

Psyttalia Wastewater Treatment Plant



The Psyttalia WWTP is the main wastewater treatment plant in the greater Athens area, receiving an average wastewater flow of approximately 730,000 m³/d. The Psyttalia WWTP capacity is 5.600.000 p.e., being one of the biggest WWTPs in Europe and worldwide.

The Psyttalia WWTP facilities include wastewater pretreatment at Akrokeramos (on the Attica mainland), comprising debris removal, screening, grit removal and odor control units, as well as a smaller pretreatment unit at Kynosoura, on Salamina Island. Pretreated wastewater is piped to Psyttalia Island, by means of submerged pipes, so as to undergo primary treatment, producing primary sludge. Primarily treated wastewater further undergoes advanced secondary biological treatment, using activated sludge processes, achieving both organic load removal and a considerable reduction of nitrogen load in the biological stage, which comprises bioreactors and final settling tanks, where biological sludge sedimentation clarifies the treated wastewater. The Psyttalia WWTP final effluent is being received by the Saronic Gulf through gradual deep disposal by means of a system of submerged outfall pipes. By then wastewater treatment has achieved suspended solids and organic load reduction by about 93% and total nitrogen reduction by about 80% in comparison with influent loads. Part of the effluent undergoes filtration (through sand-filters) and disinfection (by means of UV devices) so as to be reused as process water for the facilities on Psyttalia Island.

Primary sludge and surplus activated sludge removed from the final settling tanks constitute the raw material for biosolids production, namely the organic residue of urban wastewater sludge treatment, which can be beneficially utilized. At Psyttalia WWTP installations sludge treatment includes thickening (by gravity in tanks for primary sludge and in belt thickeners for the surplus activated sludge), followed by digestion (anaerobic, mesophilic, high-rate) for the thickened sludge mixture, digested sludge dewatering in centrifugal decanters and eventually dewatered sludge thermal drying in rotating drums.

The sludge drying unit final product (120 – 150 t/day with approximately 92% dry matter) is a renewable source of energy and it is being utilized as secondary fuel in cement factories and power stations.

Sludge mixture anaerobic digestion produces biogas, consisting of approximately 61-65% methane (CH₄) and 34-38% carbon dioxide (CO₂).

Biogas produced at Psyttalia WWTP is a renewable source of energy and it is being utilized as the fuel in two CHP plants, totalling 11.4 MWe. Additionally a 12.9 MWe CHP plant using natural gas operates at Psyttalia, supporting the operation of the sludge thermal drying unit. The CHP plant system provides a considerable part of the heat needs of Psyttalia WWTP (for sludge digestion and drying) as well as its electric power needs, whereas surplus power is being sold to the National Power Grid Manager.

Psyttalia WWTP grounds, both at Akrokeramos and on Psyttalia, include extensive green areas. Especially on Psyttalia, green coverage has been enhanced since 2008, through a grove that has covered the surface of the former temporary sludge storage areas, which were fully restored and planted.

The operation of the Psyttalia WWTP achieves continual protection, revival and enhancement of biodiversity in the Saronic Gulf ecosystem. As the biggest environmental project in Greece, the Psyttalia WWTP contributes vitally and, to a considerable extent in a sustainable manner (biosolids utilization, biogas utilization, reuse of treated effluent) to environmental protection in Greece.

General Description of Psyttalia WWTP facilities

Wastewater pretreatment works at Akrokeramos (Pumping, Screening, Grit Removal, Odor Control).

Six rectangular primary sedimentation tanks, with dimensions (in m) 100 x 20 x 3 and total volume 36,000 m³.

Twelve bioreactors with total volume of 298,000 m³.

Sixty four final settling tanks with total surface area of 52,000 m².

Three sand-filters for process water production, with a combined capacity of 1,500 m³/h.

Two UV disinfection systems, with a combined capacity of 600 m³/h.

Three covered, cylindrical, primary sludge pre-thickening tanks, each 25 m in diameter and approximately 5 m deep, with a combined volume of 7,380 m³.

Fourteen belt thickeners, each with a capacity of 150 m³/h.

Eight closed, cylindrical sludge digestion tanks, each 30 m in diameter, with a combined volume of 80,000 m³.

Four cylindrical, sludge storage tanks, with a volume of approximately 2,900 m³ each and two rectangular storage tanks with a volume of approximately 2,590 m³ each.

6 Centrifugal decanters each with the capacity of 70 m³/h.

Four sludge thermal drying lines, each with an evaporation capacity of 8.6 tn/h.

Two gas-holders, each with a capacity of 5,600 m³.

A 7.14 MWe and 10.35 MWth CHP plant, utilizing biogas in three gas-engines.

A 4.25 MWe and 6.80 MWth CHP plant, utilizing biogas in two gas-engines.

A 12.9 MWe and 17.3 MWth CHP plant, using natural gas, in a gas-turbine / generator assembly.

System of submerged outfall pipes.