

Recording & Control

Online data recording and control in anaerobic digestion processes



Optimizes process efficiency and satisfies legislative requirements

Measurement made easy

Efficient operation
of sewage and sludge
treatment plant

Introduction

Solids present in wastewater need to be safely and comprehensively treated and removed. This means not only removing toxic compounds, including both organic and inorganic materials such as heavy metals, but also eliminating any harmful bacteria present in the solids.

The process

Anaerobic digestion is the process by which micro-organisms break down into biodegradable material in the absence of oxygen. As such, the process can help to greatly reduce quantities of organic matter which might otherwise be dumped at sea, sent to landfill or incinerated.

In addition, methane gas from the breakdown of organic matter is increasingly being harnessed as a green energy source for both domestic and industrial purposes.

Many countries around the world have introduced environmental legislation covering solid waste disposal, such as the EU Disposal of Sludge (England and Wales) Regulation 2001 and has led to an increase in the use of anaerobic digestion processes, which can fall into one of two categories:

- thermophilic digestion, where sludge is fermented in tanks at 55 °C (131 °F), and
- mesophilic, where the sludge is treated at around 36 °C (96.8 °F)

Although thermophilic digestion has a shorter process time and requires smaller tanks, it is nevertheless the more expensive of the two techniques, as more energy is needed to heat the sludge. Whichever process is used, it is important to ensure that the sludge is properly treated to achieve the destruction of any harmful bacteria and parasites that may be present. This is particularly important where the digested sludge is going to be used as a fertilizer in agricultural processes.

Given the comparatively high cost of anaerobic digestion, it is important to optimize the digestion process efficiency to reduce costs and maximize the generation of methane gas.

The application

EU legislation focuses on a number of critical control points during the processing of sewage sludge. A key aspect of the legislation is the requirement for traceable, individual monitoring of temperature, mixing and content in order to achieve the destruction of harmful bacteria present in the sludge. It is also necessary to measure and record the retention time for the process to ensure that any organic matter has been treated for the correct period for it to be made completely safe.

This information is needed to provide evidence of compliance with the legislation. For example, in the UK, which has enacted EU legislation into the Disposal of Sludge (England and Wales) Regulation 2001, such evidence needs to be supplied to the Environment Agency, the regulatory body responsible for protecting and improving the environment in England and Wales.

The challenge

Differences in the feedstock used to encourage anaerobic digestion and the various types of digester used mean that the optimum temperature of digestion can vary. To help guarantee both sustained gas production and the complete destruction of harmful bacteria, it is necessary to ensure that temperature is maintained at the optimum constant level.



Different types of anaerobic digester can mean the optimum digestion temperature can vary

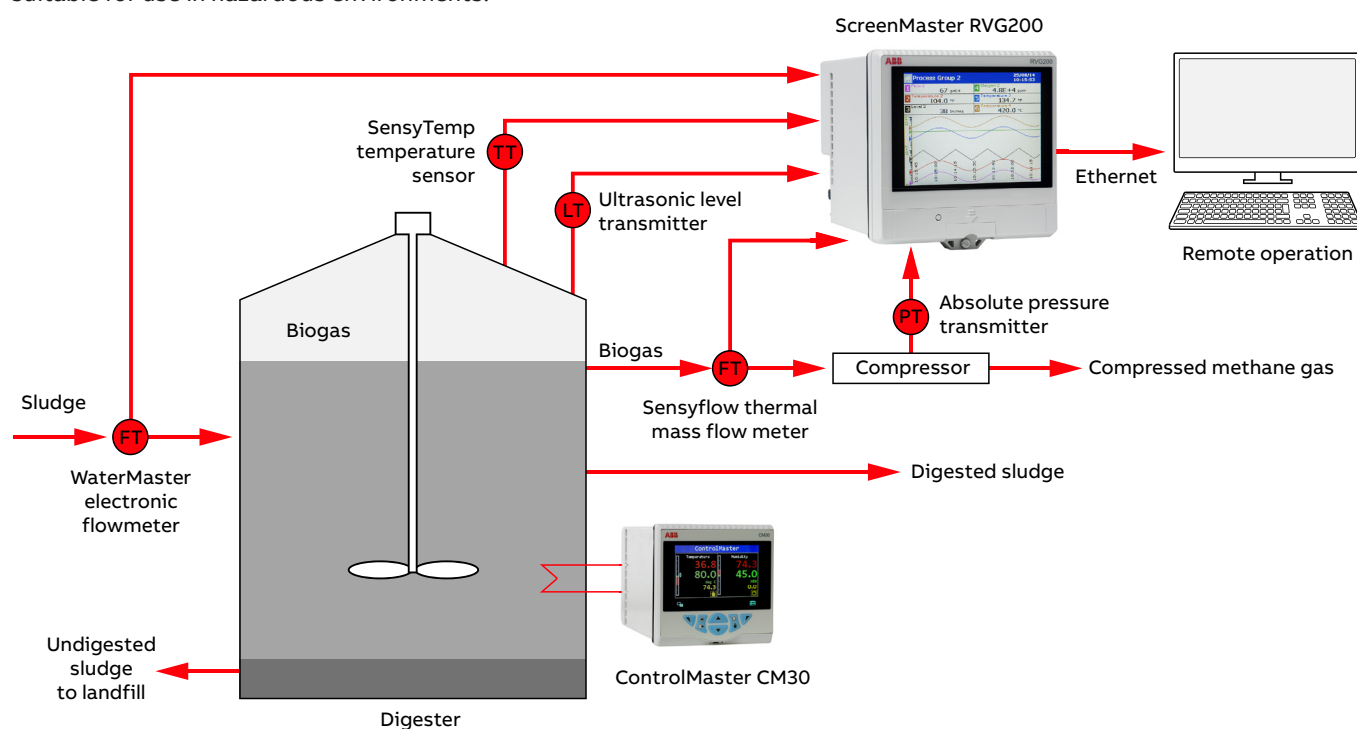
Where thermophilic digestion is used, there are also potential challenges associated with higher process temperatures and their greater sensitivity to variations in operating and environmental conditions. Given these challenges, it is important to ensure process conditions are precisely recorded and documented.

