
CHAPTER 1

IPM AT THE POOL FACILITY

LEARNING OBJECTIVES

After completely studying this chapter, you should be able to:

- Explain the term integrated pest management (IPM).
- List pests that can live in pools.
- Name the water chemistry parameters that must be managed.
- Identify the sources of contaminants in pool water.
- Monitor pool environments.
- Explain various pool pest management control tactics.
- Explain the role of pool sampling and testing in pest and water quality management.

Pool Pests and Water Chemistry

Swimming pools and spas should be clear, sparkling bodies of water that provide recreation, fun and relaxation. These bodies of water require specific management and regular maintenance to keep them clean and safe. The pool owner/operator also has certain legal liabilities for pool safety.

Managing a swimming pool or spa requires knowledge about the types of pests that may be found in a pool environment, as well as a technical understanding of the water chemistry.

A technical understanding and constant maintenance of the water chemistry is essential for maintaining a safe and clean pool or spa. Water chemistry levels influence

pest levels, and the bathers' comfort and safety. Water parameters that must be managed include:

- Organic content,
- pH,
- Total alkalinity,
- Calcium hardness,
- Temperature,
- Concentration of available disinfectant, and
- Total dissolved solids.

Pests may invade and deteriorate the quality of any environment. Microbial pests that can be introduced in pool environments include:

- Algae,
- Bacteria,
- Fungi, and
- Viruses.

Just as water chemistry influences pest levels, pest levels can influence water chemistry. Furthermore, if not controlled, microbial pests can damage equipment or create unsafe and unhealthy conditions for pool users.

Integrated Pest Management (IPM)

To manage water chemistry and control the pests that interfere with pool and spa systems, we can use a management system known as integrated pest management (IPM). IPM is the use of all available tactics or strategies to manage pests so that, in this discussion, acceptable pool and pool facility quality can be achieved economically with the least disruption to the environment. This acronym also works nicely to represent integrated pool management (IPM). IPM allows us to use all the information about an aquatic

environment to keep pests in check and water chemistry balanced. When one part of this aquatic management puzzle—pests or chemistry—gets out of control, there is likely to be problems with the other.

Understanding the characteristics of the water system you manage and the pests associated with it, including their identification, life cycles, and density, is essential to a successful IPM program. Employing an IPM program allows you to methodically gather site and system information, make informed decisions, select and implement control measures, and evaluate and record the results.

Monitoring and Sampling

Monitoring aquatic environments is a continuous job and involves using testing kits as well as your senses. Watching the color and clarity of the water are indications of water characteristics and signs of pest development. Pests may not be obvious in the morning but may be detectable later the same day. The pool's odor can be an indicator of whether the water parameters are balanced or not. By monitoring the pool users, (for example asking swimmers about eye irritation) an operator can be alerted to water quality problems. Monitoring the activity and cleanliness of the pool users also provides indicators of the water's chemical needs, especially when pools are crowded or many bathers are using tanning lotions and oils. Monitoring and requiring bathers to shower before using the pool are factors in overall pool water management. Keeping track of the sanitary condition of pool facilities and buildings also factors into the potential for pool water contamination.



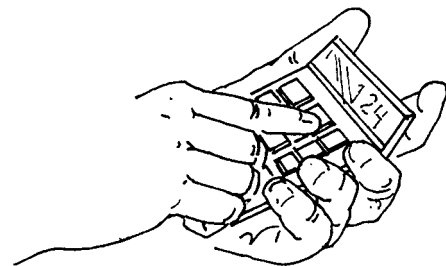
Monitoring water chemistry parameters requires a perceptive sense of smell and use of visual indicators such as turbidity. However, to specifically identify a chemical imbalance requires measurements with testing equipment. For instance, specific test kits are used to determine the disinfectant levels, pH of water, total alkalinity, total hardness, total dissolved solids (TDS), and copper and iron levels. The test kits must have fresh reagents and be kept clean to provide reliable results. The use of these kits is discussed in more detail in chapter 4.

To measure levels of disinfectants, including free available chlorine (F.A.C.), total available chlorine (T.A.C.) and combined available chlorine (C.A.C.), the D.P.D. (diethyl-p-phenylenediamine) test kit is recognized by the Michigan Department of Environmental Quality (MDEQ) as reliable if performed correctly.

Bacteriological analysis of swimming pool water determines the sanitary quality and suitability for public use. Pool water can become highly contaminated or polluted, at least momentarily, from the swimmers in it. Michigan's rules for public pools require the collection and bacteriological analysis of water samples once a week, or more often under unusual conditions as directed by the state or local health department. The frequency of sampling may vary with such factors as the amount of pool use, especially if the pool is heavily used. If possible, collect samples for bacterial analysis when swimmers are in the pool, preferably during periods of peak use. Since the maximum amount of contamination exists within approximately the first five minutes after swimmers have entered the water, it is ideal if samples are collected within this period. If the water quality under such extreme conditions is satisfactory, it is reasonably correct to state the water quality is satisfactory at other times when the bather use is less.

