



Arroyo Valenoso WWTP

The integrated water cycle • Sanitation

Arroyo Valenoso WWTP

Located in the River Guadarrama basin within the municipality of Boadilla del Monte, the Arroyo Valenoso waste water treatment plant (WWTP) services the local area.

The installation is designed to serve the needs of a 40,000 population equivalent (PE), is able to treat up to 12,000 m³ daily and to provide 2,000 m³ of reclaimed water a day.

 [Watch a video about Arroyo Valenoso WWTP](#)

In this installation the waste water passes through different processes that allow its subsequent use in the irrigation of green areas, in industrial uses or for street washing, depending on the criteria established by the applicable legislation regarding reclaimed water.

 [See images of Arroyo Valenoso WWTP](#)



Waste water treatment process

- **Pretreatment**

The waste waters are firstly subject to a sieving process in order to separate out all the large solids that could affect the subsequent purification process, the waters are also subjected to desanding and skimming. To achieve this the water passes through grates of decreasing size, which retain the debris. The removed materials are then sent to a controlled weir facility.

- **Primary treatment**

Once the larger debris is removed the water is subjected to a series of treatments to collect the small suspended particles and make them settle out.

Physico-chemical treatment

This procedure is used to cause the agglomeration of colloidal particles. The coagulation of these particles is achieved through the elimination of their electrical charges and the subsequent use of flocculants allows the uncharged particles to group together in flocs or clumps that, depending on their density, are removed from the water by subsidence or flotation.

In this plant, the treatment is carried out in two identical, parallel lines each one comprised of a mixing chamber and two flocculation chambers in series where the reagents are injected.

Lamella decantation

After this first process the water is deposited in two settling tanks where the sludges settle out. This process is facilitated by the slow circulation of the water. In this way the particles with the greatest density are deposited at the invert of the primary settlement tanks under the influence of gravity. These sludges are transported to a parallel line where sludge treatment is undertaken. The deposited sludges are removed through periodic purges and the removal of scum and floating materials is undertaken using skimmers that sweep the surface of the water.

If, under exceptional circumstances, the water received at the installation exceeds the biological treatment capacity the plant has an emergency physical-chemical treatment process. This consists of the addition of reagents to the waste water that are able to alter the physical nature of the particles that make up the dissolved solids so that they coagulate, forming larger particles that can be separated by subsidence.

- **Secondary treatment**

The Arroyo Valenoso WWTP is fitted with membrane bioreactor technology that allows the separation of the sludge and water through filtration, thus dispensing with the traditional secondary settlement process. The application of this technique yields a high quality reclaimed water in a installation that is smaller than conventional treatment plants. It is also possible to perform the whole process inside, so odours and noise do not escape and affect nearby towns.



The processes involving membrane bioreactors are comprised of two main parts:

Degradation of the different compounds present in the waste water:

This operation takes place in the bioreactor.

Ultrafiltration using the membrane bioreactor technology:

This consists of the physical separation of the biomass from the water by filtration through a system of ultrafiltration membranes. These ultrafiltration membranes are immersed in a tank in direct contact with the water and have a nominal pore size of 0.04 microns (μm), which results in the efficient retention of the suspended elements and of the remaining soluble compounds.

The filtered water is of excellent quality and it is extracted from the system for discharge to river or for subsequent reuse, while the sludge and the compounds that are larger than the membrane pore size are either passed to the sludge treatment process or returned to the bioreactor. This cycle is alternated with a short backwash in which the direction of flow is reversed, so the filtered water is forced from the inside to the outside thus cleaning the membrane.

• Tertiary treatment

In the tertiary phase, the water is subjected to treatment using ultraviolet light and sodium hypochlorite.

At the end of these three processes the effluent obtained is able to pass the most stringent requirements for reclaimed water.



Sludge line

The sludges derived from the process are directed to the sludge line where they are treated in the conventional way:

- Thickening. Increasing the concentration of sludges by eliminating water in order to reduce their volume.
- Stabilisation. Elimination of part or all of the organic material.
- Conditioning of the sludges for their subsequent dehydration.
- Dehydration or elimination of the remaining water in order to convert them into an easily handled solid.
- Storage for their subsequent use in agriculture or in cogeneration of electrical energy.

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