balance and maintain proper pool chemistry. There are three kinds of filters pool owners might use:

- Sand Filter
- Cartridge Filter
- Diatomaceous Earth (D.E.) Filter

Regardless of the type of filter, normal maintenance is essential and always involves two steps:

- Physical cleaning to remove loose debris
- Chemical cleaning to remove oils and stubborn, caked-on debris.

BioGuard offers products to physically and chemically clean the filter:

In a chlorine or bromine pool:

Skim Mor® helps remove greases and oils before they reach the filter media

Strip Kwik® eliminates the build-up of oils

Kleen It® removes scale and organic debris

SoftSwim® Filter Cleaner® removes the debris normally found to accumulate in a biguanide pool. No other filter cleaners offer this special blend of three acids for effective filter cleaning in a biguanide pool.

The Sand Filter

How It Works

Common High Rate Sand filters use a specific grade of sand (#20 Silica) to do the filtering. The sand fills approximately half the filter tank, providing adequate *freeboard* (the area above the sand) to allow proper backwashing.

Water enters through a diffuser assembly pipe at the top of the filter. Once inside, it disperses onto the top of the sand. As water seeps through the sand, the debris is captured on the microscopic, jagged edges of the sand grains. The now filtered water is collected at the bottom of the filter tank through a *lateral assembly*. The lateral assembly is designed with slot openings just smaller than the diameter of the #20 Silica sand. Water passes through it, but not the sand.

Advantages

Sand Filters are popular for several reasons:

- Easy to maintain
- Low cost
- Removes particles as small as 25-40 microns
- Works well with water clarifiers (such as Polysheen Blue®) to provide excellent water clarity.

Backwashing the Filter

When the filter pressure reaches 8 to 10 psi (pounds per square inch) above normal operating pressure, the water is having trouble moving through the filter and it's time to clean it. *Backwashing* rinses the loose debris from a sand filter.

The water level in the pool should be monitored during the backwash cycle to prevent the possibility of the water dropping below the surface skimmer. Should the water drop below the surface skimmer it is possible for the pump to lose prime (stop pumping) and cause damage to the pump housing.

Replacing the Sand

Many manufacturers refer to sand as permanent medium, but it really isn't. The sand needs to be replaced every five to seven years in pools that use chlorine or bromine as the primary sanitizer. For biguanide systems, like SoftSwim®; you may have to change the sand more often; sometimes every year or every other year. The biguanide molecule is much larger than a chlorine or bromine molecule and will build up in the filter more quickly, increasing the need for cleaning and media replacement. The pool owner must chemically clean the filter of a *SoftSwim* pool with *SoftSwim* Filter Cleaner® every four to six weeks in order to effectively remove these accumulated particles from the filter.

The Cartridge Filter

How It Works

A cartridge filter uses a synthetic fabric as the filtering media to sift particles of debris from the water. Reemay® is one of the more popular fabrics used today in cartridge filter elements. More durable than the paper cartridges, which were once used, these new synthetic fabrics have a much longer life. If they are properly cleaned and cared for, the cartridge can last approximately two to three years.

The cartridge fabric is formed into vertical pleats to maximize the surface area of fabric available for filtering within the smallest amount of space. Most cartridges for swimming pools will contain anywhere from 100 to 200 square feet or more of filter surface area. Most cartridges for spas will contain approximately 50 to 100 square feet of filter area.

Advantages

There are several reasons a pool owner might choose a cartridge filter:

- Removes particles as small as 10 to 15 microns
- Mid-priced option
- No backwashing - saves water

Cleaning the Cartridge Element

Particles (dirt, dead algae, etc.) captured in the filter pleats build up over time and the filter works less efficiently. The build-up of debris makes it more difficult for the water to pass through the filter element that causes the filter pressure to rise. An increase of 10 to 15 psi over normal, clean operating pressure tells you that it's time to clean the filter.

There are two steps necessary to cleaning a cartridge filter (or any filter for that matter)

1. Physical cleaning to remove the loose debris.

2. Chemical cleaning to remove grease, oil, and scale.

Physical Cleaning

Physical cleaning should be done when filter pressure rises 10-15 psi above normal, clean filter pressure. Use a garden hose with a nozzle. *Do not use a pressure washer hose!* The water pressure from a pressure washer is actually too strong and will destroy the fabric, making it less porous and less able to capture particles. A garden hose has the right amount of pressure to remove the loose debris without damaging the fabric. Rinsing a cartridge filter with a garden hose is a relatively simply task, but it is time consuming. Pool owners should be encouraged to buy two cartridges for their filter. While one cartridge is being cleaned, the other can be used in the filter, and the family can continue to use the pool or spa.

