



Wastewater Regeneration Plant in Viveros de la Villa - Madrid

1/2



Location	Viveros de la Villa - Madrid
Customer	Madrid City Council
Construction period	16 months
Capacity	190,080 m³/day
Population	<1,000,000 e.i.

This Project formed part of the Second Madrid's Global Sewerage Plan (PSIM II) and was financed with cohesion funds of the European Union. The Viveros Wastewater Treatment Plant is located by the junction between the M-30 ring road and the A-6 highway, along the banks of the Manzanares River in Madrid City Limits. It collects the wastewater from the northern part of Madrid and the town of Pozuelo that is conveyed in two pipes with an average flow of 190.080 m³/day and serving an equivalent population of slightly over a million inhabitants.

The project increased the secondary treatment of the existing plant by 100%, incorporating the reduction of nutrients to this process, and including the construction of a tertiary treatment for all of the wastewater flow.

Under normal conditions this installation would require an additional 40% of land. However, by using areas within the plant grounds, that with the new technologies introduced no longer provided the desired purification results, 30,000 m² of land were freed for municipal parks and gardens.

From the outlet of the current primary decantation, the equipment was divided between the four biological lines (two already existing and two new ones). Two channels with close-off gates lead to the two new lines. Along the way they take the shape of Parshall type flow measuring channels with 4" wide mouth.

The water from the primary treatment is pumped to the secondary stage through a 1200 mm diameter impulsion pipe.

At the head of the reactor there is a pit to which the decanted water is piped. There you can find two Neyrpic type flow meters that distribute the flow to the reactors, as well as a close-off gate for each line.

Each of the lines has an 84 x 27 meters tank with a 6.40 m working depth.



Wastewater Regeneration Plant in Viveros de la Villa - Madrid

2/2



The biological treatment designed is a variation of the conventional activated sludge treatment. It has 2 anaerobic zones, 3 anoxic stages and 4 oxic stages with internal and external recirculation. All this guarantees an effluent with excellent results in the elimination of nitrogen and phosphorus by biological means.

The air required for the biological treatment is supplied by seven powered blowers, one on stand-by, that are controlled by frequency variators based on data from dissolved oxygen meters. The injection system in the oxic zones consists of membrane diffusers.

By using selectors, the process creates the conditions necessary for only specific types of microorganisms to develop - those that are capable of using the energy contained in the polyphosphates previously stored to transport and store the BOD whereby it is certain that they will survive and multiply.

The anaerobic zone of the reactor is a biological selector for microorganisms capable of storing phosphorus, allowing them to dominate the sludge culture by monopolizing the food supply. The following are some of the numerous operational advantages of this system:

- It improves operations by working with high mass load values, implying a smaller biological reactor and optimizing the space available.
- It improves the process stability by interiorizing the BOD to be used by the anaerobic selector whereby it is quickly reduced to the levels of the effluent. This makes it possible to obtain an effluent of uniform quality when there is high organic pollution.
- It considerably improves the settling characteristics of the sludge from secondary decantation.
- Biological reduction of the phosphorus in the treated water, to levels around 2 mg/l without having to add reagents or producing additional sludge.
- Lower oxygen consumption since the BOD supplied does not have to be totally oxidized as a result of the BOD absorption mechanism in the selector.

The decantation is formed of four suction elements with a 43 m diameter and 4.20 m depth. German ATV standards were used to determine their size.

The main octagonal shaped distribution point has three functions: to distribute the water from the biological stage to the four settlement tanks, there being gates to shut off any of them; to collect the decanted water that is directed to filtration; and to collect the sludge produced in the secondary stage and send it to the pumping pit.

The tertiary sewage treatment uses a system of low load loss sand filters, especially designed for treating sewage, with proven results and a treatment capacity of 2.2 m³/s. Previously, physical and chemical treatment was used in two lines, each consisting of a fast mixing chamber in which coagulant was added to the raw sewage in two flocculation chambers with variable speed stirrers (decreasing) in which polyelectrolyte was added to form hydroxide flocules which were later retained in the filter bed.

The new installation consists of eight open filters with a single bed of sand supported by gravel underneath, operating by gravity at a constant level, backwashed by water with a false lower bottom equipped with filtering nozzles divided into independently functioning cells. This type has the following advantages:

- It requires a very small load loss compared to others in which the high water load loss usually requires the installation of intermediate raw sewage pumping.
- The washing water flow is very small with almost no loss of sand.
- The filters are continuously washed by water in the cells without needing to take them out of service.
- Since the filtered effluent is used for the back washing, the additional building of a tank is not required.

DRACE medioambiente is 100% responsible of the design and building of the whole Project (MEICA & buildings, civil construction, and tests on completion).