

GLOSSARY OF TERMS



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Go to Wikipedia, the online encyclopedia and type in “Sewage Treatment”, and “Water Treatment” for an excellent overview of Wastewater and Water Treatment processes.

Addition: In addition, two or more smaller numbers are combined to get a larger number known as the *sum*.

Aerobic: requiring the presence of air or free oxygen.

Aerobic Digestion: a bacterial process occurring in the presence of oxygen.

Anaerobic: occurring in the absence of oxygen.

Anaerobic Digestion: a bacterial process that is carried out in the absence of oxygen.

Alum: the common name for aluminum sulfate often used as a coagulant in water treatment.

Amperage: another word for Current, which is measured in amps.

Area: Area is the amount of surface within a figure. Area is described using **square units** (ft², m², in², etc.).

Average: Finding the average (or mean) value of a group of numbers is a two-step problem. First find the sum of all the numbers. Then divide the sum by how many numbers are in the group.

Sum ÷ How many numbers = Average

Basic Operations: Basic Operations are adding, subtracting, multiplying and dividing.

Biochemical Oxygen Demand (BOD): a chemical procedure for determining the amount of dissolved oxygen needed by aerobic biological organisms in a body of water to break down organic material present in a given water sample at certain temperature over a specific time period.

Brake Power: the power needed to do work and it takes into account the efficiency of the pump (Ep). If the pump is inefficient, it would require more power to do the same amount of work; Measured in kilowatts (kW).

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Channel: a route through which something passes.

Grit Channel: Pre-treatment of wastewater may include a sand or grit channel where the velocity of the incoming wastewater is adjusted to allow the settlement of sand, grit, stones, and broken glass.

Chlorinator: a device to apply chlorine to water at a known, controlled rate.

Chlorine: an oxidizing agent commonly used as a disinfectant.

Chlorine Demand: is the difference between the amounts of chlorine that is added to the water (called **Chlorine Dosage**) and the amount of Chlorine remaining (called the **Chlorine Residual**). It is typically measured in mg/L.

Chlorine Dosage: the amount of chlorine that is added to the water, measured in mg/L

Chlorine Residual: amount of chlorine remaining, after a certain contact time; measured in mg/L.

Circumference: The distance around the outside of a circle. The circumference can be calculated by multiplying the diameter of the circle by a constant called Pi, the Greek letter. The symbol for Pi is π . Pi is a constant with a value of 3.14.

Compound Units: Water system operators will often have to convert compound units in flow rate and velocity questions. Some examples are:

ml/s \longrightarrow L/min

lpm \longrightarrow lpd

ml/s \longrightarrow L/s

mg/L \longrightarrow kg/L

Conductor: a substance that readily conducts electricity, such as a metal wire. A wire is like a piece of **pipe** that allows water to flow through.

Conical: having the form of a cone.

Current (I): the flow of electrons through a conductor; Measured in amperes (amps). Current is similar to the flow of water in a pipe, called flow rate (Q); Measured in Litres per minute (lpm)

Detention Time: the amount of time that a volume of water will remain in a space (such as a pipe, clearwell, water storage tank); Measured in seconds.

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Diameter (D): a straight line passing through the centre of a circle or sphere.

Disinfection: a chemical or physical process that kills microorganisms.

Division: In a division problem, a number known as a dividend is separated into equal parts (divided) by a smaller number known as a divisor. The answer is known as the **quotient**.

Dosage: refers to the amount of chemical that is being added to the water, usually measured in mg/L.

Effluent: flowing out. Sewage that has been treated in a sewage treatment plant.

Equation: is a mathematical sentence stating that two quantities are equal. It has an equal sign.

Exponent: a symbol or number placed above and after another symbol or number to denote the power to which the latter is to be raised. Example: 10^3 (where 3 is the exponent).

Flow Rate (Q): the volume of a fluid which passes a specific point within a set time period; Measured in cubic metres per second (m^3/s). The flow rate depends on the cross-sectional area of the pipe and the velocity of the water moving through it.

Force: the push exerted by water on any surface containing it; Measured in Newtons (N).

Fraction: a fraction is two numbers that show a part of some whole. The top number of a fraction is called the numerator. The numerator tells you how many parts you have. The bottom number is called the denominator. The denominator tells you how many parts are in the whole.

Proper Fraction: the numerator (top) is always less than the denominator (bottom).

Example: $1/3$, $8/9$, $1/2$

Improper Fraction: the numerator is as big as or bigger than the denominator.

Example: $3/3$, $9/8$, $2/1$

Mixed Number: a whole number and a proper fraction are written next to each other.

Example: $3 \frac{1}{2}$, $4 \frac{1}{4}$, $11 \frac{3}{5}$

Head (H): the vertical distance measured from the water surface to a point below the water surface; measured in metres (m). 1 metre of hydraulic head = 9.81 kPa

Horsepower (Hp): the motor power needed to pump water.

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Hydraulics: is the science that deals with the behaviour and movement of fluids. Water treatment plant operators must know and understand the concepts within hydraulics in order to perform their jobs correctly.

Imperial units: These are the units that were commonly used in the British Commonwealth Countries. 98% of the world's population converted or are in the process of converting to the Metric System of Measurement (SI) but the U.S. still uses a system very similar to the Imperial System.

Influent: something flowing in.

Kilowatt (kW): a unit of electrical power equal to 1000 watts

Length: the distance between two points. The basic unit for length is the **metre**.

Linear Measurements: One-dimensional objects are referred to as linear.

Liquor: a combination of wastewater and biological mass.

Litre: the basic unit of measurement for volume in the metric system.

Metric System: the metric system is a system of units and measurements based on multiples of 10. The metric system is also referred to as the International System of Units (SI).

