

Municipal Wastewater Treatment Plant in Miajadas - Cáceres

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Location	Miajadas - Cáceres
Client	Junta de Extremadura
Construction period	42 months
Capacity	5.400 m³/day
Population	21.500 e.i.

The Municipal Wastewater Treatment Plant in Miajadas was built for a population of 21,500 equivalent inhabitants to serve this city, its industrial complex and Escorial. The process chosen is extended aeration with nitrification-denitrification, which permits small variations in the basic parameters set, is easy and efficiently operated and has a low cost of maintenance.

The average flow at the treatment plant is 5,400 m³/day. The preliminary treatment is designed for three times this amount and the biological treatment can handle twice as much.

There is sufficient space on the plot to double the facilities located there today.

The waste water reaches the treatment plant through three pipelines that formed part of the original project. The first sewer collects wastewater from Miajadas, is 1,442 meters long and has a diameter that varies between 700 mm and 1000 mm. The second sewer comes from Escorial, is 4,047 meters long and has a diameter of 400 mm and the last collects the wastewater from the Miajadas industrial complex, is 5,970 meters long and has a 700 mm diameter.

Water line

The water line begins at the inlet of the treatment plant where the above pipelines come together. This unit has a safety overflow weir and gate so the wastewater treatment plant can be isolated if necessary.

Next is the solids pit where the heavy material settles out for removal. It has a surface area of 11.75 meters, is equipped with a 100 lt clam-shell hanging from the overhead crane in the preliminary treatment building. The trash rack with 80 mm openings in the grid is located before the pumping chamber.

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The plant's pumping station has four submersible centrifuge pumps, each with a capacity of 224 m³/h flow. Three of them are in operation while the fourth is on stand-by.

The preliminary treatment stage includes the following operating units:

- Elimination of solids (trash racks) in the two 0.70 meter wide lines of the channel with 40 mm openings, with a manual by-pass screen.
- Elimination of solids (fines screens) on the two 0.70 meter wide channels with 3 mm openings.
- Grit/grease removal unit (using air) along the two 11 meter long lines, the one for grit being 1.05 meters wide and the other, for de-greasing, 1.95 meters wide.
- Concentrators and storage for sand and grease.
- Transport and storage for the waste collected at this stage.

Upon leaving the preliminary treatment stage, the flow is measured by an electromagnetic flow control device installed in the pipe. Afterwards, there is a pit with an overflow weir leading to a secondary by-pass and from there the water goes through two pipes, one to each biological treatment line, with flow meters similar to the one mentioned above.

The extended aeration biological treatment with nitrification-denitrification, includes the following operational units:

- Biological reactor in closed channel and fine bubble Heration in two lines with a unitary volume of 3,245 m³, with nitrification and denitrification. 4,000 mg/l of solids are concentrated in the reactor. This requires an air flow of 3,133 m³/h.
- Secondary decantation in two units of 20 meter diameter.
- Extraction and evacuation of floating material to preliminary treatment.
- Elimination of phosphorous by adding ferric chloride.

The effluent is disinfected in a 120 m³ contact tank using sodium hypochlorite as an additive. The treated water is measured electromagnetically and dumped into the Arroyo Nuevo.

Sludge line

The sludge from the secondary decantation unit goes to the pumping station where it is recirculated to the biological treatment using three 224 m³/h of unitary volume pumps, one on

standby. The excess is conveyed to the thickening unit by two 35 m³/h submersible centrifuge pumps, one on standby. The gravity thickening process for the biological sludge consists of a 262 m³ round tank with a 10 meter diameter.

The sludge is mechanically dehydrated by a 7 m³/h spinner resulting in 22% dryness. It has been sized to work 8 hours a day from Monday to Friday. The thickened sludge is pumped to the dehydration unit by two helicoidal screw pumps with a polyelectrolyte dosing device to eliminate the water. The dehydrated and stabilized product is lead to a 25 m³ storage hopper by a conveyor screw.

Auxiliary installations

The wastewater treatment plant has two buildings.

The first is an industrial bay with a metallic structure, sandwich type roof and two-toned, ribbed sheet metal façade. It contains the preliminary treatment, the transformer station and MCCs, the dehydration and industrial air supply unit as well as an overhead crane and hoist block system. The second was built *in situ* and is used by the staff for follow-up and control tasks using automatic devices and computers.

Other auxiliary installations include the drinking water network, the drainage system for apparatuses and supernatants, outdoor lighting and the compressed air unit. Here the preliminary treatment, dehydration and thickening processes, the latter with a polyester top. The deodorization is done with active carbon filters that, considering that the volume of gasses to be treated is over 10,000 m³/h, represent 6 renewals per hour.

The phosphorus content is reduced by co-precipitation, adding a metallic salt (ferric chloride) at the inlet to the biological reactor.

The following table shows the amount of contaminants eliminated in the biological treatment:

	Input	Outlet
DBO ₅	310 mg/l	20 mg/l
TSS	465 mg/l	25 mg/l
N-NTK	55 mg/l	8 mg/l
N-NO ₃		7 mg/l
N total		15 mg/l
P	10 mg/l	2 mg/l