

Aeration Control

Providing accurate and fast control of aeration processes in waste water plants



Great energy savings and quick return on investment

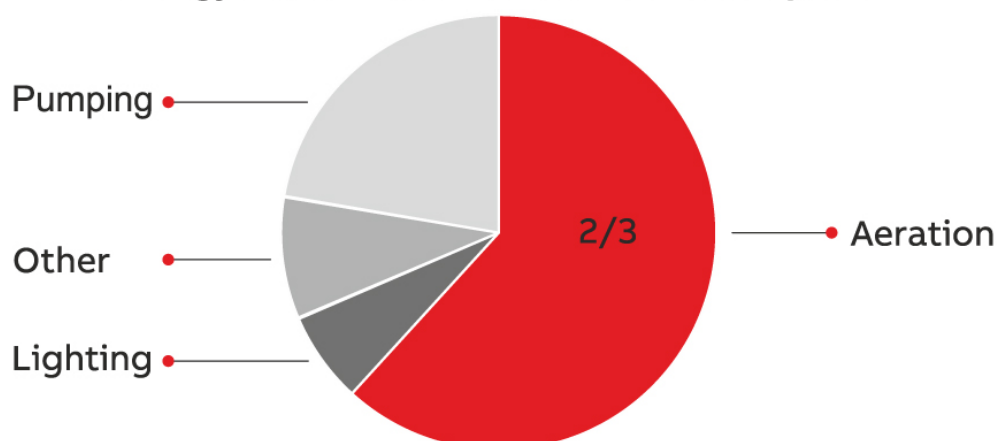
Measurement made easy

Introduction

Is excessive energy consumption from aeration draining your resources? Let ABB simplify your measurement.

With extensive range of products and expertise, ABB offers solutions for even the most challenging issues. ABB offers the following products to control your process.

Energy costs in a wastewater treatment plant



The process

Waste water, or raw sewage, is water that drains from toilets, sinks, showers, baths, dishwashers, washing machines , and liquid industrial wastes.

Raw sewage contain chemicals, biological contaminants, suspended solids, and gases that must be removed before the water can be reused or passed to a receiving environment such as the sea, rivers, lakes or canals.

A typical waste water treatment consists of 3 major stages:

1. Primary - pre-treatment
2. Secondary - sedimentation and aeration
3. Tertiary - filtration and disinfection

Of these three stages, secondary treatment is the most crucial part as this is where aerobic bacteria is allowed to consume the organic matter in the sewage through a process called aeration.

Most modern waste water treatment plants use an activated sludge process, which uses a culture of bacteria and other organisms to feed on the organic materials in the sewage.

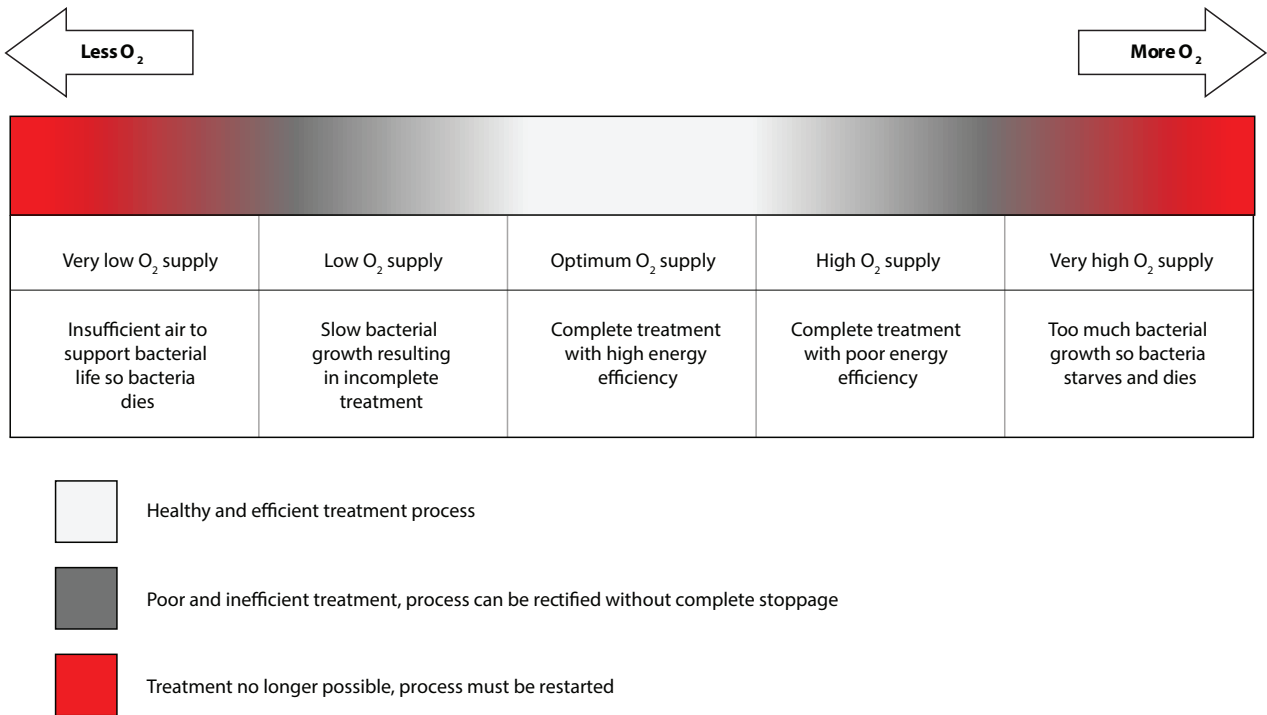
Aeration in an activated sludge process is based on providing an appropriate volume of air into aeration basins,

