



EmiCo.™

Greenhouse Gas Analyzer

Product Brochure

VARIOLYTICS
Making the invisible visible.

EmiCo. | Greenhouse Gas Analyzer

Overview

The Variolytics Emission Control System (EmiCo.™) enables the wastewater industry to meet their emission reduction targets by mitigating nitrous oxide (N₂O) production in the treatment process. EmiCo is a patented measurement technology coupled with process optimization software, delivering wastewater utilities a system solution to reach net-zero.

What is the EmiCo. Analyzer?

The EmiCo analyzer houses a robust process mass-spectrometer that provides analysis of volatile compounds in the liquid & gas phase. The multi-parameter analysis runs automatic and delivers precise real-time measurements 24/7. EmiCo has a flexible design, with versatile integration options & measurement spots that can be increased as needed. The system is engineered to withstand the harsh environment of a wastewater treatment plant.

EmiCo. consist of the following modules:

- » Climate controlled cabinet
- » Heated probe and sample lines
- » Industrial computer
- » Vacuum pumps
- » Sampling system with up to 12 measuring spots
- » Process Mass-Spectrometer



Application & Benefits

What is EmiCo. used for?

The wastewater treatment industry is undergoing a green transformation on its path to net-zero. Currently, nitrous oxide and methane make up 70% of a plant operation's total greenhouse gas emissions. This can be avoided through improved process control. EmiCo provides the tools to do this, detecting direct emissions when they occur and mitigating them with the appropriate control strategies.



What are the benefits?

The optimization model enables state-of-the-art process control of wastewater treatment, focusing on low energy & chemical consumption in consideration of direct emissions. The benefits for wastewater utilities are:

- 1 Up to 50% reduction in total emissions (CO₂e)
- 2 Up to 20% reduction in energy costs (KWh)
- 3 Automated reporting on direct emissions for regulators
- 4 Reduced chemical demand
- 5 Increased visibility on the metabolism of the microbiology



Technology

How does the technology work?

The measurements from the EmiCo system are carried out using a process mass spectrometer. Mass spectrometry (MS) is an analytical technique that is used to measure the mass-to-charge ratio of ions. The results are presented as a mass spectrum, a plot of intensity as a function of the mass-to-charge ratio. Mass spectrometry is used in many different fields and is applied to pure samples as well as complex mixtures. Through our patented inlet system our MS can measure from the gas and liquid phase, making the analyzer unique on the market.

Your Path to Net-Zero



What can be measured?

Mass-spectrometry-based analysis has a large measuring range, with low detection limits from the ppb to the 100% range. EmiCo provides multi-parameter measurements in real-time from the liquid & gas phase. EmiCo is calibrated to measure the following parameters, in relevant concentrations for emission control in wastewater:

- » **Nitrous oxide (N₂O)**
- » **Methane (CH₄)**
- » **Oxygen (O₂)**
- » **Carbon dioxide (CO₂)**
- » **Nitrogen (N₂)**

Unique Selling Proposition

Why choose EmiCo.?

EmiCo is the first system solution for reaching net-zero in wastewater. The system goes beyond monitoring direct emissions. EmiCo provides a holistic picture of the state of the microbiology through its unique parameter set. The information is correlated with standard process data from the treatment process, providing a support system with control strategies for optimization.

- 1 Optimization mitigates N₂O emissions, while ensuring energy consumption is kept at a minimum and throughput at a maximum.
- 2 EmiCo analyzer can measure in 12 spots simultaneously, covering multiple lanes.
- 3 Robust, real-time measurements 24/7, with insights into the state of the microbiology – not just emissions.
- 4 Auto-calibration with reference gas prevents drift in the measurement result.

