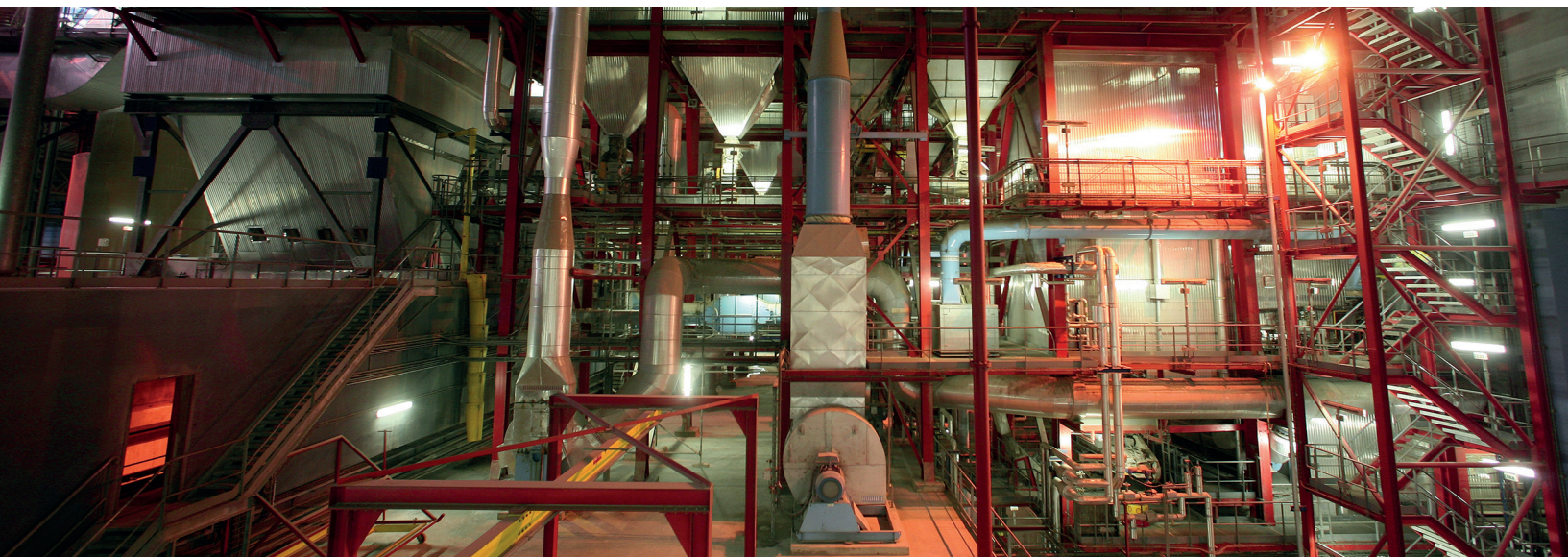


Water quality at waste-to-energy plants



Problem

Continuous monitoring of water quality is essential not only to ensure efficient operation, but also to protect the facilities of waste incineration plants. Our customer needed online monitoring to get reliable data on the quality of water entering the boilers, as well as the superheated steam to the turbine, and the demineralised water.

Solution

Hach[®] was awarded a contract to design, build and deliver a turnkey rack-mounted Steam and Water Analysis System (SWAS) for sampling and online monitoring of key parameters including silica, pH, conductivity and dissolved oxygen.

Benefits

Hach online instruments provide real-time measurements and improve process control. The need for routine manual checks is reduced, while reliability and consistency of the data increases.

Background

Veolia operates the Grand-Quevilly waste-to-energy plant to produce thermal and electrical energy. The site has three waste incineration furnaces that generate superheated steam. This then passes through the turbo generator to produce electricity with a nominal power of 32 MW.

The non-recovered energy is condensed and then returned by the feed tank. The efficient operation of these units is critical, as they run approximately 8000 hours per year and require precise control over various parameters to ensure optimal performance and longevity of the equipment.

