



Water treatment

The integrated water cycle

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1. The importance of having drinking water

Drinking (or potable) water is defined as water that can be consumed without posing a health risk.

The World Health Organisation (WHO) considers water to be potable if it complies with the following requirements:

- It does not contain any substances harmful to health (biological, chemical or radioactive pollutants).
- It must have an adequate proportion of dissolved gases and mineral salts.
- It must be colourless, odourless and tasteless.

According to these basic premises, much of the fresh water available on the planet should not be consumed without first going through a purification process.



2. Drinking water throughout history

The Greeks were already aware in the fifth century of water's ability to transmit diseases and they recommended its filtration and boiling before ingestion.

The biggest water treatment plant built up until then was constructed in Paris in 1806, its process consisted of letting the water settle for 12 hours before filtering it through sand and carbon.

Then in 1827 the Englishman James Simplon built a sand filter for purifying drinking water, which today is considered the first effective system used for public health purposes.

In the field of disinfection, it was not until the early twentieth century that its use became common with the use of chlorine in the form of calcium hypochlorite. Although some years earlier, in 1897, it had also been used irregularly in Maidstone (England).



3. Drinking water treatment in the Community of Madrid

Canal de Isabel II commissioned its first drinking water treatment plant (DWTP), located in Torrelaguna, in 1967. Although it had previously constructed an ingenious system for diverting turbid waters from a supply canal to ensure they did not enter the El Villar reservoir, which operated for more than 40 years.

The water supply to the Community of Madrid that is treated by Canal usually comes from its source in good condition, whether it comes from surface water, from the Rivers Aulencia, Guadalix, Alberche, Sorbe, Jarama, Lozoya, Manzanares, Guadarrama, Aceña, Morales and Tajo, or from groundwater from the northern and central Tertiary detrital aquifer.

This quality is enhanced in its sanitary and organoleptic aspects in the 14 managed drinking water treatment plants, thereby ensuring the quality of the region's water supply. These plants are able to treat a total of 52.6 m³/s. The Colmenar DWTP, located in the municipality of Colmenar Viejo (Madrid), has the greatest capacity, with an individual treatment capacity of 16 m³/s.



3.1 Drinking water treatment processes

Water treatment is carried out using a series of linked processes that depend on the characteristics of the water to be treated. The most common sequence is the following:



Pre-oxidation

Introduction into the water of a chemical oxidising agent that is able to remove all oxidisable material, whether organic or inorganic.

Coagulation and flocculation

This process causes the clumping together of the particles responsible for the water's colour and turbidity.

Settling

When the water is almost still gravity will act to cause the particles and clumps formed in the previous process to become deposited, forming a sludge that is subsequently removed.

• Filtration

Is the retention of the particles that could not be removed by the previous process by passing the water through filters.

Neutralisation

Adjusting the acidity of the water using chemical reagents in order to avoid corrosion of the pipes.

Final disinfection

The addition of reagents, normally chlorine and ammonia to form chloramines to remove any microorganisms that may have survived the previous processes and ensure the quality of the water as it passes through the distribution network.

3.2 Sludge treatment processes

A targeted plan has been implemented in order to improve the ecological condition of the rivers where the effluents produced by the treatment plants are discharged and recover for supply much of the water that was previously discharged. This plan consists of equipping the drinking water treatment plants with installations for treating sludge.

The sludges accumulated during treatment, which are deposited during the settling phase, along with the water from filter washing is sent to these installations where they are subjected to a gradual process aimed at making them more concentrated (settling, flotation and mechanical dehydration) until they are finally deposited in a hopper for collection and subsequent final disposal.

) Watch a drinking water treatment video

See a table of DWTP



