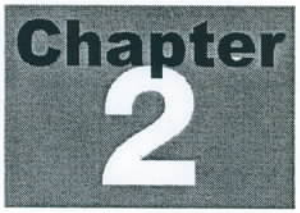

Chapter

THE SATURATION INDEX

Before discussing the proper maintenance procedures for the prevention/elimination of surface problems in swimming pools, spas, and water features, it is necessary to understand the method that has been used successfully around the globe for over 69 years when water is considered balanced. The word "balanced" is used as a gauge. It shows how the principle-of the saturation index works and is related to non-aggressive, non-precipitating water. Water has an appetite. Temperature controls its appetite for most water balance products. Feed the water the proper amounts of food (balancing products) and it becomes full and satisfied (stable), removing its need for aggressiveness. Starve it enough and it becomes hungry (aggressively destructive). These water conditions will stain or destroy pool finishes and any metal components with which it comes in contact.

The Langelier method, developed sometime in the early 30's by civil engineers, has been criticized for use in other than a boiler or municipal water treatment for which it was created. To date, no scientist, chemical manufacturer or chemical engineer has dispelled its importance. Proper testing and use of water balance products is the key. As with any formula, slight variations to accommodate climatic or geographic conditions always exist, but not to the extremes often recommended by self-professed experts.

CHAPTER 2
THE SATURATION INDEX

THE SATURATION INDEX WORKS!

The following is the Langelier Saturation Index as it pertains to water balance parameters to maintain calcium carbonate and other minerals in suspension.

SATURATION INDEX = pH + AF + CF + TF – 12.1

TECH NOTE:
Acceptable "Saturation Index" is between +0.5 and -.05. When dealing with a cosmetic surface the index should be maintained between +0.3 and -0.3. A positive value is more acceptable than a negative value. However, a slight minus value may be required to remove certain mineral deposits such as stains and scale.

TABLE 2.1

TOTAL ALKALINITY	CALCIUM HARDNESS	TEMPERATURE
PPM = A factor	PPM = C factor	F = T factor
5 = 0.7	5 = 0.3	32 = 0.0
25 = 1.4	25 = 1.0	37 = 0.1
50 = 1.7	50 = 1.3	46 = 0.2
75 = 1.9	75 = 1.5	53 = 0.3
100 = 2.0	100 = 1.6	60 = 0.4
150 = 2.2	150 = 1.8	66 = 0.5
200 = 2.3	200 = 1.9	76 = 0.6
300 = 2.5	300 = 2.1	84 = 0.7
400 = 2.6	400 = 2.2	94 = 0.8
800 = 2.9	800 = 2.5	105 = 0.9
1000 = 3.0	1000 = 2.6	128 = 1.0

A Saturation Index of 0 is perfectly balanced.
A Saturation Index of negative has corrosive tendencies.
A Saturation Index of positive has scaling tendencies.
A Saturation Index of +0.3 or -0.3 should be used for visible, cosmetic, pool surfaces.

INDEX EXAMPLE:

A 15,000-gallon pool has a pool temperature of 90° F, pH of 7.8, total alkalinity 125 ppm, and a calcium hardness of 300 ppm. The "Saturation Index is calculated as follows. The index indicates a scaling condition exists. Water

EXAMPLE

	ph 7.8
The	+2.1
Saturation	+2.1
Index	+0.75
	12.75
	-12.10
	=+0.65

TECH NOTE:

The Langelier Saturation Index is a method of ascertaining the aggressive or scaling condition of water. It does not take into account the addition to or suppression of existing compounds of the water balance scale. Therefore, additional care should be taken in altering the water chemistry in the pool environment. As the water temperature increases, the solubility of calcium carbonate decreases. This is one of the few water balance compounds that have an inverse relationship to temperature. See Chapter 3, Calcium Hardness (CH).

Langelier also does not take into consideration the addition of sanitizers with low pH (trichlor, bromine or gas) or high pH (liquid chlorine, calhypo, salt water chlorine generation), which can cause drastic chemical balance swings in concentrated applications. See Chapter 7, Chemical Feeders.