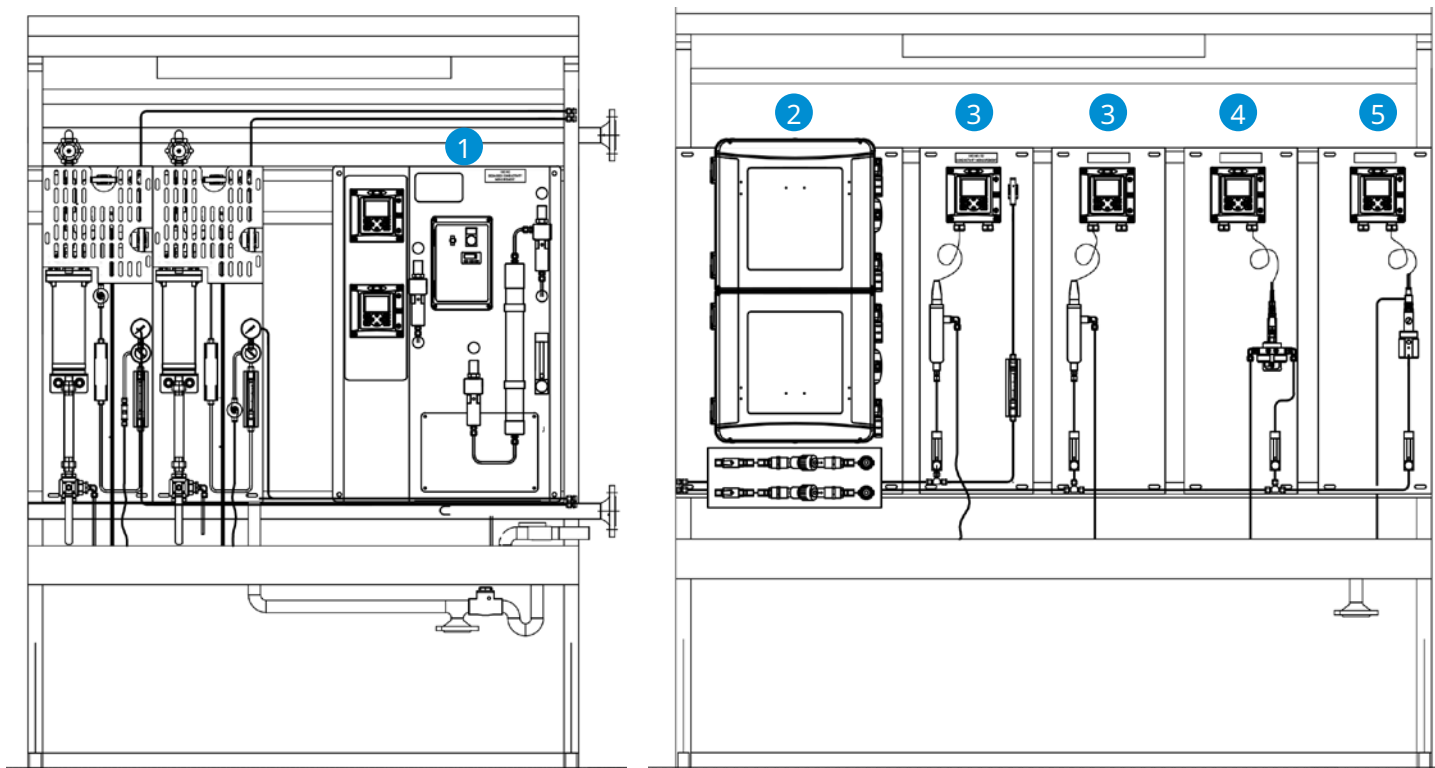
The primary challenge faced by the customer is the need to continuously monitor and maintain the quality of water and steam used for power generation. This includes ensuring the purity of demineralised water, the quality of feed water to the boilers, and managing the purity of the superheated steam entering the turbines. Any deviation in these parameters can lead to inefficiencies, equipment damage, and potential downtime, which would be costly and disruptive.

Initially, the customer regularly measured water samples in the laboratory, but the decision was then taken to switch to on-line measurement in order to meet the requirements of the insurance companies that cover its installation (in particular the turbine).