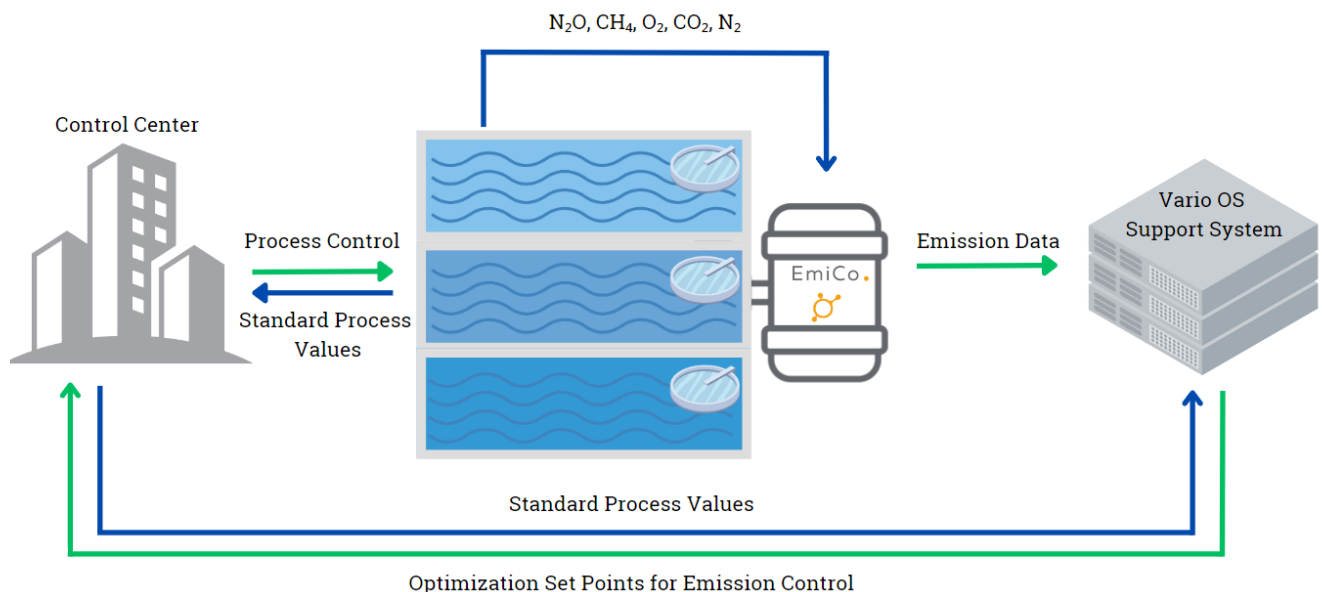


Your path to optimization

How do we optimize?

1. Data collection phase

EmiCo is installed at the aeration tanks of your sewage treatment plant and independently collects data on the formation of nitrous oxide (N_2O) and methane (CH_4), as well as on the state of the microbiology (O_2 , CO_2 , N_2). The real-time values of N_2O & CH_4 are made visible and allow you to report your direct emissions. Gain insights on how events throughout the year affect your treatment process in relation to direct emissions. The measurements are transferred to our software and correlated with your other process values, to formulate optimized control strategies.