Replacing the Cartridge

Depending on how often the cartridge has been chemically cleaned, the fabric in the cartridge will have deteriorated and/or plugged up. Filter pressure will usually remain high (over 10 psi above normal pressure when new) even after cleaning. At this point, the cartridge filter needs to be replaced. An additional symptom of a plugged-up filter is a low or weak flow of water from the pool or spa return inlets. If the element is not replaced, problems associated with poor circulation and poor filtration will begin to show.

The Diatomaceous Earth (D.E.) Filter

How It Works

With this filter, D.E. powder is used to strain debris from the water. D.E. is the fossilized remains of plankton (diatoms) ground into a very fine powder. The D.E. powder coats the *filter grids* (the fabric covered structure within the filter). These grids must be *pre-coated* with D.E. for the filter to work.

Advantages

There are several reasons a pool owner might choose a D.E. filter:

- Removes particles as small as three to four microns for the cleanest water
- Greatest ratio of filter surface area-to-water
- Highest quality

Physical Cleaning

When filter pressure rises 10 to 15 psi above normal, it's time to clean the filter. With a D.E. filter, "cleaning" could mean a couple of things. It could mean:

1. Regeneration of the D.E. surface area without changing the D.E.
2. Backwashing the D.E., cleaning the grids, and recharging the filter with D.E.

Regeneration of the D.E. can be done many ways, depending on the manufacturer's design of the filter. Ultimately, the result of these processes causes the D.E. powder to be "stirred-up" or knocked loose from the grids in the filter tank when the pump is turned off. When the pump is turned back on, the D.E. powder re-coats the filter grids with a "new" D.E. surface area exposed to do the filtering.

Backwashing the D.E. filter accomplishes much the same task as in a sand filter. Reversing the flow of water loosens the dirty D.E. and debris attached to the grids. This dirty D.E. is washed out of the filter tank and out the waste/backwash line

Chemical Cleaning of Filtration Systems

In addition to physically cleaning the filter media, chemical cleaning needs to be done periodically. This will help maximize the life and efficiency of the filter media. BioGuard® offers three filter cleaning options.

In a chlorine or bromine pool, two products are used to chemically clean the filter. Strip Kwik® is used as the first step of the process, removing oils and greases. Kleen It® is used second to dissolve calcium scale deposits that can build up on filter media. In chlorine or bromine pools, chemical cleaning should be done twice a year. Once in mid-season and once when the pool is closed. If the pool is operated year-round, and additional cleaning will be needed in the spring.

For SoftSwim® pools, the SoftSwim Filter Cleaner® is available for chemically cleaning the filter media. This cleaner is formulated specifically for biguanide pools. SoftSwim filters need to be cleaned more often than chlorine/bromine filters, usually every four to six weeks.

Applying Strip Kwik, Kleen It or SoftSwim Filter Cleaner to Sand Filters:

1. Before chemically cleaning a sand filter, backwash filter thoroughly and turn the pump off.
2. Remove any chlorine from the skimmer basket and pour product (Strip Kwik or Kleen It) into skimmer or hair/lint pot.
3. Turn the pump on (with selector in backwash position) until product moves into filter.
4. Turn the pump off and let product soak in filter for one hour. Backwash the filter again and return to normal filtration cycle.
5. For SoftSwim Pools, allow the filter media to soak for 12-24 hours, then backwash and return to normal operation.

Applying Kleen It® to Cartridge or D.E. Filters:

1. Turn pump off and rinse off loose dirt from filter elements.
2. Apply product by spraying directly onto filter elements. If needed, lightly brush heavy grease spots.
3. Let wet filter elements sit for 5 - 10 minutes. For heavily soiled filters, allow elements to sit for 1 hour.
4. Rinse elements thoroughly with full-strength water from a garden hose.
5. Reassemble filter and resume normal operation.

Applying Strip Kwik® or SoftSwim® Filter Cleaner to Cartridge Filters:

1. Rinse the cartridge thoroughly with garden hose.
2. Soak the cartridge in a solution of 1 part Filter Cleaner to 3 parts water.
3. Let the cartridge soak for at least 1 hour and then brush lightly to remove heavy grease accumulation.
4. For best results and a longer cartridge life, rinse the chemically cleaned filter thoroughly and allow it to dry before returning it to service. It is a good idea to have two cartridges. One can be in use while the second one is being cleaned and dried. Follow the same steps for a SoftSwim pool using the SoftSwim Filter Cleaner.

Applying Strip Kwik or SoftSwim Filter Cleaner to D.E. Filters:

It is important to chemically clean the girds of a D.E. Filter every time it is backwashed and recharged.