Another major challenge was the high pressure and temperature of the sample, which requires cooling and depressurisation to avoid damage to downstream water and steam quality monitoring analysers.

In addition, the limited space available on site for the installation meant that a compact, fully integrated solution was needed that could handle sample conditioning, while adapting to the space available.

The decision for such an analytical solution is driven by the necessity to ensure the longevity and efficiency of the incineration units, minimise maintenance costs, and comply with regulatory standards.



Technical drawing of the installation of two free-standing SWAS racks

By implementing continuous analysers, Veolia aims to enhance the operational reliability of their facilities, optimise energy production, and maintain high standards of environmental performance.

Having 24/7 online measurements in place ensures traceability on water quality, which in the event of a shutdown would be key information to get insurance coverage.

Solution

Water quality should be monitored using either laboratory measurements, online continuous analysers, or a combination of the two. Laboratory measurements offer a snapshot of the water chemistry at specific moments, but they do not predict changes that may occur in the following hours. To ensure that the water chemistry consistently meets the manufacturer's standards for boiler and turbine operation, continuous monitoring of the parameters is the most effective approach.

To ensure optimal operation and longevity of plant, a complete measurement system was installed to monitor quality of feed water, demineralised water, and steam going to the turbine. Monitoring feed water quality helps prevent impurities entering the system, which could cause fouling or damage downstream. High quality demineralised water is essential to prevent contaminants that might lead to scaling and corrosion in boiler and turbine. Finally, measuring steam going to the turbine is critical, as impurities can erode turbine blades. This can significantly impact efficiency and reduce lifespan of the turbine, resulting in plant shutdown with major technical and financial consequences.

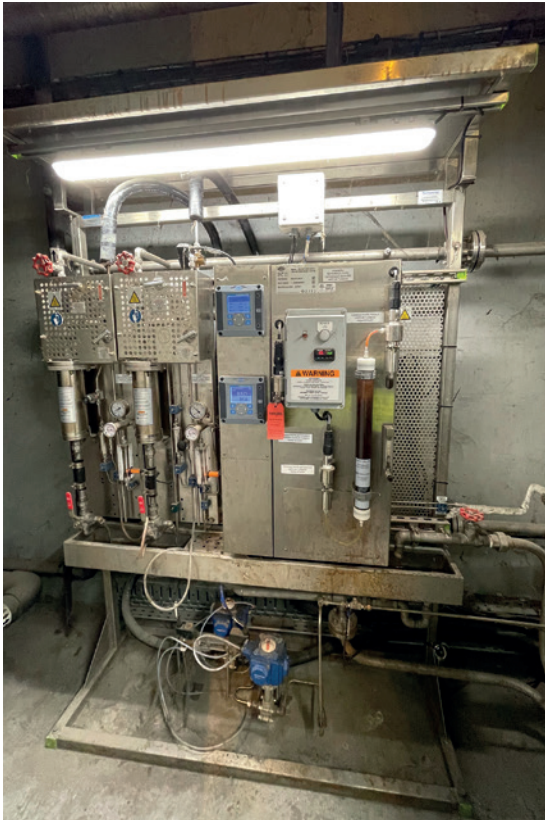
Parameters and instruments

- (1) Degassed Cationic Conductivity Panel (DCCP): Hach 9525
- (2) Silica: Hach 5500sc Silica analyser
- (3) Specific Conductivity: Hach 8315 Sensor and 9500 controller
- (4) pH: Hach 8362 Sensor for ultra pure water and 9500 controller
- (5) Dissolved oxygen: Hach 9582

Complete turnkey solution

Hach delivered a complete steam-water analysis system for project requirements:

- Three sample streams, two of them have high temperature and pressure
- Two stainless steel free-standing SWAS racks to fit in L-shaped space available near water tank
- Sample preparation panels including all necessary safety components to reduce pressure and temperature
- Common drain line
- Roof and lighting
- Hot blow down for purging steam
- Special cooling system to cool down purged steam
- Complete documentation file including layout, P&ID, wiring diagram, and project manual



SWAS rack 1 with sample panels and DCCP panel



SWAS rack 2 with silica analyser, controllers, pH, conductivity, dissolved oxygen probes

Benefits and improvements

Easy installation

Hach's standardised, configurable Steam and Water Analysis Systems (SWAS) are prefabricated on rack and include all necessary components to allow analysers to be easily connected to a hot and pressurised sample. It helps to protect and respect all safety and sample requirements. The modular, robust, and industrial design allows for easy installation, fast startup, and reliable operation.

