

# Greenhouse Gas Sensor

World's only sensor for dissolved  $N_2O$  direct from Bioreactor

## Empowering Deammonification Process Controls with Direct $N_2O$ Monitoring

The new possibility of measuring nitrous oxide ( $N_2O$ ) in the deammonification process yields important insights about the anammox bacteria substrate availability.  $N_2O$  is tightly linked to the nitrite ( $NO_2^-$ ) concentration, the key substrate besides ammonium ( $NH_4^+$ ). To address the challenging control of the deammonification process, wastewater companies have invested in measurement technology from Unisense Environment. This enables them to measure  $N_2O$  levels directly in the process tanks, balance anammox bacteria substrates, and additionally document and minimize the climate impact of the deammonification process.

- ◆ **Cost effective** compared to off-gas equipment
- ◆ **Robust** sensor for 24/7 operation
- ◆ **Fast responding** in less than one minute
- ◆ **Independent** of airflow during denitrification

## Large impact of $N_2O$ on carbon footprint

$N_2O$  is a product of both nitrification and denitrification during the biological treatment of wastewater. Through aeration it is subsequently stripped and released into the atmosphere.  $N_2O$  is a highly disregarded greenhouse gas with a global warming potential 300 times higher than  $CO_2$ . Traditionally,  $N_2O$  emission from wastewater treatment plants has been estimated by use of the IPCC emission factor of 3.2 g/PE/year  $N_2O$ -N. This factor is an underestimate and studies in the Netherlands, France, USA, and Australia have shown, that for some wastewater treatment plants, the  $N_2O$  emission can account for up to 90% of their total carbon footprint.

## Real-time emission estimation

Long term studies have documented a high level of performance, sensitivity, and durability of the  $N_2O$  Wastewater Sensor qualifying it as the perfect and reliable tool for continuous online measurements of dissolved  $N_2O$ . Moreover, direct comparison with well-controlled off-gas data has proven and validated the real-time emission data based on our  $N_2O$  sensor output.

## $N_2O$ wastewater system

- ◆ Measuring and assessing the amounts of  $N_2O$  being produced during wastewater treatment
- ◆ Minimising the large climate effect of  $N_2O$  by implementing new process strategies
- ◆ Reporting of greenhouse gas emissions from  $N_2O$

## True carbon footprint

In modern wastewater treatment the primary focus on energy savings and energy production has resulted in an increase in the production of  $N_2O$  leading to an increase in  $CO_2$  equivalent emission. Therefore it is essential to look at the whole process to document the true carbon footprint.

## Breakthrough bioprocess control with $N_2O$ sensor

Combining today's wastewater bioprocess control know-how with the new industrial sensor for  $N_2O$  provides a significant potential in reducing the environmental load caused by this potent greenhouse gas. New state-of-the-art bioprocess controls can be developed, using input from the  $N_2O$  Wastewater System, yielding a clear environmental advantage over standard control regimes.



Wastewater Controller  
Technical Specifications

Controller	TFT touch screen controller
Box Size and Weight	301.5 x 283.2 x 120.5mm, 3.2 kg
Housing	Surface-mounted case made of plastic (ABC)   IP67 - dust-resistant and waterproof
Mounting	Multiple holes for surface or pipe mounting - mounting plates and weather protection canopy available
Electrical Safety	According to EN 61010, part 1: Overvoltage category III, pollution degree 2
Power Supply	AC 110 to 240 V + 10/15%; 48 to 63 Hz
Sensor Inputs	2 x N2O Wastewater Sensor with built-in temperature sensor
Other Inputs	Optional: Air flow (m3/h), 4..20 mA   Optional: 2 x Air flow ON/OFF (Binary input - potential-free contact)
Sensor Output	2 x temperature compensated N2O value (N2O-N[mg/L])
Sensor Emission Output	2 x Emission calculations (N2O-N [mg/m3/d]) with standard fixed model parameters   Optional: Dynamic input parameters
Other Outputs	Internet, ModBus (serial or TCP)   Optional: 2 x N2O Wastewater temp. sensor   Optional: PROFIBUS-DP   Optional: USB datalogging - software required

Wastewater Sensor  
Technical Specifications

Size	Robust design in 44 mm aluminum alloy casing (6063-T6) and black POM acetyl copolymer
Response Time	<45 sec
Built-in Temperature Sensory	Yes, N2O signal is temperature compensated
Calibration	2-point calibration, every second month
Guaranteed Lifetime	4 months
Expected Lifetime	>6 months
N2O Sensor Head	Replaceable
Cable Length	5 meter standard   Optional: Extension to 100 m