1. For chlorine/bromine pools, remove the grids and soak a solution of 1 part Filter Cleaner and 3 parts water.
2. In SoftSwim pools, remove grids and soak in 1 qt of product to 5 gallons of water or 2 qts of product to 10 gallons of water for large grid assemblies.
3. Once the grids are cleaned, rinse thoroughly and replace the grids. Recharge filter with D.E. powder and return to service.

Enhancing Filtration

All filter types can use the assistance of water clarifying agents. As you have read, the three filter types have different capabilities to filter out small particles. D.E. filters can filter particles as small as three to four microns, compared to sand filters that can only filter particles in the 25 - 40 micron size range. It's possible for sand filters to filter out smaller particles, provided they are given a little assistance.

Physically increase the filter surface area using Sparkle Up. Sparkle Up can also tighten the pore size, allowing the media to remove particles as small as 2-3 microns. With the help of Pool Magnet Plus, Sparkle Up also helps remove metals from the water.

Polymerically increase the particle size with Polysheen Blue to enhance filtration. This polymeric compound caused larger particles to form, making it easier for the filter to remove them.

Settle the debris to the bottom with Power Floc or, in a SoftSwim® pool, SoftSwim Filter Aid and Flocculent. As a filter aid, the SoftSwim product forms a gel-like layer on the filter media to help trap and remove debris. When applied as a flocculent, the product drops debris to the bottom of the pool to be vacuumed. Power Floc attracts particles together so they settle to the bottom and can be vacuumed to waste.

Water Enhancer Summary

For Chlorine / Bromine Pools:

- **Polysheen Blue®** should be considered for regular use as a maintenance application on most pools, especially those using sand filters. This routine application will improve the clarity of the water.
- **Sparkle-Up®** used in conjunction with **Pool Magnet Plus®** is the only way to remove dissolved metals from the water.
- **Power Floc**, in addition to its water clarifying capability, can also be used to "drop an algae problem to the bottom of the pool." After vacuuming to waste, algaecides can more efficiently remove the remaining algae from the water.

For *SoftSwim* Pools:

- Dual purpose ***SoftSwim*® Filter Aid and Flocculent®** will provide two options for enhancing water clarity. The difference in the application depends on the extent of the cloudiness.

Note: Power Floc is not recommended for use in SoftSwim pools because it will remove some of the biguanide, as well as suspended debris from the water.

Key #3 - Cleaning

This topic should take you approximately 45 minutes to complete.

Objectives

- Identify cleaning activities that must be incorporated into a pool care program.

Topic Introduction

This topic describes:

1. Cleaning
2. Vacuuming
3. Skimmer Nets
4. Surface Cleaning Products

Pool Care Key #3 – Cleaning

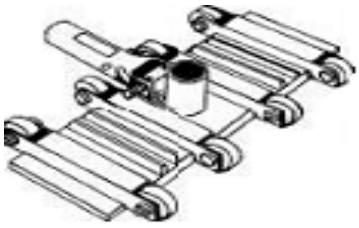
Nothing takes the place of physically cleaning a pool. Certain "housekeeping" activities must be incorporated into any pool care program.

The act of **Brushing** is the most important of all pool cleaning activities. Since all pools have areas of little or no circulation, these *dead spots* are the primary breeding ground for colonies of algae, bacteria and mold.

Brush the walls of the pool at least once a week, paying special attention to where algae and bacteria are likely to accumulate first. Brushing knocks this biofilm loose, allowing it to be more easily killed by chemicals or filtered out through the pool system.

The type of brush needed depends on the type of pool. A vinyl liner pool requires a soft, nylon bristled brush to scrub the surface while protecting the vinyl from damage. For hard surfaces, like plaster or fiberglass, stainless steel bristles work best, especially when trying to dislodge stubborn growths like black algae. BioGuard® also offers a brush that blends the strength of stainless steel with the lower cost of nylon bristles. This is an economical alternative for non-vinyl pools.

Vacuuming



Debris like leaves and bugs eventually sink to the bottom of the pool. Besides being unattractive, this also reduces the efficiency of the sanitizer. The sanitizer's primary role is to kill pathogenic (disease causing) bacteria. If excessive amounts of leave, debris, insects, and wildlife are allowed to stay in the pool, the sanitizer will, unwittingly, spend much of its time and energy trying to attack this organic debris.

Vacuuming to remove debris is important for two reasons:

1. The visual appearance of the pool is improved.
2. The sanitizer's efficiency is improved by allowing it to focus on killing the bacteria.

Skimmer Nets

Before debris sinks to the bottom, it floats on top. Capturing this debris before it has a chance to settle makes sense for two reasons:

1. It relieves the pool owner of the need to vacuum debris from the bottom of the pool.
2. By removing debris quickly, the sanitizing and oxidizing chemicals are not distracted from their primary roles of killing pathogenic bacteria or breaking down undesirable compounds.