which promotes the bacteria and microorganisms to grow in the wastewater. These bacteria and microorganisms use dissolved oxygen to burn or break down organic waste into carbon dioxide, water and energy, aiding in the removal of pollutants.

Aeration in waste water treatment plants accounts for around 66% of energy use in wastewater treatment processes. Many treatment plants aerate 24/7 maintaining a higher dissolved oxygen level than necessary amounting to wasted energy and higher energy costs.

The efficiency of the aeration process purely relies on dissolved oxygen levels being controlled as closely and accurately as possible.

Under ideal conditions, dissolved oxygen levels should be maintained at between 1.5 to 2 ppm. If not enough dissolved oxygen is available, the aeration basins will be deprived of the oxygen needed for effective bacterial growth, negatively affecting the rate of sewage breakdown and impairing treatment process efficiency. If even less air is introduced, or no air at all, the bacteria will consume all the DO in the basin and die. In this case, the sewage treatment process stops until the process is restarted and bacteria is built up again, a procedure that can take up to few weeks.



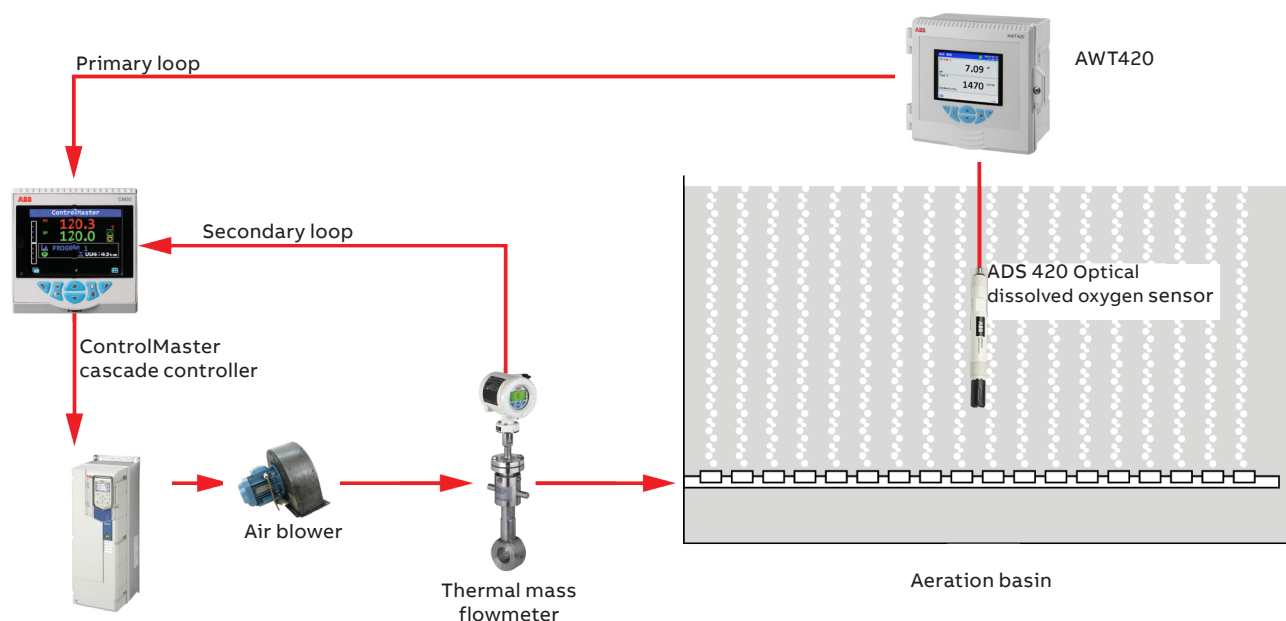
Too much dissolved oxygen can also have a detrimental impact. With aeration processes accounting for over half of a plant's energy costs, it is vital that their efficiency is optimized as much as possible. Failing to ensure tight control of dissolved oxygen greatly increases the risk of operators incurring excessive energy costs.