Enhanced safety

The SWAS rack solution provides safe operation through shut-off valves for hot samples, safety valves for cooling water, protection screen for hot parts and certified pressure tests. By integrating a hot blow down purging option hot sample line is effectively cleaned to prolong the coolers lifetime and avoid clogging.

Efficient operation

Online instruments allow for real-time measurements of critical parameters like pH, conductivity, and dissolved oxygen. This allows for early detection of incidents like corrosive environment, leakage, etc. and the operator can respond quickly. Hach online analysers offer improved data quality and consistency by reducing variations in sampling and measurement techniques and by minimizing human errors, which becomes even more critical in low ppb ranges.

Minimised downtime

Continuous data collection and diagnosis by Hach's Prognosys diagnostic system allows for trend analysis and predictive maintenance, minimizing unplanned shutdowns and improving overall plant reliability. Thanks to Hach's Field Service Plus program regular maintenance, calibration, and certification are

performed on instruments by qualified Hach service technicians, ensuring quick resolution of any issues and minimizing downtime.

Cost savings

Hach's turnkey solution helped the plant to save costs in several ways:

- The online instruments allow real-time measurements, eliminating the need for manual checks and adjustments. This automation has reduced the labour required for routine monitoring by up to 15 hours a week.
- Online monitoring systems provide early detection of corrosion and scaling, preventing unplanned turbine shutdowns and reducing unexpected outages. This has helped the plant to avoid fines for failing to produce electricity in accordance with their contract. According to the site, this could go up to 200 € per hour of not producing electricity.
- The 5500sc Silica analyser offers a sample-in feature that allows for the rapid analysis of a grab sample poured directly into the analyser, providing immediate results without the need for extensive preparation. This easy-to-use function saves operators time and makes it easier to perform checks and validations.
- The SWAS panel integrates an efficient cooler design that ensures the need of less cooling water and a wide sample pressure and temperature range. Additionally, the regenerative cooling option of the degassed cationic conductivity panel eliminates the need for external cooling water, simplifying installation and reducing operating costs.

Conclusion

High purity water combined with appropriate chemical treatment is essential to control corrosion and scaling in waste-to-energy plants. Veolia needs to monitor the quality of water and steam to ensure safe operation and optimise the chemical treatment scheme.

Hach offers a comprehensive range of laboratory and online instrumentation to address water quality needs. Moreover, Hach is a single source supplier for turnkey complete solutions including sample preparation, panel and rack installations, and professional service.

Veolia's employees are satisfied with the operation of the online measurement system. It has increased the plant's safety and efficiency, as well as their confidence in their water quality management.



"Having improvements with online measurement specially Silica analyser have changed my life. With less manual intervention, everything run smoother and more efficiently."

Frédéric Leprince

Chemist / Prevention officer at the SNVE plant



About the customer

The SNVE waste-to-energy plant in Grand-Quevilly was established in 1986. It was designed to convert municipal solid waste into energy, significantly reducing the volume of waste sent to landfills and providing a sustainable energy source for the region.

Mission

Veolia manages more than 90 waste-to-energy facilities in the world to treat municipal solid waste while creating renewable energy. Their mission is to resource the world, helping customers address their environmental and sustainability challenges in energy, water and waste. By producing energy from waste, use of fossil fuels is limited, and waste volume and landfill costs and subsequently environmental footprint is reduced.

Vision

Veolia's vision for the SNVE plant includes continuous improvement in process efficiency and energy recovery. The company aims to enhance the plant's performance, ensuring it meets regulatory standards while providing reliable energy to the local community.

