What Are Total Dissolved Solids? (TDS)

Dissolved solids and total dissolved solids are terms, commonly used interchangeably, that denote the concentration of mineral constituents dissolved in water. Dissolved solids do not include gases, colloids, or sediment, but consist chiefly of carbonates, bicarbonates, chlorides, sulphates, phosphates, and nitrates of calcium, magnesium, sodium, and potassium, with traces of iron, manganese and a few others. Total solids include both suspended and dissolved solids, so the term is not interchangeable with dissolved solids.

The concentration of dissolved solids is determined or estimated by a) Conductivity, b) the residue on evaporation of the filtrate and c) sum of the concentration of all the constituents determined by analysis or less commonly, by specific gravity determinations. One common method of determining dissolved solids is to evaporate a known volume of water and weigh the residue. During the evaporation process, bicarbonate is changed to carbonate, carbon dioxide and water while some magnesium, chloride, nitrate and organic materials are partly volatilized.

The computed dissolved solids content is also equal to the sum of the major ions determined in each sample analysis; after all solid constituents are converted mathematically into the forms in which they would normally exist in a dry state. Obviously, partial chemical analysis may make it impossible to estimate dissolved solids because of the limited number of constituents measured. Rarely will the dissolved solids content determined by evaporation be equal to that determined by calculation. The values may differ by +10 to 20 mg/L, when the concentration is on the order of 100 to 500 mg/L. Three reasons for this discrepancy are (1) the chemical analysis may not be sufficiently complete, (2) during evaporation several substances, such as organic materials, may be volatilized, and (3) some water of hydration may remain in the residue.

In solutions in which the concentration of dissolved solids is greater than 1000 mg/L, the calculated value may be preferable to the residue on evaporation. In some analyses the method used to determine dissolved solids is not reported. Where the concentration is less than 1000 mg/L, it is reported to the nearest whole number, but only to three significant figures at higher concentrations. Although the N.H.M.R.C. (1987) proposed a limit of 1000 mg/L of dissolved solids in drinking water, concentrations in excess of 1000 mg/L are sometimes found in municipal supplies where less mineralised waters are not available.

Many Australian waters have characteristically high levels of dissolved solids, the most common of which are sodium bicarbonate and chloride, and calcium and magnesium bicarbonates and sulphates.

Taste thresholds vary widely depending on the particular dissolved solids present. Supplies containing a TDS level of 1000 mg per litre are generally acceptable, on the basis of taste considerations. However, TDS levels of up to 1500 mg per litre can be acceptable in areas where better quality water is not locally available and where other water supplies cannot be procured at reasonable cost. Above 1500 mg per litre taste generally renders water unacceptable to consumers.

CLASSIFICATION TDS - mg/L

Slightly mineralised 0 - 100
Slight to moderate 100-150
Moderately mineralised 150 - 500
Moderate to Highly 500 - 750
Highly mineralised 750 - 1500
Very Highly 1500 - 3000 (Slightly saline)
Brackish 3000 - 10,000
(Moderately saline)
Very Brackish 10,000 - 34,000
(Very saline)
Sea Water 34,000 - 45,000 (briny)
Brine 45,000 plus (briny)

Specific conductance, electric conductance or conductivity, is an extremely useful measurement that is both conveniently and rapidly determined. This measurement, indicated by a meter, is used to estimate the concentration of dissolved solids in water. Conductance, the ability of a substance to conduct an electric current, reciprocal of the resistance of a cube of the substance 1 cm on a side at a specific temperature, usually 25º C. It is reported in units of Siemens* (S), but since natural waters have conductivity values far less than 1 S, the data generally are reported in units of micro Siemens (uS) or millionths of a Siemens. e.g. uS/cm at 25 degrees C.

Dissolved solids can be estimated by multiplying the conductivity by some pre-determined constant (C). Dissolved solids, mg/L = 0.7 x conductivity, uS. If the water is highly mineralised, dissolved solids are usually more than 65% of the conductivity, but they are less if the water has a high or low pH or contains sodium chloride. As a general rule, the conductivity is multiplied by 0.7 in order to estimate the dissolved solids.

The reason for this difference is that there is no simple relation between ionic concentration and conductance. How well a current in a given solution will be conducted depends on the number and kinds of ions present, their relative charge, and the freedom of ions to act as conductors. Dissolved solids concentrations should not be estimated from conductivity values that exceed 50,000 uS, because the relation becomes indefinite for solutions approaching saturation.

Distilled water generally has a conductance that ranges between 1 and 5 uS, while rain water commonly ranges from 10 to about 50. Conductance may be considerably higher, however, where the atmosphere is polluted with sulphur dioxide or other industrial contaminants, in coastal areas where it may contain sea salt, or in arid regions where wind-blown dust from evaporite deposits is prevalent. Elsewhere, the conductivity of both surface and ground waters varies widely from nearly distilled water to brine. Of course, the conductivity of ground water at a particular site is nearly constant, while the conductance of surface water varies with the discharge of the stream.

Conductivity is measured by using a conductivity meter. For an accurate reading the water temperature should be close to or at 25º C. As for all instruments the conductivity meter should be checked against a known conductivity standard on a regular basis. The units of conductivity was originally the MHO, this was changed to SIEMEN which is an International System of Units.