

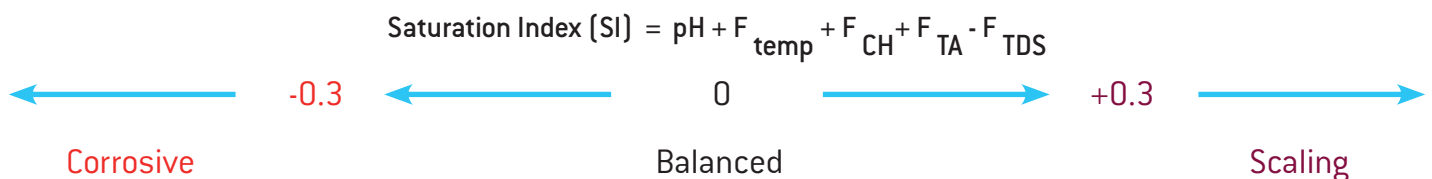
# Langlier Saturation Index (LSI)

## Technical Bulletin

The Langlier Saturation Index (LSI) is a mathematical tool that uses the pH reading and factors for total alkalinity, calcium hardness, temperature, and TDS to determine whether pool or spa water is balanced, corrosive, or scaling. Once the season is underway however, Dealers, as well as their customers, tend to only focus on the sanitizer, pH, and alkalinity levels of pool and spa water. The LSI value itself is something that likely is ignored even if it is included in the testing and evaluation of water samples. While water temperature is an important component of the LSI calculation it is typically only considered by the consumer if it is deemed too hot or too cold.

Even when pools are being readied for winter, the role that temperature plays may be ignored or forgotten. However, this is not the time to ignore or forget that pool water temperatures can drop 40° – 50° F from the time the pool is closed to the coldest part of the winter. A dramatic temperature drop like this could cause water that is perfectly balanced at 70° – 80° F to become corrosive when the temperature drops to 50°F or colder. Failure to consider this effect can lead to damage to plaster, concrete, or even metal components over the winter even though the water was perfectly balanced when the pool was closed.

The reason can be clearly seen by reviewing the Langlier Saturation Index and looking at an example of how temperature affects the calculation.



The table below compares LSI values at a temperature of 75°F and then at 50°F. In this example, only the factor for temperature is different. The pH, alkalinity, hardness, and TDS are the same. This clearly shows that water deemed balanced at a closing temperature of 75 degrees F becomes corrosive at 50 degrees F. And of course in some parts of the country, it is not unusual for pool water temperatures to get even colder.

Property	Temp = 75° F	Temp = 50° F
pH	7.5	7.5
Temperature	0.6	0.2
CH = 225	2	2
TA = 100	2	2
TDS = 800	-12.1	-12.1
SI Value	0	-0.4
Water Condition	BALANCED	CORROSIVE

Although it is not possible to guarantee every outcome, you can estimate what the Saturation Index is likely to be next January and February. First test the water sample near the time of closing using the ClearCare Expert® software and note the LSI value and water condition on the report. (Water temperature around closing are still likely to be above 70°F). Then use the chart below and select the water temperature range for typical winter conditions in your area. Subtract the LSI adjustment factor from the value calculated by the ClearCare Expert® software. This will provide a fair indication of whether the water will remain balanced in January and February.

Expected Winter Temperature Range °F	60 - 70	50 - 60	40 - 50	30 - 40
LSI Adjustment Factor	0.1	0.2	0.3	0.4

Example: Saturation Index reported by ClearCare Expert = -0.1 (Water is balanced)  
Subtract LSI Adjustment Factor for  
Expected Winter Temperature Range 40 – 50°F = -0.3  
Predicted LSI Value at winter temperature conditions: -0.4 (Water is Corrosive)

If the trial calculation indicates the water is likely to be corrosive, here are some general recommendations for balancing the water when the pool is closed to help ensure it remains balanced all winter long:

- Adjust the pH to the upper end of the range
- Adjust the Total Alkalinity to the upper end of the range. Be sure you are using the adjusted TA value, and remember that high CYA levels will significantly impact the actual TA value.
- Ensure that the Calcium Hardness level is at least 200 ppm. Even high calcium levels would for once become an asset instead of a liability when water temperatures plunge. Just keep in mind that that situation will reverse itself in the spring when temperatures rise.

Take care not to over-adjust or get outside the recommended ranges in anticipation of the winter conditions. While preparing the water balance for the colder temperatures, it is also important to avoid creating a scaling condition at the time the pool is first closed.

If you have questions about the Langlier Saturation Index, winterizing pools, or any other pool or spa questions, please contact your Sales Representative, Customer Care or our Technology Department.

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