Specific Identification of Pests and Chemical Imbalances

Once the pool operator determines there is an upset in the chemical balance of the water—it is turbid, smells strongly of the disinfectant, or possibly there is a contaminate in the water—the cause of the poor water quality must be identified. Determining which water parameters are outside of an acceptable range and using another tool—the *Langelier saturation index*—provides the operator with information needed to balance the pool water. (The use of the Langelier saturation index is discussed in chapter 6, *Water Chemistry and Pool Water Balance*.) Further, the levels of disinfectant must be evaluated continually and adjusted according to current conditions. Correctly identifying a type of algae aids in the selection of the best control tactic. Also, the level and frequency of detecting contaminants gives the operator information for adjusting management practices to ensure public safety.



The pool operator must know how much water is in the pool and have a working knowledge of the pool's recirculation and filtration systems. Identifying malfunctioning equipment must be immediate. A malfunctioning filtration system may require abnormally large amounts of chemicals, while makes daily pool maintenance difficult, and leads to repeated pest problems. In contrast,

under-applying chemicals may render the pool water unhealthy.

Determining Significance

Since imbalances associated with aquatic sites typically cannot adjust themselves, nor will pests leave the site, any detection of pests or improperly balanced water in a swimming pool or spa warrants immediate control action. There are legal standards of disinfectant residuals and recommended water chemistry parameters that must be maintained according to MDEQ standards. See Appendix K and Public Swimming Pool Act 368.

Selecting Management Methods

Having identified correctly a pest or water chemistry problem, the pool operator can make appropriate adjustments—taking manually or mechanical action or using chemical controls to eliminate the pest or problem. In pool management, if one parameter is out of balance, other parameters are likely to be out of balance. Thus, taking action to correct all water chemistry parameters avoids recurring or persistent problems. To anticipate the desired outcome of your corrective or maintenance actions, determine your pest management goal. Then whenever you manage a pest, you will want to achieve one or a more of these three goals:

- Prevention -- keeping a pest from becoming a problem or maintaining balanced water chemistry.
- Suppression -- reducing pest numbers or damage to an acceptable level and maintaining adequate disinfectant levels throughout the pool.
- Eradication -- destroying an entire pest population such as pathogenic organisms.

In aquatic sites, eradication is a somewhat common but a difficult goal to achieve for some pests due to the constant introduction of contaminants. However, other pests are not tolerated in a swimming pool or spa.

Evaluation and Record Keeping

Completing daily pool operation records is mandatory for complying with Michigan Pool Rules, Michigan Public Health Code, Act 368 of P.A. 1978, Part 125. In addition, keep track of pool recirculation and filtration maintenance activities to help monitor equipment performance. A sample pool operation report form is in Appendix F.

Maintaining records of commercial pesticide applications (including disinfectants, algaecides) is required by the Natural Resources and Environmental Protection Act, Act 451, Part 83, Pesticide Control and Regulation 636. For future decision making, note the results of your chemical applications. There is no specific record keeping form for pesticide applications. The records must include the name and concentration of the pesticide applied, the amount of pesticide applied, the purpose (or pest) the date the pesticide was applied, the address or location of the application, where applicable, the method and rate of the application.

Required Commercial Pesticide Applicator Record Keeping Information:

- Name and concentration of the pesticide applied.
- Amount of the pesticide applied.
- Purpose (or target pest, i.e. algae).
- Date the pesticide was applied.
- Address or location of pesticide application.
- Where applicable, the method and rate of application.

These records must be kept for a minimum of one year and be made available, upon request, to an authorized representative of the MDA during normal business hours. (Reg. 636, R 285.636.15)

Techniques Used in Pool Management

In most environments, natural and applied (human intervention) techniques are used to manage pests. Proper identification, knowledge of the pest and its density, and understanding the environment that favors pest development allows applicators to choose the right combination of techniques to manage a pest in the most economic and efficient manner. Understanding water parameters, what influences them and how to test for them will help you keep those parameters in balance.

Swimming pools and spas are artificially designed and constructed aquatic environments. Natural pest controls do not sufficiently control the microbial pest populations found in these systems. Pool facilities and pool water management require applied pest management control techniques. Applied control involves using mechanical, physical, cultural, and chemical methods to manage safe and healthy pool environments. Pool operators must be concerned not only with the pool itself, but with facilities surrounding the pool as well.

1. Physical and mechanical controls. Physical and mechanical controls prevent or reduce the infestation of pests or contaminants. The pool's design and construction have an influence on the likelihood of pest infestations and reproduction. Two of the most important tools are filtration equipment and multiple inlets with adequate recirculation flow that a pool operator employs to maintain clean water. When working properly, the recirculation and filtration system distribute the water evenly throughout the pool. This helps ensure water clarity. If not working properly, water clarity suffers.

Keeping pool surfaces—sides and bottom—smooth also is important to deter pests from adhering and becoming established. Daily skimming of the water's surface helps remove debris before it sinks to the bottom. To prevent leaves and other debris from entering the water when outdoor pools are not in use, use devices such as net-like screens which are pulled over pools.



Skimming is an important pool maintenance practice.