BioGuard® offers a complete line of skimmer nets for easy removal of floating debris. Some skimmer nets are designed for surface debris, while others (leaf rakes) are designed to "scoop up" large amounts of leaves and other debris from the bottom of the pool.

Surface Cleaning Products

The oily residue from bathers is likely to form a greasy water line at the waters surface, especially inside and around the pools interior wall. Routine chemical cleaning of this residue is important for several reasons.

- Cleaning prevents this residue from permanently discoloring a vinyl liner.
- This residue can easily become the breeding ground for bacteria.
- Greasy water lines look bad.
- Subsequent cleanings will be easier.

BioGuard® makes a product formulated for cleaning the waterline of a pool:

New and Improved Off the Wall® removes normal build-up of greasy dirt and scale from the pool surface. Now up to two times better at penetrating soil, scale, and hard deposits than the original Off the Wall formula, it is an acidic solution with detergent and surfactant additives that easily remove most residue and make cleaning much easier.

The product is a concentrated cleaner and it is recommended that protective eyewear and gloves be worn during application.

Strongly discourage pool owners from using household cleaners for pool cleaning. These cleaners can drastically change the quality of the water.

Key #4 - Chemistry

This topic should take you approximately 30 minutes to complete.

Objectives

- Identify the primary function of a sanitizer.
- Describe the primary function of an oxidizer.
- Recognize the reasons chemical treatments are necessary.
- Identify the factors that could affect water chemistry.

Topic Introduction

This topic describes:

1. Chemistry
2. The Nature of Water

Pool Care Key #4 – Chemistry

The fourth step in pool maintenance is applying the proper products at the proper time. By doing this you can achieve the **Three P's of Water Chemistry**.

1. **Prevention of Disease** – By killing disease causing bacteria.

2. **Protection of Equipment** – Water that is out of balance adds wear and tear to a pool system. Scale can build up on equipment and pipes, making the pool system less efficient. Or these components could corrode, shortening the life of the equipment. Proper chemical balance prevents this damage.

3. **Provide the Expected Environment** – Pool owners expect pool water to be clear and sparkling as well as protected from algae growth.

Chemistry

In the last section, we learned that each pool or spa has a distinct *personality* dependant on its size, shape, source of fill water, material of construction, equipment, accessories, location, exposure to outside contaminants and owner. These personality characteristics are important because recognizing these traits will assist you and your customer in defending the pool or spa against two primary enemies:

- Bacteria - Microscopic, single-celled organisms that may be involved in the transmission of diseases.

- Algae - Microscopic, one-celled plants that often thrive in water.

There are 3 main types of algae found in pools: green algae, yellow or mustard algae, and black algae. Contributors to algae growth or an algae bloom include:

- Poor circulation and filtration
- Low sanitizer level
- Lack of proper pool care & physical maintenance

Maintaining proper water balance and weekly pool maintenance is the best way to prevent an algae bloom. If algae does appear in the pool, there are several BioGuard Products that can treat the problem

Bacteria, algae and other microorganisms enter the pool every day from sources ranging from the bathers to the weather. So every day you have to fight bacteria and algae with sanitizers and algicides, essential and key **chemistry** components to proper pool and spa maintenance. In the following modules, we will explore two of the chemical groups used to provide the expected environment for pools and spas:

- **Sanitizers –** Chemicals that kill bacteria

- **Oxidizers -** Elements or compounds that create a chemical reaction to form oxygen. Oxidizers are added to pool or spa water to destroy unwanted compounds such as urine, perspiration, suntan lotion and oils enhancing water clarity.

Before we get too deep into the chemistry, let's take a moment to understand some of the basic characteristics of water.

The Nature of Water

All water is not alike. Although two atoms of hydrogen and one of oxygen form the liquid we call water, within this liquid are dozens of other elements, compounds and living organisms. There are trace metals like iron, copper and manganese; minerals like calcium and sodium; dissolved gasses like nitrogen and carbon dioxide; living organisms like bacteria, algae, mold and fungus, not to mention all the other chemicals we add deliberately. Water is known as the *universal solvent*. That means virtually any element that occurs in nature can be picked up or dissolved into solution in water. This becomes a challenge to keep the water clean and clear for use in pools and spas.

Typical fill water needs some help in order to make the water suitable for pool and spa use. The parameters of water chemistry care involve three basic areas of attention:

- Sanitizing
- Oxidizing
- Water Balance

Adding products for maintenance is one thing, but there is only one way to determine whether water has the proper level of sanitizer and mineral balance… You have to test the water. We will discuss water testing as the fifth key to pool care in Module 2.