Moreover, if excessive air is injected into the basins, bacteria will grow beyond acceptable limits, organic matter in the basin will be consumed too quickly, and the bacteria will starve and die, also halting the process. Excess air can also have a negative impact on other processes, such as de-nitrification.

ABB's measurement and control products offers great energy savings by optimizing the aeration process. ABB's

dissolved oxygen sensing system coupled with ControlMaster PID controller and a flowmeter will deliver enhanced levels of accuracy and reliability in controlling your aeration process.

Precision control of the aeration process is achieved by connecting inputs from two loops i.e. air flow and DO to ControlMaster Cascade controller. ABB's controllers comes with preconfigured cascade templates which makes it easier to setup and commission. The cascade template connects two PID loops together in order to enhance the control of a primary loop (DO) by manipulation of a secondary loop (Air Flow). ControlMaster's cascade feature helps optimize the air flow and significantly reduces the power consumption, lower operational and maintenance cost.



What ABB products are suitable?

ABB optical DO system with EZLink

Comprising the ADS420 sensor and AWT420 multi-channel transmitter, the system utilizes the latest developments in optical measurement technology. Consistent, reliable and accurate, it can help operators to realize significant savings through reduced energy consumption and maintenance. ABB's EZLink plug and play technology automatically connects the transmitter and sensor, with no need for wiring or complicated configuration.

Available in the 2-channel version, the AWT420 can be connected to 2 probes, enabling monitoring at multiple points without purchasing and installing separate transmitters.



ControlMaster Controllers

Available in panel mount (CM10, CM30 and CM50) and field mount versions (CMF310), ABB's ControlMaster range of controllers is ideal for controlling the aeration process. ControlMaster's simple-to-use user interface delivers clear text prompts that make installation, commissioning and operation quick and easy.



Customizable full-color TFT display

With their full-color TFT displays, all controllers in the ControlMaster range provide operators with a clear and comprehensive overview of their aeration process.

Flexible communications

With a choice of either Ethernet® or Modbus® communications, ControlMaster controllers can be easily integrated into your control system. Ethernet communications can provide automatic notification of critical process events via email or remote monitoring of the aeration process via the ControlMaster's integrated webserver by simply addressing it in a standard web server.

Full environmental protection

With fully-sealed IP66 and NEMA 4X enclosures, our ControlMaster products offer full protection against water and dust ingress, enabling them to be used in even the most arduous operating conditions.

Historical trending

Short-term trending capability provides valuable information during commissioning as well as for drilling into the history of unattended processes.

Diagnostics

ControlMaster's diagnostic functions clearly display messages detailing fault conditions, abnormal process status and maintenance requirements. There is also the option of switching to an alarm and diagnostic status display to view any active messages.

...What ABB products are suitable?

ConfigPilot

ConfigPilot is the PC configuration platform for ABB's ControlMaster range of controllers. With an identical menu structure to the ControlMaster, ConfigPilot is instantly familiar. Configurations can be created from scratch off-line or read from a ControlMaster device.

ConfigPilot simplifies the use of advanced functionalities in Graphical displays for complex configuration items such as profile control and display customization make configuration quick and easy.

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/recorder.

