

# Powering a sustainable future

## Acqua & Sole drives energy and circular economy innovation



Established in 2007, Acqua & Sole is an Italian company at the forefront of biogas production, specializing in the design, construction and operation of cogeneration plants that convert organic waste into renewable energy. Acqua & Sole is also involved in the development of hydroelectric power plants and photovoltaic systems, further expanding its contribution to Italy's clean energy goals. Thanks to its visionary approach, Acqua & Sole supports the circular economy, reduces waste and promotes sustainable agriculture through the production of nutrient-rich fertilizers.

"Endress+Hauser's portfolio meets all our needs and helps us fully leverage our production capacities according to the most stringent standards."

Alfonso Bova  
Technical Director  
Acqua & Sole



**Acqua & Sole has developed an advanced biological process for the recovery and upgrading of organic matter at their facility in Vellezzo Bellini. The plant processes 120,000 tons of organic waste and wastewater sludge annually, converting it into sanitized and deodorized organic fertilizer, biogas and digestate. It is unique in Europe and serves as a hub for research, innovation, knowledge sharing and industrial and territorial symbiosis in the circular economy and sustainability sectors.**

As of 2020, the company has successfully implemented this process, recovering significant amounts of nutrients such as phosphorus, potassium and nitrogen. The digestate produced is used by surrounding farms to replace 70% of chemical fertilizers, enhancing soil fertility without emitting unpleasant smells or aerosols. This system not only helps to reduce the release of greenhouse gases but also maximizes the recovery of valuable nutrients. The biogas produced is upgraded to biomethane, which can be injected into natural gas grids or used as fuel for vehicles.

**The process** The process for the recovery of organic matter involves three main steps:

- Organic waste materials such as agricultural residues, food waste and sewage sludge are received and prepared for treatment.
- The substrate undergoes anaerobic digestion, producing digestate and ammonium sulfate, a valuable fertilizer. The digestate is sanitized and stabilized for agricultural use.
- The digestate and ammonium sulfate are stored and later used to enhance soil fertility, replacing chemical fertilizers.
- Additionally, the plant produces biogas, which is upgraded to biomethane. The biogas is compressed and treated to separate methane from carbon dioxide. The biomethane is then injected into the local gas grid or sold at a filling station at a favorable price.

**The challenge** Optimizing the biogas upgrading process presents key challenges in managing process complexity, ensuring the removal of impurities while safeguarding economic viability.



Efficient removal of impurities like CO<sub>2</sub>, H<sub>2</sub>S and water vapor is crucial for meeting biomethane quality standards, requiring continuous monitoring and rapid adjustments if needed. Maintaining economic viability is critical, as the costs of equipment, operation and maintenance can impact the plant profitability. Keeping up with technological advancements helps improve efficiency and reduce costs, while regulatory compliance ensures adherence to stringent biomethane quality and environmental standards. Reliable monitoring and control systems are necessary to ensure process stability and safety, allowing for smooth operation.

#### Our solution

- Advanced sensors and control systems enable real-time monitoring and provide accurate data on gas composition, pressure, temperature and flow rates, therefore ensuring the process operates within optimal parameters

- Reliable instrumentation helps detect and mitigate potential hazards, such as gas leaks or pressure build-ups, ensuring the safety of the plant and its personnel
- To guarantee reliable level measurement in the digester, free space radars are installed externally, hence minimizing maintenance effort and corrosion from aggressive media
- Reliable and robust optical analysis technologies ensure that quality specifications are consistently met, allowing biomethane to be safely injected into the grid

The Vellezzo Bellini plant is an example of efficient territorial symbiosis and bioeconomy that combines decarbonization and energy self-sufficiency with the circular economy and the use of renewable products. This approach promotes participatory sustainability and reinforces the positive impact on citizens and the surrounding agriculture. The longstanding partnership with Endress+Hauser has not only enhanced

operational efficiency but also ensured the economic viability of the plant. Shared values, such as a commitment to research and development, unite both companies and promote a fruitful partnership that contributes to a sustainable energy future.

*“We have been working with Endress+Hauser for over ten years. The products and solutions are first-class and help us to control the biogas to biomethane upgrading in a sustainable, efficient and safe manner.”*

Virginia Palomba  
Engineering and Process Manager  
Acqua & Sole

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