Aerobiology Laboratory Associates, Incorporated
Consulting Laboratory

Website: www.aerobiology.net

LIQUID , Test Code 2051 - ATP Analysis

Adenosine Triphosphate (ATP) is present in all living cells and is an important part of respiration. Photosynthesis consists of the absorption of light by chlorophyll pigments and conversion of this light to chemical energy. This occurs in organelles called chloroplasts on membrane systems known as thylakoids. Respiration reverses the process of photosynthesis, releasing the stored chemical energy. Respiration occurs in organelles called mitochondria. ATP consists of three parts, adenine, ribose, and phosphate groups. Adenine when bonded to ribose gives us adenosine. Adenosine plus three phosphate groups gives us ATP. Adenosine bonded to two phosphate groups is ADP. In the energy production cycle in the chloroplasts and mitochondria, energy is stored when ATP is produced from ADP and a phosphate group "P". The ATP/ADP cycle provides energy for cellular activity. When energy is necessary the third phosphate group breaks off from ATP. This forms ADP and releases energy. When a phosphate group is freed up, it may move on to another molecule in a process called phosphorylation. The molecule gains both the phosphate group and the energy. ATP synthesis is catalyzed by ATP synthetase. As a cell dies the ATP is released and destroyed by a phosphatase enzyme. In this method, ATP is extracted from any living cells present in a sample and mixed with an aliquot of luciferase (an enzyme extracted from firefly tails). The reaction between the two results in a measurable light output. The amount of light generated from the reaction is measured by a luminometer (ATP Meter, AMSA, INC.) or photometer generally in relative light units (RLUs) and is directly proportional to the amount of ATP in the sample.

ATP is also a method to determine the fouling index or, as indirect measurement, is useful to estimate the probable microbial content of a water sample. The method has widespread use in the food and beverage industry. Since the mid-1990's, the ATP method has been more widely used in the industrial water treatment industry. Some examples of these are:

Used as a measure of fouling index
Used as a predictor of near-future fouling
Used as a evaluation of biofilm coupons
To determine kill times and efficacies of biocides
To determine organic deposit and sessile bacterial removal and inhibition

1. Obtain a sterile container from Aerobiology.
2. Collect a 100ml of water from the tap or reservoir in the sterile container making sure the inside of the container is not contaminated by the collector.
3. Keep the water in a cooler and an ice pack for transportation to the laboratory.
4. The water sample **must** reach the laboratory within 24 hours of collection or the sample will be deemed invalid.

References:

David Wayman, Michie and Ken Davenport. 2001. Using ATP to determine Biocide Efficacy. *The Analyst*. April, 2001.

Attila G. Relenyi and Tim Keister. 2001. Using an ATP Meter with the All-In-One Shot ATP test kit. *The Analyst* , April 2001.
Attila G. Relenyi. 2001. Organic Film and General Organic Fouling Indices. 2001. *The Analyst*, April 2001