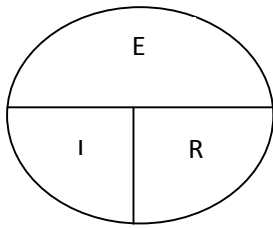
Motor Power: the power needed to do work and it takes into account the efficiency of the motor (Em); Measured in kilowatts.

Multiplication: One way to think about a multiplication problem is to think of it as the repeated addition of the same number. For example, $8 \times 5 = 8 + 8 + 8 + 8 + 8 = 40$. The answer in a multiplication problem is known as the *product*.

Non-conductor: does not conduct electricity, also called an insulator. Examples include rubber, plastic, glass.

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Ohm's Law: $E = IR$ $E =$ Voltage (volts), $I =$ Current (amps), $R =$ Resistance (ohms)



Use the Ohm's Law Circle to help rearrange the formula: $E = I \times R$

Or $I = \frac{E}{R}$ Or $R = \frac{E}{I}$

Order of Operations: Operations are adding, subtracting, finding the square root, etc. Knowing which operation to do first, second and so on is important for solving the equation correctly. The Order of Operations helps us do that. To remember the order in which we must do the operations, we use the following: **BEDMAS**

Perimeter: this is a special linear dimension. It is defined as the distance around the outside of an object.

Pi: the Greek letter. The symbol for Pi is π . Pi is a constant with a value of 3.14.

Power: the rate at which work is done. It is measured in watts or kilowatts (1 kW = 1000 watts).

Pressure: amount of force acting on a unit area; Measured in Kilo Pascals (kPa)

Problem Solving Steps:

- Step 1 – Read the Problem
- Step 2 – Identify the Unknown
- Step 3 – Make a Drawing
- Step 4 – Convert the Units
- Step 5 – Find the Equation(s)
- Step 6 – Rearrange the Equation and Plug in the Known Values
- Step 7 – Use a Calculator to Solve for the Unknown
- Step 8 – Select the Closest Answer

Pump: a mechanical device for causing flow, or for raising or lifting water or other fluid, or for applying pressure to fluids.

Pump Power (P): the rate of doing work over time; Measured in kilowatts. Pumps must be able to work at the rate needed to deliver water.

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Radius (R): a straight line extending from the centre of a circle to the outside edge.

Rate of flow: the volume of water per unit of time which is passing a certain point at a particular instant.

Ratio: the relation between two quantities, expressed as fractions.

Resistance (R): slows or opposes the flow of electricity; Measured in ohms. Comparable to static or friction head losses in a pump system.

Rounding Numbers: To round a whole number to a given place, underline the digit to be rounded, then:

1. Look at the digit to the right of that place.
2. If the digit is 4 or less, round DOWN. Do not change the number in the place. Just replace each digit to the right of that place with zero.
3. If the digit is 5 or more, round UP. Increase the number in the place you are rounding to by 1. Replace each digit to the right of that place with a zero.

Scientific Notation: A method of expressing numbers in terms of a decimal number between 1 and 10 multiplied by a power of 10.

Sedimentation: a physical water treatment process used to settle out suspended solids in water.

Sewage: the waste and wastewater produced by residential and commercial establishments and discharged into sewers.

Sludge: the residual, semi-solid material left from industrial wastewater or sewage treatment processes.

Subtraction: a smaller number is taken away from a larger number. The answer is known as the *difference*.

Suspended Solids (SS): small solid particles which remain in suspension in water. Usually removed through the use of sedimentation.

Tank: a circular or rectangular vessel.

Temperature: Two scales are commonly used to measure temperature; degrees Fahrenheit (°F)

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and degrees Centigrade ($^{\circ}\text{C}$), usually called Celsius. Centigrade is the metric scale and Fahrenheit is what is used in the U.S. In the Centigrade scale, water freezes at 0° and boils at 100° . In the Fahrenheit scale, water freezes at 32° and boils at 212° .

Uplift Force: the force of water pressure pushing upward.

Variables: the unknowns in an equation which are represented by letters (such as A, L, V, etc.).

Velocity (v): the speed of a moving object or material that travels a specific distance within a specific time; measured in metres per second (m/s).

Voltage (E): the electrical pressure that causes current to flow through wires. Could be produced by a battery, for example; Measured in volts. Voltage between two points is similar to the pressure required to move water, usually created by a pump.

Volume: the amount of space occupied by an object. Volume has two definitions that are important to understand when performing water system calculations. These definitions are:

1. Volume is the amount of space occupied by a three-dimensional object, often expressed in cubic units such as **cubic metres (m^3)**.
2. Volume is the holding capacity for liquid of a space or object, often expressed in units such as **litres (l)**.

Therefore, water can be expressed as a space measurement (cubic metres) or as a liquid measurement (litres).

Wastewater: water that carries wastes from homes, businesses and industries; a mixture of water and dissolved or suspended solids. Also called sewage.

Water: an odorless, tasteless, colorless liquid formed by a combination of hydrogen and oxygen and is a major part of all living matter.

Water Power (measured in kW) or Water Horsepower (measured in Hp): the power needed to do work. This assumes 100% motor and pump efficiency.

Weight: the measure of the amount of material in an object. In the metric system, the main unit for weight is the gram.

Weight of Water: 1 L of water weighs 1 kg.

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Weir: a wall or plate placed in an open channel used to control and/or measure the flow of water.

Whole Number: numbers we use everyday such as 1, 2, 3 and so on. They are called whole numbers because they are whole and not parts of a whole such as a decimal or a fraction.

Work (W): the energy needed to lift a weight a specific vertical distance; Measured in joules (J)