AGE Education Programme

# Water Filtration Methodologies

## Introduction

Water treatment processes are generally simple but have been refined over the years to be more effective and cost efficient. There are a variety of water treatment processes that suit different conditions, so it’s important to understand the differences so that the right process can be selected for any given situation.

## Sedimentation

Sedimentation refers to the settling of solids in water so that they can be removed. This is a natural process that happens in lakes and slow moving rivers.

## Coagulation

To improve the effectiveness of sedimentation, chemicals such as aluminium sulphate and ferric chloride are added to the water to bind particles that would not otherwise settle. The process causes the chemicals to become part of the larger particles, known as flocs, and they are therefore removed with the sediment when the water is filtered.

The most commonly used form of water filtration in the world is a combination of sedimentation, coagulation and flocculation. This process has been around since the early part of the 1900’s and is successful at removing nearly 100% of bacteria and viruses. This is because the bacteria and viruses normally adhere to the particles in the water.

The only downside of the sedimentation type of processes is that organic matter may be left in the water causing a discolouration, smell and/or taste that is unsatisfactory from a consumer point of view.

## Sand Filtration

Another simple method for removing small particles from water is to pass it through a filter of fine particles such as sand. Sand filtration has been around for over 100 years and is used in many countries around the world today.

Sand filtration doesn’t require the use of chemicals and is even capable of removing some bacteria. To improve the efficiency of sand filters, scientists realised that the slower the water passed through the sand bed the cleaner it became. As the filter matures, microorganisms adhere to the surface of the sand and then tiny particles in the water are attracted to this microbial layer.

The introduction of high pressure water filters and back-flushing systems has greatly improved the results achieved by this filtration method. Even better effectiveness has been achieved by combining coagulation and sand filtration systems. Coagulation enables the larger particles to be removed before the sand filter removes the remaining particles and bacteria.

## Membrane Filtration

Because the impurities in water are often particulates, a filter that allows only water to pass through is ideal. This is concept behind membrane filtration, where the size of the holes that the water passes through, known as pores, can be controlled to allow or block particles. These filters are made from various forms of plastic, creating very accurate pore sizes.

The size of the pore is reflected in the terminology used to describe various water filtration processes. These include:

* Microfiltration (0.1 microns) which removes bacteria
* Ultrafiltration (0.01 microns) which removes viruses
* Nanofiltration (0.001 microns) which removes liquid organic matter and some minerals

The only problems with membrane filtration are that the membranes can become blocked easily, they are more expensive than other filtration systems, and liquid organic matter can still pass through with the water, unless you use expensive nanofiltration, causing colour, odour or flavour problems.