



Future-Ready Wastewater Treatment

In October 2001, the City of Barcellona Pozzo di Gotto issued a build-operate-transfer (BOT) call to address major deficiencies at its activated sludge (AS) water resource recovery facility, built in the 1970s. The facility could not effectively treat wastewater from both the municipality and nearby citrus and dairy industries, leading to illegal discharges, environmental damage, and difficulties handling seasonal population surges. On the island of Sicily, waste activated sludge (WAS) management further complicated operations. The AS process generated large volumes of biosolids, but very few facilities were available for their safe and economical treatment.

To comply with stricter European Union regulations and improve performance, the city needed to expand and retrofit the facility. The goals were to increase capacity by 2.5 times to treat a pollutant load of 110,000 population equivalent (p.e.), expand by 3.2 times to reach an average daily flow of ~26,900 m³/day (7.1 million gallons per day [MGD]), and reduce WAS management challenges. However, the project had to be completed within a restricted site footprint of just 2,630 square meters (0.65 acres). VRT Technology was selected as the winning proposal because it resolved these issues while using less than half the available land area, offering the best cost-to-benefit ratio.



REDUCE



REGENERATE



BARCELLONA POZZO DI GOTTO, ITALY



WASTEWATER



INDUSTRIAL



CHALLENGES FACED

The utility must keep the existing AS WRRF fully operational throughout construction and commissioning while completing all work within a demanding 300-day deadline. The expansion must fit within the current site boundaries, and it needs to ensure reliable treatment of highly polluted industrial wastewater, which places added pressure on operations. Finally, the utility is tasked with reducing both biosolids production and electricity consumption without compromising overall treatment efficiency.

TECHNOLOGIES & SOLUTIONS USED

VRT 4.0 Technology is a secondary and tertiary treatment with biologic nutrient removal and complete removal of WAS organic fraction. It is also suitable for digestion, reduction and stabilization of primary and secondary WAS produced on conventional WRRFs. The core of VRT 4.0 Technology is a continuous underground aerobic vertical biodigester that combines principles and benefits of time-tested technologies, with the most advanced computational fluid dynamics modelling and simulation tools.

IMPACT & INSIGHTS



The facility produces about 1,777 metric tons (1,960 tons) of Class A biosolids annually from an average daily flow of 5 MGD, roughly 83% less than a conventional AS WRRF. Following thermal drying and briquetting, fewer than 500 tons of dry, mineralized Class A briquettes are produced for final disposal. Thus, it becomes economically feasible to fully eliminate PFAS in biosolids by pyrolysis. Currently, biosolids management costs less than \$150,000 USD per year, providing significant savings compared to conventional solutions. The average energy consumption for wastewater treatment with biological nutrient removal is 0.3 kWh/m³.

LESSONS LEARNED



Innovation in the water sector is often slow and complex, hindered by the caution and accommodations of key stakeholders. In this case, advancements were made because the risks of adopting new solutions were lower than the costs of relying on conventional approaches, which carried strict compliance deadlines and potential legal liability for public officials. For private-sector recipients, long-term security is key. Medium- to long-term contracts covering design, supply, construction, and operation, and ideally including partial or full financing under a build-operate-transfer model, can give investors the confidence needed to support innovative projects.

“

Since April 2022, the facility has operated 24/7 off the grid, relying solely on the energy generated by a 300 kW PV power plant, making it one of the most sustainable WRRFs in the European Union.

”