Alden Leeds, Inc.

Manufacturer of chemicals that care for your pool:
Technical Document #8

NITRIFICATION & CHLORINE DEMAND

How green is a green pool? When is a normal shock treatment the correct dose compared to a treatment 3x normal? Or 5x?

These questions test the imagination of anyone who is asked to describe a "green pool." Maybe one should be asked, "Can you see the shallow end bottom, the hopper, or even the deep end bottom?"

WHAT IS NITRIFICATION? If green is really green, it's a good bet that nitrification has taken place. Nitrification is a micro biological process in which ammonia (NH3)is converted by oxidation into nitrite (N02) and nitrate (N03). This process is carried out by two bacteria known as Nitrosomonas. But first, ammonia must be formed. The sources of ammonia are quite plentiful: inorganic fertilizers, plant protein decay (leaves etc.) and animal protein decay (bugs etc.) Specialized bacteria decompose the proteins into ammonia in part of an ongoing cycle called the NITROGEN CYCLE. (see Nitrogen Cycle Chart). Nitrosomonas, in turn, get their energy or "food" from the newly created ammonia and carbon dioxide, both present in the water. Once nitrification begins, an accelerating cycle develops. The nitrates, once formed, are great algae nutrients! And as nitrates accumulate, algae bloom and the water turns greener and greener. As the Nitrogen Cycle progresses, more and more plant life becomes available for further bacterial decomposition into more and more ammonia.

WHAT ARE THE EFFECTS? Nitrification leads to water conditions that range from slight odor to major algae bloom. These conditions have been observed in both swimming pools and in municipal waste water treatment systems. The color can range from a light green tint to an emerald or dark green, or even a black. Water clarity can range from a hazy deep end to almost solid color at a depth of a few inches.

WHAT CONDITIONS FAVOR NITRIFICATION? The primary influence is the level of ammonia present. And this level, in turn, depends on the level of decomposing plant and animal life, and certain fertilizers. A second factor is pH, especially in the range of pH= 7.5-8.5. A third factor is water temperature in the range of70-85F. A fourth factor is periods of extended darkness (covered pools) followed by exposure to sunlight (promotes algae growth). Clearly the "worst case scenario" is a pool that is carelesslywinterized (not cleaned or vacuumed, little or no sanitizer added),poorly covered (rips, pin holes, too small etc.), and left covered late into the spring (long incubation and warming water).

WHAT CAN BE DONE? Testing for Nitrification is too complicated for a single test such as a nitrate test (being used by some pool dealers to identify the problem). A nitrate test will only test one part of the cycle. Research * indicates, for example, that Nitrosomonas bacteria secrete organic compounds that actually stimulate the growth of other types of bacteria. A test for these bacteria would be needed too. Data from the Metropolitan Water District of So. Cal. shows 5-10 ppm of chlorine effective in controlling mild nitrification. Severe cases can require 25-50 ppm of chlorine (5x shock treatment) and repeated treatments in some cases.

• Handbook of Chlorination, Geo. Clifford White, 3rd Ed. 1992

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