

SPASA FACT SHEET No. 16

THE LANGELIER INDEX

The formula for the Langelier Index or Langelier Scale was originally developed by Dr Wilfred Langelier as an accurate method of determining water balance.

The Langelier Saturation Index is often referred to by pool builders and pool equipment manufacturers as the recommended method of maintaining balanced water. i.e. non-corrosive and non-scale forming.

There are four major factors considered for water balance, which effect the Saturation Index.

1. pH
2. Total Alkalinity
3. Calcium Hardness
4. Temperature

Three of the four factors are given numerical values which are then applied to the formula.

Total Alkalinity	referred to as AF (Alkalinity Factor)
Calcium Hardness	referred to as CF (Calcium Factor)
Temperature	referred to as TF (Temperature Factor)

The actual pH reading is used in the formula and therefore is not given a value.

The formula for determining the Saturation Index, using the four factors is;

$$\text{pH} + \text{AF} + \text{CF} + \text{TF} - 12.1 = \text{Saturation Index (The required Index is 0.0)}$$

A minus figure is under saturated and corrosive. A positive figure is over saturated and the tendency will be scaling. The accepted limits for the index are -0.5 to +0.5.

Factor Tables.

Temperature	Factor	Alkalinity	Factor	Calcium Hardness	Factor
0	0.0	5	0.7	5	0.3
3	0.1	25	1.4	25	1.0
8	0.2	50	1.7	50	1.3
12	0.3	75	1.9	75	1.5
16	0.4	100	2.0	100	1.6
19	0.5	150	2.2	150	1.8
24	0.6	200	2.3	200	1.9
29	0.7	300	2.5	300	2.1
34	0.8	400	2.6	400	2.2
41	0.9	800	2.9	800	2.5

Note: Temperature is in Degrees Celcius.

Alkalinity and Calcium Hardness expressed in ppm (parts per million)

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The following are examples of how the formula is used to determine the Saturation Index and what would need to be done to change the index.

Example 1.

We have tested a pool and obtained the following readings;

pH 7.3 / Alkalinity 60ppm / Calcium Hardness 50ppm / Temperature 28 Degrees C.

Using the factors from the tables and applying it to the formula we have,

$$7.3 \text{ plus } 1.7 \text{ plus } 1.3 \text{ plus } 0.7 \text{ (total } 11.0) \text{ minus } 12.1 = -1.1$$

An Index of -1.1 is under saturated and corrosive. To correct this we add bicarbonate to the pool water with the following results;

pH 7.8 / Alkalinity 200ppm / Calcium Hardness 50ppm / Temperature 28 Degrees C.

Again applying the factors from the tables we have,

$$7.8 \text{ plus } 2.3 \text{ plus } 1.3 \text{ plus } 0.7 \text{ (total } 12.1) \text{ minus } 12.1 = 0.0$$

An index of 0.0 is balanced water.

Example 2.

We have a spa pool with the following readings;

pH 8.2 / Alkalinity 200ppm / Calcium Hardness 800ppm / Temperature 40 Degrees C.

Applying the factors from the tables we have,

$$8.2 \text{ plus } 2.3 \text{ plus } 2.5 \text{ plus } 0.9 \text{ (total } 13.9) \text{ minus } 12.1 = 1.8$$

An index of 1.8 is over saturated and the tendency will be scaling.

As the temperature reading is fixed, we want to reduce the numbers by 1.8 spread across the other three factors.

i.e. $\frac{1.8}{3} = 0.6$ This figure must be taken from each of the three factors.

We would then have,

$$7.6 \text{ plus } 1.7 \text{ plus } 1.9 \text{ plus } 0.9 \text{ (total } 12.1) \text{ minus } 12.1 = 0.0$$

Using the factor tables in reverse, we find the actual readings required to achieve this balanced result are,

pH 7.6 / Alkalinity 50ppm / Calcium Hardness 200ppm / Temperature 40 Degrees C.

By making the necessary adjustments to the pool water (see Fact Sheet No. 1. Water Balance) the required balanced water index can be achieved.

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Whilst the use of Langelier Index may seem rather complicated, it is an accurate measure of water balance and is therefore the preferred method of many companies involved in the pool industry.

To ensure your swimming pool and/ or spa is correctly balanced we recommend regular testing by your S.P.A.S.A. accredited pool shop or service technician.

For more information on balancing and maintaining the water in your pool and/ or spa, see Fact Sheet No. 1. Water Balance, Fact Sheet No. 4. Sanitising The Pool, and Fact Sheet No. 10. Spa Pool Maintenance.

For further information on building, renovating or maintaining a pool, contact;

SWIMMING POOL & SPA ASSOCIATION OF NSW LIMITED

PO BOX 313, BURWOOD NSW 1805. Ph: (02) 9747-6644, Fax: (02) 9744-7916



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