The screenshot shows the ConfigPilot software interface. The title bar reads "ConfigPilot - *". The menu bar includes Home, New, Open, Save, Save As, Read, Write, Undo, Redo, Report, and Build. The right side of the menu bar contains Help, Settings, and About. The main window title is "Input/Output -> Analog Inputs -> Analog Input 1".

On the left is a "Parameter Tree" with the following items: Device Setup, Display, Input/Output, Analog Inputs (selected), Analog Input 1 (selected), Analog Input 2, Analog Input 3, Analog Input 4, Analog Outputs, Digital I/O, Relays, Control, Process Alarm, Profile, Totalizer, and Functions.

The main configuration area for "Analog Input 1" contains the following fields:

Input Type	Milliamps	Linearizer	None
Elect. Low	4 mA	Elect. High	20 mA
Eng. Dps	x.x	Eng. Units	l/h
Eng. Low	0.0 l/h	Eng. High	1000.0 l/h
Filter Time	0 Secs	Broken Sensor	Upscale
Fault Detect	10 %		
Pulse Units		Pulse/Unit	1

At the bottom, there are two status bars:

Instrument Type: CM30	I/O Build: 3	Functionality: Dual Loop	Comms. Module: None	No. Analog Inputs: 4	No. Analog Outputs: 2	No. Relays: 4
No. Digital I/O: 6 Config. Description:						
Instrument Type: CM30	I/O Build: 3	Functionality: Dual Loop	Comms. Module: None	Software Revision: /00.02.23E	Access: Read / Write	

More information about thermal mass flowmeters

Why are thermal mass flowmeters suitable for this application?

Thermal mass flowmeters offer a high quality and cost-effective solution for precise and dynamic direct mass flow measurement of air with good measurement performance at an economic price level.

Thermal mass flowmeters provide:

- **Direct mass flow measurement**
No compensation of temperature and pressure required
- **Wide measuring range of up to 1:150**
Measurement down to virtually zero
- **Low pressure drop**
No additional energy loss
- **Short response time**
Close control of the process
- **Best accuracy**
Efficient usage of precious gas

SensyMaster - our solution for air measurement in aeration basins

SensyMaster covers a wide range of gas flow measurement applications.

The combination of SensyMaster FMT430 or 450 and pipe components ensure highest measurement performance and state-of-the-art features such as:

- **Latest technology of sensor protection frames with optimized design.**
Longer maintenance cycles due to self-cleaning effect of thermal sensor
- **Best-in-class accuracy up to 0.6% o.r. and short response time <0.5 s**
Precise and dynamic process control
- **ABB common platform handling - common look and feel**
Intuitive operation reduces training and commissioning time with e.g. EasySetup
- **Modular I/O concept - up to 5 I/Os in one instrument**
Optimal tailoring to the application, even 3 current outputs are possible



SensyMaster FMT 430/450

- **SensorApplicationMemory**
Plug and play electronic replacement, no recalibration and manual parameterization
- **Application Selector for up to 8 applications**
One device out of the stock can be used in different applications in one easy set up step
- **Easy and reduced maintenance due to diagnostic and verification**
Predictive maintenance and extended service intervals save internal resources

User-friendly handling of up to 2 factory set applications with SensyMaster.

- Computer based parametrization via ABB Field Information Manager (FIM) with infrared adapter or HART-Modem
- Several diagnostic features included in every device
- Enhanced diagnostic including SensorCheck optional
- Computer-based verification report with clear pass or fail statement (ABB verification tool: SRV500)
- Onside diameter adjustment without recalibration
- Centering pin technology for quick and repeatable re-installation.

Conclusion

In conclusion, optimizing the aeration process in wastewater treatment is crucial not only for maintaining effective sewage breakdown and treatment efficiency but also for reducing operational costs and energy consumption. Achieving precise control of dissolved oxygen levels is paramount to preventing both under-aeration, which slows down bacterial activity, and over-aeration, which wastes energy and disrupts biological processes.

ABB's advanced measurement and control solutions, such as the ADS420 luminescent dissolved oxygen sensor and AWT420 transmitter, offer a reliable means to achieve this optimization. By integrating these technologies with ControlMaster PID controllers and FMT430 thermal mass flow meters, wastewater treatment plants can enhance their operational efficiency, minimize energy usage, and ultimately contribute to sustainable environmental stewardship.



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Measurement & Analytics

abb.com/products/measurement-products/a-more-measured-world-of-water



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