

Simplified TKN (s-TKN™): TKN Finally Made Easy!

TKN is the total concentration of organic nitrogen and ammonia. The original TKN method was developed by the Danish chemist Johan Kjeldahl in 1883. Today, TKN and TN are used to monitor and control nitrogen in fermentation processes.

The traditional TKN method consists of digesting the sample at high temperatures for several hours with strong sulfuric acid and metal catalysts such as copper or mercury. Ultimately, the organic nitrogen is converted to ammonia for determination by a variety of analytical techniques. The analysis requires expensive, fragile equipment along with a large amount of laboratory space. In addition to the above limitations, the TKN method suffers from interferences that are not well understood and traditional methodologies have been unable to correct for these.

TKN comprises one of the most challenging, dangerous, and labor-intensive tests that a laboratory performs. Regardless of your method of testing, do-it-yourself or outsourcing, related waste disposal and cost per test present substantial expense. Hach's s-TKN method can help ease these headaches for approximately \$9 per test.



Nitrogen Relationships

Total Nitrogen is defined as the sum of organic nitrogen, nitrate, nitrite, and ammonia:

$$\text{Total N} = \text{Organic N} + \text{NO}_3^- \text{-N} + \text{NO}_2^- \text{-N} + \text{NH}_3 \text{-N}$$

N = Nitrogen

NO₃⁻-N = Nitrate nitrogen

NO₂⁻-N = Nitrite nitrogen

NH₃-N = Ammonia nitrogen

By definition, TKN, a component of total nitrogen, is the sum of organic nitrogen and ammonia. Therefore, the above equation may be re-written as:

$$\text{Total N} = \text{TKN} + \text{NO}_3^- \text{-N} + \text{NO}_2^- \text{-N}$$

The Hach s-TKN Method

The s-TKN method is based on the nitrogen relationship at the left. By rearrangement, s-TKN is defined as the difference between the concentrations of total nitrogen and oxidized nitrogen:

$$\text{s-TKN} = \text{Total N} - (\text{NO}_3^- \text{-N} + \text{NO}_2^- \text{-N})$$

In the s-TKN method, total nitrogen is determined by a persulfate digestion in an enclosed vial, oxidizing all nitrogen forms to nitrate. The nitrate reacts with an indicator, forming a complex that is measured photometrically. An undigested sample aliquot reacts with an indicator to determine the oxidized nitrogen photometrically. The spectrophotometer automatically subtracts this value from the total nitrogen value and displays TKN, total nitrogen, and nitrate + nitrite.

Benefits of the s-TKN Method

Simplified TKN contains everything needed to measure TKN in one box.

The s-TKN Method uses TNTplus® technology, offering safer pre-measured chemistries that work exclusively with the Hach DR Family of Spectrophotometers (DR 1900™, DR 3900™, DR 5000™, and DR 6000™). The chemistry vials require no preparation or glassware (no cleanup!) and enable the spectrophotometer to automatically recognize the testing method, eliminating the need to pre-program or calibrate curves. No blank is required, further reducing expense.



The new s-TKN system:

- Eliminates the use of hazardous mercury
- Reduces operating expenses; each test costs approximately \$9, representing annual savings of over \$1000 compared to outsourcing TKN on a monthly basis
- Minimizes training and equipment requirements
- Takes ~1 hour total analysis time with minimal hands-on time

Real-time, effective process control

Performing a low-cost, safer TKN gives operators an improved tool for process control. Real-time results also eliminate the delay of outsourcing, giving a more effective tool for making necessary process adjustments. Additionally, with a nominal cost per test, the possibility of increased testing gives more optimal results.