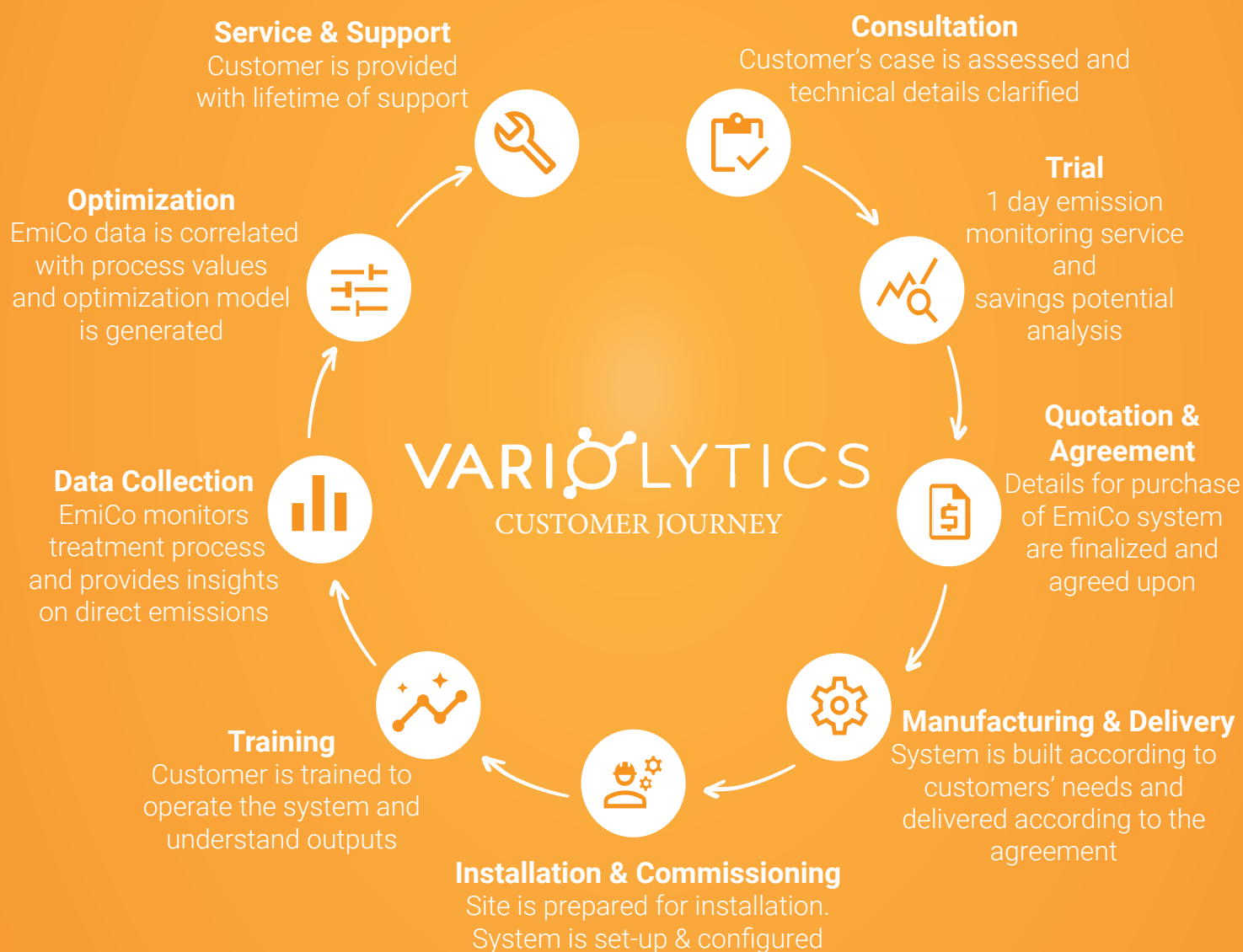
2. Optimization phase

The optimization model is generated through the learning phase of an artificial neural network (ANN). The ANN learns from the data provided. It is supported by classical mathematical methods. After successful validation, i.e. proof of prediction quality, it can be used to support plant control. The model is examined from different angles (e.g.: correlation analysis, statistical analysis, sensitivity graphs). These tools make the model transparent for the operator. The model displays current forecasts for expected process values. Operators can compare these values with current values of their plant and trigger targeted control activities. A “what if analysis” with the help of the model confirms whether changes to the process are possible without risk. The possible control variables are generated according to the principles of mutation and selection.

Customer Journey

EmiCo represents the most advanced process control system for water utilities and provides the industry with a path to net-zero. We excel in manufacturing reliable, serviceable and cost-effective system solutions for our customers that pave the way for a more sustainable future. We take pride in our innovation and are committed to building long lasting relationships with our partners. Together we can shape a better future.

Ready to take the next steps with us?



Pricing Options

Which option is right for you?

We understand that your business has CAPEX or OPEX constraints. Therefore, we provide flexible purchase options that fit to your business. The EmiCo system is offered as a full-service rental or as a direct purchase. Customers can also choose to start with the rental option and purchase the system at a later point. Furthermore, the modular design of EmiCo allows customers to expand the system along the way. Customers can start small and begin deployment of the system in one lane of their treatment process and increase the measuring spots for more lanes at any time.

Do you require support with grant applications?

Many governments are supporting the green transformation process of their industries through targeted grant and subsidy programs. Take advantage of these funding opportunities and inform yourselves which programs are available in your region. As your partner, we support you in the application process every step of the way.

How does maintenance work?

To guarantee continuous operations of EmiCo, maintenance of the system is required. For this purpose, we offer customers a maintenance service. The package includes:

1. An annual on-site visit of our service team

Change and maintenance of wear parts

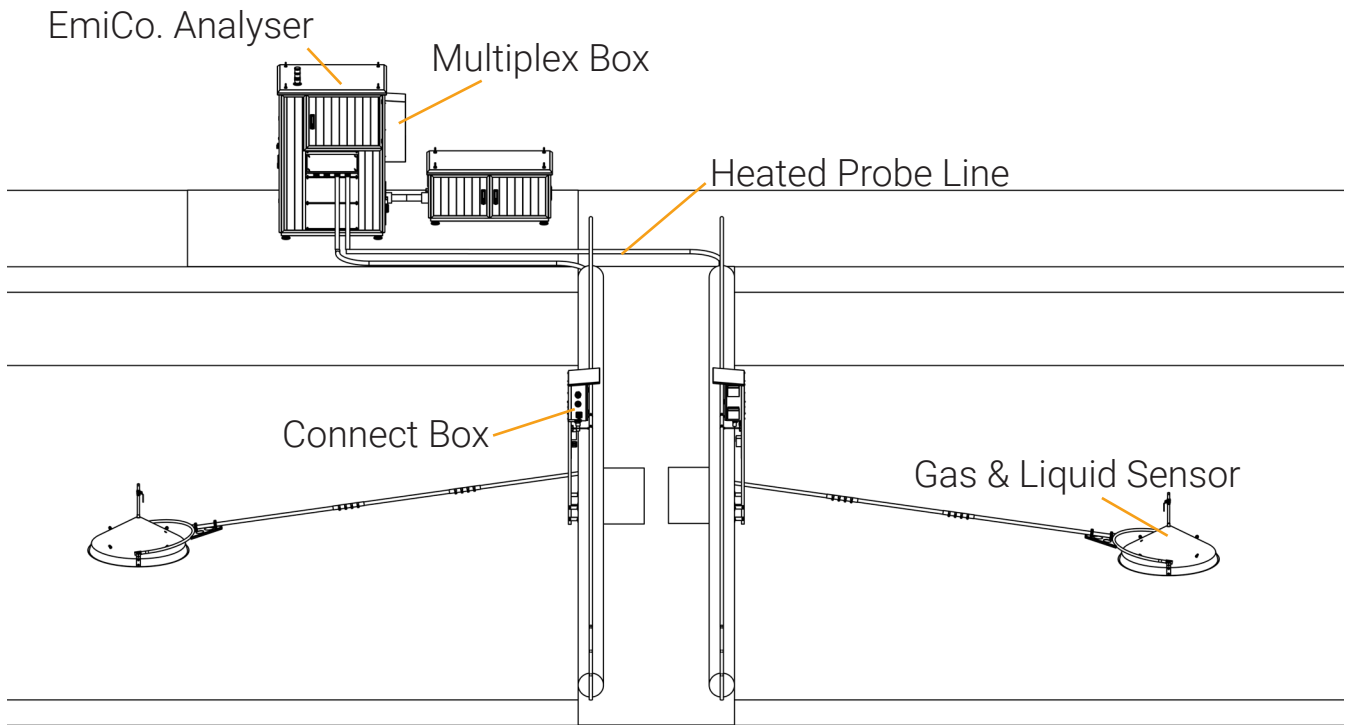
Software updates

Detailed protocol of calibration & maintenance work

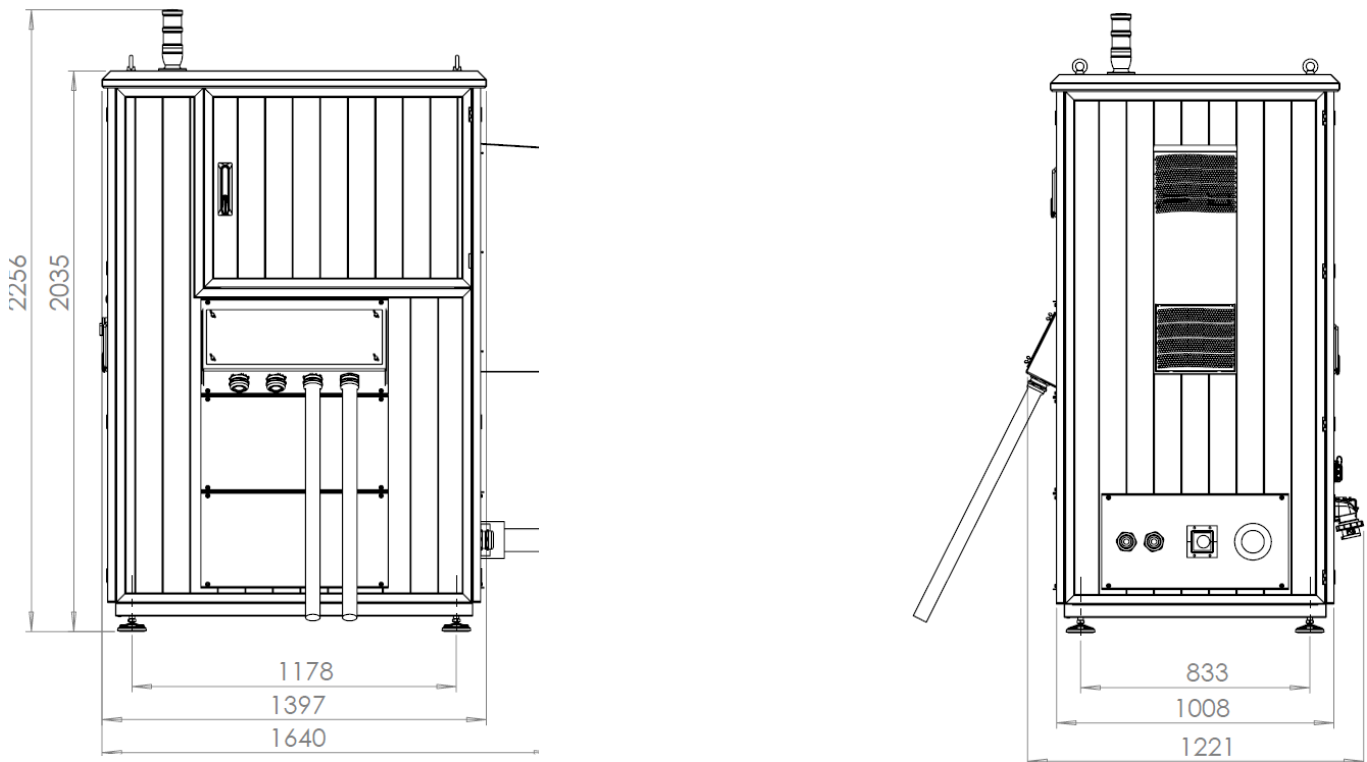
2. Unlimited remote customer support

Response time within 24 hours during business days

Technical Representations



EmiCo. Analyser



Technical Specifications

Specifications	
Constructive features	
Dimensions	1477 x 1872 x 1007 mm (L x H x D)
Weight	~ 400 kg
IP protection class	54
Transport/ mobility	4 x heavy duty castors Load capacity at 4 km/h: 550 kg
Reference gas (10L/150bar)	on board
Measuring points Connections	
Gas (emission from aeration tank)	¼" Swagelok Quick-Connect QC4
In situ probe (dissolved gas in the liquid)	¼" Swagelok Quick-Connect QF4
Reference gas (compressed gas cylinder)	¼" Swagelok Quick-Connect QF4
Electrical connections	
Power supply	400 V/16 A CEE
Outputs	
LAN	RJ45 Ethernet
Performance features	
Operating temperature	0 ... 50°C
Ambient temperature	-20 ... 40°C
Storage temperature	10 ... 40°C
Max. Metering flow rate (gas)	~2 L/min

Technical Specifications

Specifications	
Accessories	
1. Sample gas collecting hood	
Material	GRP
Dimensions	1400 mm x 700 mm
Weight	16 kg (without attachments)
2. Accessories sample gas collecting bonnet	
Retaining rod	3 x aluminium tube 43 mm / L 1500 mm
Wall mount	61 kg
Sensor volume flow gas (1m ²)	Hot-wire anemometer / 0.57 - 113 Nm ³ /h
