



BASICS OF THE TOTAL SUSPENDED SOLIDS (TSS) WASTEWATER ANALYTICAL TEST

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Since the implementation of the Clean Water Act and subsequent creation of the United States Environmental Protection Agency (USEPA) in the early 1970s, poultry processing plants have been required to continually improve the quality of their process wastewater effluent discharges. The determination of wastewater quality set forth in environmental permits has been established in a series of laboratory analytical tests focused in four (4) major categories: organics, *solids*, nutrients and physical properties.

For most poultry professionals a complete understanding of the standard methods required to accurately complete critical wastewater analytical tests is not necessary. However, a fundamental understanding of the theory behind and working knowledge of the basic procedures used to complete these wastewater tests, and the answers to commonly asked questions about each test can be a valuable tool for anyone involved in generating, monitoring, treating or discharging process wastewater.

Measuring SOLIDS in Wastewater

A number of analytical tests have been developed and are used to determine the concentration (typically in milligrams per liter - *mg/L* - or the equivalent unit of parts per million - *ppm*) of the various forms SOLIDS can exist within a wastewater sample. One of the laboratory test most widely used to establish and monitor environmental permit limits for the concentration of SOLIDS in wastewater samples is total suspended solids (TSS).

SOLIDS in wastewater can be viewed in two basic ways: *particulate size* or *particulate composition*. The TSS test is based within the category of *particulate size* and is represented in the following formula:

$$\text{Total Solids (TS)} = \text{Total Suspended Solids (TSS)} + \text{Total Dissolved Solids (TDS)}$$

Basics of the TSS Test

As the formula above shows, TS in a wastewater sample can be separated based on particulate size into TSS and TDS fractions. To accomplish this separation, a laboratory bench-scale filtration system (see Figure 1) is utilized under pressure to pull a measured volume of wastewater through a filter disc. SOLIDS that remain on the disc are TSS, while SOLIDS that pass thru the disc and end up in the capture flask below are TDS.

The filter disc utilized for the test is specific in both composition (i.e., non-combustible glass fiber) and pore size (i.e., 0.7 – 0.8 μm). The unit “ μm ” stands for “micrometer” or the more commonly used term “micron”. To understand the separation point between TSS and TDS, one has to remember that:

1 meter = 1,000 millimeters AND 1 millimeter = 1,000 micrometers, thus

1 micron = 1/1,000 of a millimeter OR 1/1,000,000 of a meter

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Figure 1. Total Suspended Solids (TSS) laboratory vacuum filtration unit. (Rocker Vacuum Filtration System, NewStar Environmental, Inc. – newstarencvironmental.com)

Critical elements of the TSS analytical procedure include:

1. Absolute dryness of the filter disc both pre- and post-filtration for accurate weight measurement,
2. Accurate measurement of the measured volume of the wastewater sample passed through the filter disc (**NOTE:** There is **NOT** a specific volume of wastewater that must be passed through the filter disc. Logically, the more wastewater that passes through the filter, the more accurate the result will be. However, it is left up to the laboratory technician to determine the volume utilized based on the predicted concentration of TSS in a wastewater sample. Too small a volume and accuracy is lost. Too large a volume and the filter disc can become hopelessly clogged before all of the wastewater passes through. Thus, the **KEY** is accurate measurement of whatever volume is utilized), and
3. Accurate completion of the final calculation step, which converts the weight of TSS on the filter disc and the volume of wastewater sample used, to the final concentration unit of *mg/L*.

If you are interested in learning more about the TSS wastewater analytical test, there are several informative videos available online, including:

Total Suspended Solids Test (<https://www.youtube.com/watch?v=fKGM040wvI>)

For more information or to have questions answered concerning TSS or any wastewater analytical test contact your local University of Georgia Cooperative Extension Agent.