There are other issues that must be addressed. Vandalism is a costly problem that can be deterred with supervision and keeping pool enclosures and equipment rooms properly secured. To avoid chemical accidents, store pool chemicals in a cool, dry, ventilated and locked area. Safety of a pool facility requires the use of appropriate fencing, locks and gates. Further, first aid equipment and rescue equipment must be available and in good repair. See Appendix C for more information.



Keep pool chemicals stored in a cool, dry, ventilated and secured area.



Safety includes the availability of first aid and rescue equipment at the pool facility.

Remember, you must post the maximum number of pool users that the pool can handle where all swimmers can see and read it, and then enforce the bather load limit.

2. Cultural Controls. Sanitation is an important aspect of maintaining clean and safe pools. The pool operator must consider the entire pool complex including the pool water and structure, decks, floors, toilet, and locker room facilities, and enforce a stringent code of cleanliness to reduce pests and safety hazards.

Bather cleanliness is vital to maintain sanitary and safe pool conditions and to prevent the introduction of contaminants into the pool. Expecting cleanliness standards entails adhering to common sense provisions. These may include:

- Requiring a full-body shower with soap and warm water immediately before entering the pool water is recommended. Before entering or returning to the pool after using the toilet, bathers must shower to



Require pool users to shower with soap and warm water before using the pool to prevent contaminants from entering the pool.

remove contaminants from the body. Monitor swimmers for cleanliness, especially if tanning oils are used at the pool. Bathers must thoroughly rinse all soaps from showering and shampooing before entering the pool. Soap and shampoos upset the water chemistry.

- The pool should never be used as a bathtub or toilet. Disease organisms are introduced into the pool water when urine and feces are released into the water.
- Clothes worn in the pool should be designed for swimming. Clothes with frayed edges are not recommended. Bathing suits must be clean to prevent introducing bacteria and algae into the water.
- Street clothes or shoes should not be allowed in the pool area unless a person with official duties requires entry. This limits the dirt and debris tracked across the deck of the pool.
- Keep swimmers out of the pool if they have skin cuts, blisters, open sores, a cold, inflamed eyes, or any infection of the eyes, ears, nose or throat. Do not tolerate spitting into the pool or clearing of noses— these habits contaminate the water.

Maintaining good water quality is easier if pool operators and pool users keep contaminants out of the pool. Also, it is important to keep glass, soap, papers, sharp toys or anything else that might affect the safety of the pool users out of the pool area. Although it is permissible to serve and consume food within pool enclosures, the owner or operator of the pool should have a staff member monitor the area to maintain safe and sanitary conditions.

3. Chemical Controls. Pesticides are naturally derived or synthetic chemical controls that kill, repel, attract, sterilize, or otherwise interfere with the normal behavior of pests. In the pool management industry, many of the chemicals used in pool operations are referred to as disinfectants or sanitizers. These products control microbial organisms that are introduced into pool water. Certain chemicals are labeled for the control of specific pests. For instance, products used to kill algae are called algacides. When a chemical is used for the purpose of killing or altering a pest, it must have an EPA-approved label and an EPA (Environmental Protection Agency) registration number.

The elimination or control of infectious organisms requires maintaining adequate disinfectant levels in all parts of the pool water. Chemical controls are mandatory for operating a safe and healthy pool in Michigan. The Michigan Public Swimming Pools Rules of Act 368, P.A. 1978, Michigan Public Health Code, sets forth several specific requirements regarding operational practices and procedures for public swimming pools. A set of these operational guidelines are printed in Appendix K. Refer to a complete copy of the Act to know the requirements for compliance.

In addition to pesticides used to kill algae, fungi, bacteria, or other pests found in pool water, there are chemicals used for maintaining pool water quality by balancing the water chemistry parameters. Water chemistry parameters that must be managed include organic content, pH, total alkalinity, calcium hardness, temperature, and total dissolved solids. The chemical maintenance of these parameters is discussed in chapter 6, Water Chemistry and Pool Water Balance.

Review Questions

IPM at the Pool Facility

Write the answers to the following questions, then check your answers with those in the back of the manual.

- Which of the following organisms can be pests of swimming pools?
 - Algae
 - Bacteria
 - Fungi
 - Viruses
 - All of the above.
- Circle all of the water chemistry parameters that a swimming pool manager must monitor and maintain:

pH	Organic matter	Total Alkalinity
Calcium hardness	Temperature	
Disinfectant levels	Total dissolved solids	
- Bathers that use the swimming pool can introduce a constant supply of contaminants to the pool water. True or False?
 - True
 - False
- Monitoring pool environments to maintain clean, safe water includes:
 - monitoring the pool users.
 - using test kits.
 - sending samples to a laboratory.
 - All of the above.
- List some physical and mechanical controls that prevent or reduce the infestation of pests or contaminants in pools.
- Sanitation of the entire pool complex, including the pool water and structure, decks, floors, toilet, and locker room facilities, is an important aspect of maintaining clean and safe pools. True or False?
 - True
 - False
- To measure levels of disinfectants, including free available chlorine (F.A.C.), total available chlorine (T.A.C.) and combined available chlorine (C.A.C.), which test kit is recognized by the Michigan Department of Environmental Quality as reliable, if used correctly?