Sensor temperature gas	PT100 / -50 - 100°C
Sensor temperature liquid	PT 100 / 0 - 150°C
Insitu probe	
1. Analytical Tubes Heated	
Analysis tube (Refgas)	¼" PTFE / 1.5 m
Outer sheath	Black corrugated polyamide hose
Thermal insulation	Multilayer thermal fleece (Tmax 200°C)
Heating	Fluoropolymer insulated heating cable 230 VAC/ Tmax 100°C Moisture-protected with protective conductor braiding
Outdoor protection	Additional silicone skin 1 mm black as external protection of the corrugated tube against environmental influences Protection class IP67
Gas analysis hose	¼" PTFE / 60°C Heated
Analysis tube Insitu probe	¼" PTFE / 60°C Heated



About Variolytics

Variolytics is a technology company, based in Stuttgart Germany, focused on measurement instruments and process optimization. The mission of Variolytics is to contribute to a more sustainable society by making the invisible visible. The company was founded in 2020, as a spin-off from Fraunhofer Society for the advancement of applied research in Germany. Prominent Investors of Variolytics include the High-Tech Gründerfonds and the Fraunhofer Technologie-Transfer Fonds. Since 2023, Variolytics is also supported by the EIC Fund for breakthrough innovation companies.



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Variolytics GmbH
Meitnerstraße 6
70563 Stuttgart DE

Tel. +49 711 2525 9620
info@variolytics.com
www.variolytics.de

