

Enlargement of the Biological Treatment at the Wastewater Treatment Plant in Besós, Barcelona

1/2



The biological treatment unit at the Besós treatment plant was enlarged to improve the quality of the water along the shoreline north of Barcelona. This plant serves most of the capital city of Barcelona plus five other towns.

Location	Barcelona
Customer	Depurbaix
Construction period	36 months
Capacity	525,000 m ³ /day
Population	2,800,000 e.i.

The treatment plant in Besos has a design capacity of 2,800,000 equivalent inhabitants and currently is the plant that treats the largest flow of municipal wastewater in Catalonia.

This totally covered and deodorized facility is integrated in the new urban setting of the zone in which it is located.

Due to the lack of space available in the area, the most advanced technologies of compact design were used.

Characteristics of the water:

	Inlet	Outlet
BOD ₅	325 mg/l	<25 mg/l
SS	300 mg/l	<35 mg/l
DOQ	725 mg/l	<125 mg/l

Characteristics of the biological sludge:

Concentration in the thickening process	>5 %
Yield in thickening	>90 %

Description of the facility

Intermediate pumping

A pumping station is located at the outlet from the primary treatment to lift the water to the biological treatment unit. This station has six axial-flow pumps, each with a capacity of 6,900 m³/h to 4 meters height.

Biological reactor

Water is fed to the biological treatment unit through two channels that distribute it to 9 biological reactors, separated into two groups that work independently. Eight lines are equipped, leaving the ninth for an expansion in the future.

The biological process involves an active sludge process headed by two anaerobic selectors and one facultative selector in series, followed by the oxic zone.

The total volume of the 8 equipped lines of the biological reactor is 112,500 m³ with a water height of 7.5 meters. The air is supplied by four 38,000 Nm³/h turbo-compressors at 850 mbars with a 1250 Kw motor.

No. of mixers in selector:	24 units
Turbocompressors:	4 of 38,000 Nm ³ /h
Power installed in aeration:	5,000 kW
Diam. turbocompressors impulsion pipe:	2,000 mm
No. of diffusers:	45,000 units
Equipped biological reactor volume:	112,500 m ³

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2/2



Secondary sedimentation

Two channels distribute the mix liquor to a total of 18 secondary settling tanks divided into two groups that work independently. At this time, 16 of these sedimentation tanks are equipped, leaving the equipment of the remaining two for a later date.

In order to optimize the use of the space available, the sedimentation tanks were built as rectangular tanks on two levels, a unique layout for Europe. The surface area of each one is 840 m² on each level giving a total of 1,680 m² per tank. Each sedimentation line has five sludge collection pipes. Four are longitudinal and one is transversal. They were built using plastic chains and scrapers.

The treated water is conveyed to the sea through a marine outfall.

Sedimentation surface area:	26,880 m ²
No. of sludge collection pipes:	80 units
Total chain length:	15 Km
Total no. of scrapers:	1,520 units
No. of isolation penstocks:	72 units

Biological sludge recirculation and surplus production

The sludge is removed from each decanter by direct aspiration with sixteen 1,200 m³/h horizontal centrifuge pumps that convey it to two 1,500 mm diameter general recirculation pipes, one for each group of settling tanks and reactors. The exceeding biological sludge goes to the thickening building through two 400 mm diameter pipes.

Sludge thickening

The biological sludge is thickened by four 225 m³/h centrifuges, each with concentration capacity of 5% at the outlet.

The thickener return flow goes to the head of the plant while the thickened sludge goes to the dewatering and thermal drying units for treatment.

Ventilation and deodorization

Air for the plant's forced ventilation is taken from the Forum Public Square located above it. The air is filtered and dehumidified before it is distributed through the ducts to the plant's galleries, the basement levels and the power rooms with the electric boards. From the end of the galleries it is also sent to the biological reactors and the secondary sedimentation tanks working from the first part through to the end of the line. Finally, the ventilation air together with the air from the biological process is sucked through a deodorization system and released into the atmosphere through a stack with a 2 m diameter rising 20 meters above the square. It has a considerable dispersion effect.

The system to treat the air taken from outside has a design capacity of 90,000 m³/h input air at 30°C and 80% relative humidity. The end purpose is that the conditions in the treatment plant do not provoke condensation or corrosion of the equipment.

The electric rooms are equipped with their own ventilation and cooling system that takes outside air from the filtering and dehumidification system. Nine 300,000 m³/h helicoidal fans were installed for the covered spaces built to operate this underground facility.

The treatment system used to deodorize the plant is of the chemical absorption type that combines the absorption effects of active carbon with the chemical reaction of the admixtures in the washing towers.