As methane is formed as a by-product of the sewage digestion process, there is also the potential risk of explosion, requiring any measurement instruments to be suitable for use in hazardous environments.

The solution

ABB's Measurement & Analytics business can offer a complete range of products to help you monitor and control your digester system. Typically temperature is measured at the top, middle and bottom of the digester and controlled using ABB's ControlMaster range of PID controllers. The temperature's values are also recorded using ABB's RVG200, state-of-the-art paperless recorder, alongside other key parameters such as Level, Sludge flow and Gas flow. ATEX approved flowmeters are used to measure the input sludge flow and methane gas flow.

The temperature, level and flow signals from these instruments, together with data from other equipment, such as sludge pumps and PLCs or other control systems used for mixer control, can be relayed via analogue signals or Modbus® communications to an RVG200 paperless recorder, for secure data storage. This data can be uploaded to a PC for subsequent analysis and reporting.



What ABB products are suitable?

ABB offers a full range of products and expertise that can help operators make sure that they comply with the requirements for anaerobic digestion applications.

RVG200

The RVG200 recorder takes the established operating and security benefits of the ScreenMaster range one step further. Features include touchscreen 'swipe' operation, front and rear USB ports for connecting peripheral devices (including a barcode scanner and keyboard) and Ethernet and RS485 communications. Up to 24 process signals can be connected to the RVG200's analog inputs or transferred to it via digital communications.

The integrated remote operation feature allows you to take complete control of your process from anywhere and anytime you like. Custom view feature allows you to create a pictorial representation of your process and gives you an ultimate view of your process.

As with all devices in the ScreenMaster paperless recorder range, the RVG200 features extensive security measures to protect against unauthorized tampering with process data, compliant with FDA 21 CFR Part 11 requirements. Standard security features include the ability to configure and allocate multiple users with individual password and access rights.

All recorded data is also securely stored by the RVG200's 256 MB of internal flash memory that can be expanded to 2 GB if required.

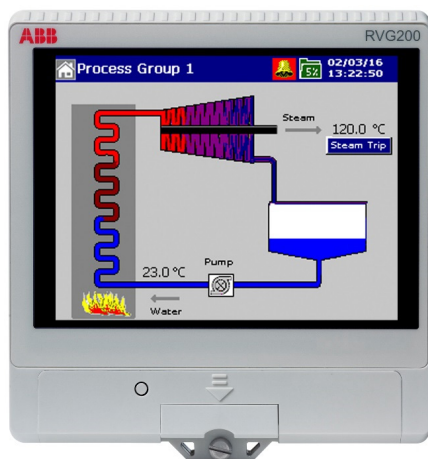


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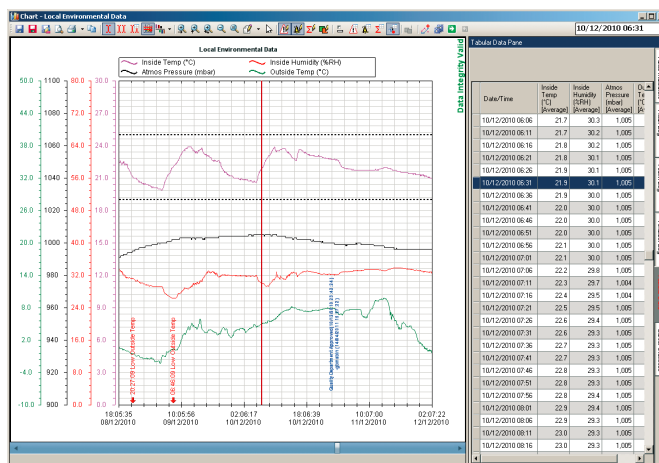
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DataManager Pro

ABB's DataManager Pro software enables operators to review and analyze data from multiple digesters at the touch of a button. Using Ethernet communication or cellular network (additional hardware required) you can fully automate the data collection from your remotely located digesters to a central hub.

Functions include the ability to compile graphical charts comparing multiple parameters, plus a dual cursor function enabling operators to review data for specific periods of time.

DataManager Pro also offers a range of presentation possibilities, including the ability to annotate specific alarms and present recorded data as a combined graph accompanied by tables and statistics.



DataManager Pro analysis software offers a powerful tool for reviewing recorded data

Once complete a configuration can be written to a ControlMaster via its front panel IrDA port or saved for future use. In addition ConfigPilot's report generation capabilities in Word®, Excel® or PDF® format hugely simplifies the creation of documentation. All of these powerful features are available for free and can be downloaded from:

abb.com/products/measurement-products/recorders-controllers.

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