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MARLO INCORPORATED ®

SCALING OR CORROSION INDEX FOR WATER

Many times a water supply is thought to be corrosive by mere reference to the pH value of the water. Technically the degree of acidity or alkalinity of a water supply is indicated by the pH value: a ph of 7.0 represents a neutral water, values or pH above 7 are considered alkaline and below 7 are of an acid nature.

Relating only to the pH value can be erroneous in determining whether a water supply has corrosive tendencies. A true evaluation of whether a water supply is corrosive, as well as if it also will be scale forming, is to look at it from the causes of corrosion and scaling.

Degrees of corrosion generally are caused by the alkalinity (carbonates CO_3 and bicarbonates HCO_3) and the free carbon dioxide CO_2 contained in the water. Scaling is generally referred to hardness scale and its degree of scale potential (normally calcium hardness).

To help determine the corrosive and scaling properties of a water supply, the following method can be used. It is a modification of Langelier's Calcium Carbonate Saturation Index. The modifications make this method usable on waters usually encountered and at ambient temperatures only. For waters of high solids content or at elevated temperatures, more precise calculations should be used. The answers as obtained by this method should be considered indicative only.

Basic Formula: $pH_S = 11.6 - F\,(Ca) - F\,(Alk)$

where $F_{(Ca)}$ and $F_{(Alk)}$ are obtained from the graph for calcium and alkalinity.

S.I. (Saturation Index) - pH_S (calculated)
If S.I. is 0, water is in chemical balance.

If S.I. is a positive number, scale forming tendencies are indicated.
The larger the number, the stronger the tendency.

If S.I.is a negative number, corrosive tendencies are indicated.
The larger the number the stronger the tendency.

EXAMPLE: Find the saturation index for a water 65^0 F, 300 ppm total dissolved solids, calcium hardness of 200 ppm as $CaCO_3$, alkalinity of 160 ppm as $CaCO_3$, and ph of 7.2.

From the graph: $F_{(Ca)} = 1.9$ for 200 ppm hardness, $F_{(Alk)} = 2.2$ for 160 ppm alkalinity.

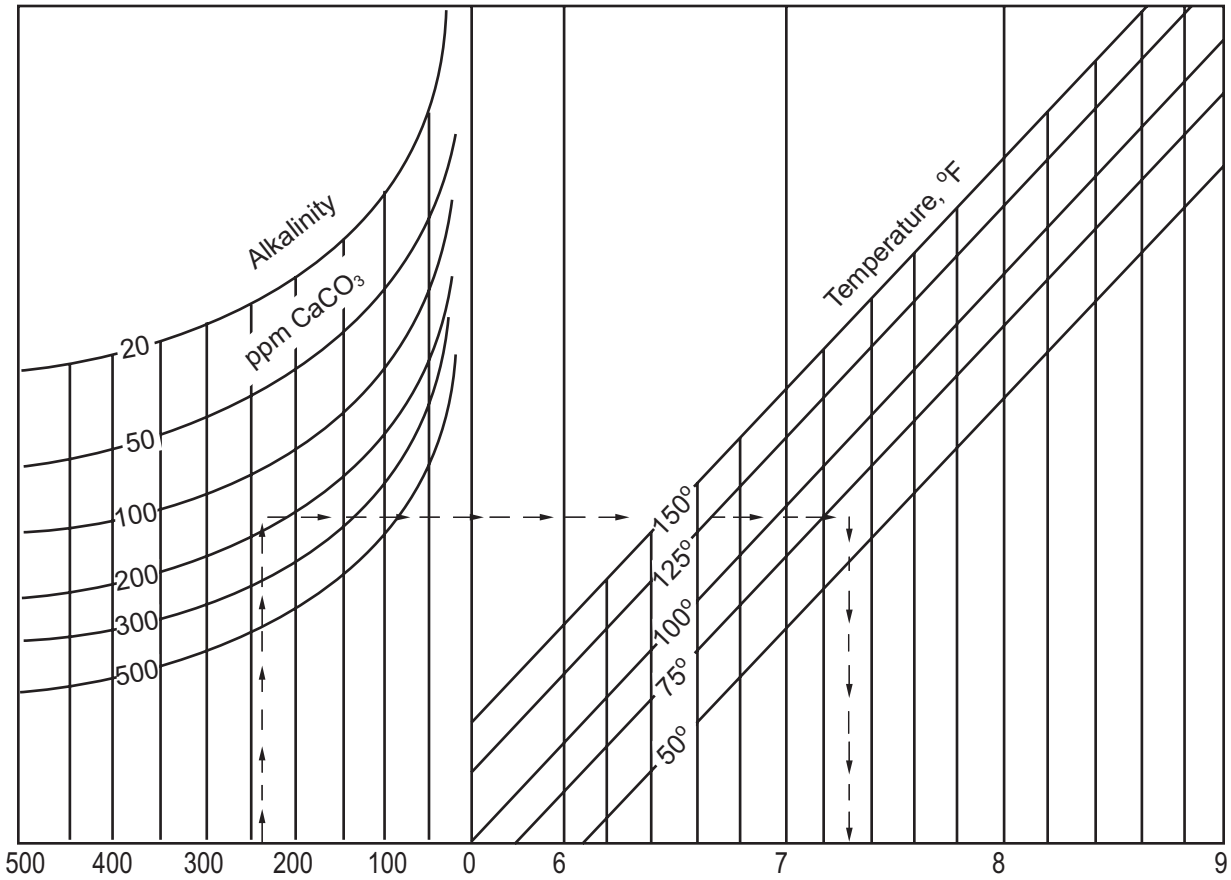
Then substituting, $pH_S = 11.6 - 1.9 - 2.2 = 7.5$

S.I. = 7.2 - 7.5 = $^-$0.3

Thus the saturation index is indicative of a corrosion tendency.

The above example shows that a water supply with a pH of 7.2 can be corrosive.

Simplified Langelier Index



Ca Hardness, ppm as $CaCO_3$

pH Value at Saturation (pH_S)

Example: Raw Water
Calcium = 240 ppm

Alkalinity = 190 ppm
pH = 6.8

Temperature = 70°F
From Chart: pH_S = 7.3