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SCALE FORMATION IN SWIMMING POOLS

HOW TO RECOGNIZE SCALE: Under certain circumstances, scale will form on underwater surfaces of swimming pools. It may appear in different forms, but usually dark sections or streaks in the pool finish are the first indications. Often they will take the form of footprints or wheel marks due to the greater affinity or repulsion of these areas for the formation of crystals. In a few instances, crystals looking somewhat like sugar will form on metal surfaces or the cement finish. These are very sharp and can easily draw blood to skin surfaces being rubbed across them.

The scale is composed principally of calcium carbonate. As the white scale builds up it usually takes on a brown, black, yellow or greenish cast, depending on the foreign matter present to be deposited with the crystals.

WHAT CAUSES IT? As everyone knows, water, as found in nature, has dissolved in it numerous minerals in various quantities. The capacity of water to dissolve a certain mineral depends on: 1) the nature of the mineral, 2) the temperature, 3) the type and quantity of other dissolved substances, 4) the calcium hardness, 5) the alkalinity and 6) the pH (hydrogen ion concentration, sometimes referred to as degree of alkalinity or acidity).

Since calcium carbonate is relatively insoluble, water is capable of dissolving only a small amount before the saturation point is reached. An increase in temperature or pH reduces the amount of calcium carbonate that can be held in solution. The water is then supersaturated and, with further change, a precipitate may form which can adhere to surfaces in the form of scale.

HOW TO DETERMINE IN ADVANCE IF SCALE WILL FORM: The problem is how to tell when scale is likely to form. This is done by determining the “saturation index.” Professor Langlier of the University of California, a leading water treatment authority, devised a formula for computing the “saturation” or Langlier” index from known results of a water analysis.

An index of zero denotes chemical balance. A minus index shows corrosive tendencies, and a plus index indicates scale forming conditions are present.

HOW TO PREVENT SCALE: A laboratory analysis must be made of the water in question to determine the following:

1. Total dissolved solids.
2. Temperature in degrees Fahrenheit
3. Calcium hardness expressed as CaCO3.
4. Alkalinity expressed CaCO3.
5. pH.

The results of the above are then applied to Langlier’s formula (or sent to our office for computations). If the resulting index is above plus 0.5, steps should be taken to lower the index to a point between minus 0.5 and plus 0.5. This can be done by one of the following means:

1. pH Adjustment Method: Provided the pH does not drop below pH 7.2, an acid can be added to the water. The saturation index will be lowered in direct proportion to the pH. For example: If the index is 1.0 at a pH 8.5, acid would be added to lower the pH to 7.5 and give the index of zero. Due to the danger of damage to the pool finish, muriatic or hydrochloric acid should not be used except by trained operators. Sodium bisulfite, a powder, is easy to handle and comparatively safe to use. Trial and error is the simplest method to determine the amount of sodium bisulfites required. Start by adding five pounds for each 30,000 gallons. Quick distribution and dilution can be attained if the powder is dissolved through the pump strainer or open vacuum line. Test the water and repeat until the desired pH is reached.
2. Water Softening Method: A method of reducing the calcium hardness and/or the alkalinity must be used if the saturation index is greater than the difference between 7.2 and pH of the water. As an example, the index might be 1.5 and the pH of the water 8.0. Reducing this pH by 1.5 would lower the pool water to pH 6.5, below the allowable minimum, so the pH method cannot be used.
   If more suitable water is not available for refilling the pool, the pool water or new raw water can be run through a water softener. This should be accomplished under the direction of a competent technician however, since without careful pH control the opposite effect might be obtained by admitting corrosive water to the pool. It is possible for this water to dissolve calcium from the cement finish to a point of saturation; then a minor change in pH during normal water treatment, or a change in weather could cause scale formation from the “softened” water.

REMOVING THE SCALE: If the scale formation is confined to relatively small areas of the pool finish , it can be removed with “wet” or “dry” sandpaper which can be obtained from auto paint shops or dealers.

Where larger areas of heavy scale are encountered some success has been achieved with power sanding machines. These actually grind into the finish, however, exposing some of the fine sand aggregate. These areas are noticeable, but not always objectionable.

Reports have been received to mild success in softening scale by lowering the pH of the pool water to around 6.5 for an extended period. Then the pool has been drained and the scale removed in the conventional manner with sandpaper. This, like acid washing the pool, should be done only under expert supervision and as a last resort, since it can etch the pool finish. The low pH water can also cause excessive corrosion in the pipes and filter equipment.

In the worst cases, the pool must be refinished.

Brass wool (i.e. Brillo) should be used on chrome or other metal surfaces. (Steel wool should not be used as the filings will cause rust stains on the pool finish).

A razor blade may be used on tile surfaces, accompanied with a weak acid rinse for the worst cases.

WHAT ARE THE CHANGES OF POOL SCALE? Although thousands of pools have been in operation for periods of five to twenty years without developing scale, it does happen occasionally. Average water is usually close to chemical balance. Even after years of treatment with Purex (sodium hypochlorite) and alum (the normal pool treatment chemicals), the balance is not usually upset appreciably. However, the addition of various other chemicals such as copper sulfate and powered hypochlorites can lessen the stability, especially in extremely hard or soft water.

WHAT ABOUT SCALE IN POOL HEATERS? Pool heaters will scale the same as a domestic hot water heater or boiler. Due to the higher temperatures, scale will form in heater coils when it is not evident in a pool. In such cases, the saturation index must be computed at the temperature of the water at the heater outlet, and the water corrected accordingly. One can understand why higher temperatures narrow the limits of practical pH adjustment. Scale formation is reduced when the outlet temperature of the heater is lowered by putting more water through the heater or lower the burner flame. It can also be reduced by the installation of heat exchange equipment. In more extreme cases, the water must be softened, or the heater must be delimed at intervals.

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