



## Case study

# Solving the challenge of final effluent ammonium monitoring

How Germany's largest WWTP achieved stable, low-maintenance online measurement with NH6000sc & FX620

## Problem

In complex wastewater environments, such as Hamburg's wastewater treatment plant (WWTP), achieving reliable online ammonium measurement has long been a challenge. Several sample technologies and/or preparation systems were tested over the years, but none provided a consistent, low-maintenance filtration solution capable of delivering clean, representative samples to online analysers – especially at critical points like the final effluent.

## Solution

The FX620 filtration module, paired with the NH6000sc ammonium analyser, delivered a breakthrough in operational stability and measurement reliability. With its integrated pump and compressor, lightweight design, and automatic cleaning system, FX620 drastically reduced maintenance needs. NH6000sc provided accurate, lab-comparable ammonium readings, even at low concentrations, across multiple process test points.

## Benefits

The key achievement was securing reliable final effluent monitoring for compliance, something no previous setup had sustained. Maintenance time and manual cleaning frequency were significantly reduced with no manual intervention over 4 weeks. Additional tests at the biological treatment and primary outlet revealed that online measurement was feasible with low maintenance constraints at these locations, opening new perspectives for future monitoring strategies.

## Background

Hamburg's wastewater treatment plant, Köhlbrandhöft/Dradenau, is the largest in Germany, treating wastewater for 2.8 million population equivalents. The site is split into two facilities: Köhlbrandhöft handles primary and sludge treatment, while Dradenau is dedicated to biological and tertiary treatment before final discharge. Effluent quality monitoring is critical for regulatory compliance and environmental protection, especially under the revised Urban WasteWater Treatment Directive (UWWTD). However, reliable online ammonium measurement at key process points like final effluent has long been a challenge at that plant.

Over the years, several ammonium measurement technologies have been tested. Each system faced limitations:

- Excessive biofilm formation (see *picture 2* for a typical example of mucus/slime buildup on the filter, which previously required intensive manual cleaning)

- Frequent clogging
- Inconsistent sample quality
- High manual cleaning frequency and long intervention times with competing ion-selective electrode (ISE) technologies, typically requiring 2 manual cleanings per week and weekly matrix calibration, consuming around 2 hours of operator time weekly

These issues made continuous monitoring impractical and undermined operator confidence in the data, particularly at the final effluent, where peace of mind is essential. A robust, low-maintenance solution was actively being sought to overcome these limitations and enable reliable online monitoring.



Picture 1: Hamburg WWTP



Picture 2: Typical slime build-up in effluent monitoring

## Requirements

The plant needed a solution that could:

- Deliver stable, low-maintenance filtration for representative sampling
- Provide accurate ammonium measurements even at low concentrations
- Enable compliance monitoring at the final discharge
- Support process control in the biological stage
- Explore new monitoring possibilities at the primary outlet, where no measurements had previously been feasible

## Solution

The deployment of the FX620 filtration module (*picture 3*) paired with the NH6000sc analyser (*picture 4*) marked a turning point.

FX620 features:

- Integrated pump and compressor in the NH6000sc cabinet for easy installation
- Lightweight filter design (2.2–3.5 kg) with a single membrane
- Rotating filter support for enhanced cleaning
- Powerful air bubbling system
- Extended maintenance intervals

NH6000sc delivers:

- Lab-comparable ammonium readings
- Minimal manual intervention
- High accuracy, even at low concentrations
- Automatic cleaning of the whole sampling line at a customised frequency



**Picture 3: FX620**



**Picture 4: NH6000sc installed in effluent**

## Results

Three test deployments were conducted:

### Test 1 in final effluent

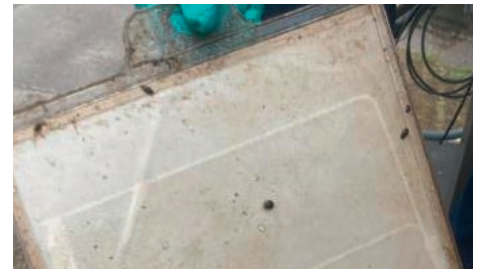
FX620 maintained 90% flow rate (1100 ml/h) over 4 weeks with no mechanical cleaning, only automatic cleaning of the sampling line every 48 hours. As illustrated in *picture 5*, the membrane remained remarkably clean, demonstrating filtration effectiveness. Operators reported unprecedented stability and expressed strong confidence in the compliance data provided by NH6000sc.

### Test 2 at biological treatment step

FX620 operated continuously for 12 weeks without any manual cleaning (membranes were not cleaned between test 1 and test 2 – see *picture 6*). Paired with NH6000sc, the system delivered accurate and stable data for process control, with zero cleaning effort required throughout the test period.

### Test 3 in primary treatment effluent

Historically considered unsuitable for online measurement due to poor sample quality and heavy fouling, especially linked to metal salt dosing. FX620 proved otherwise: by reducing the automatic cleaning interval from 48h to 6h, deposits inside the analyser were effectively minimised, maintaining stable performance and opening new perspectives for upstream monitoring.



**Picture 5: FX620 membrane after 4 weeks with no mechanical cleaning in final effluent**



**Picture 6: FX620 membrane after 16 weeks with no mechanical cleaning in final effluent**

## Benefits

- Effluent monitoring is finally possible with low constraints on maintenance and high accuracy: a long-standing goal now achieved
- Maintenance time drastically reduced, with no manual cleaning for weeks
- Operator satisfaction is “peace of mind” with reliable data
- New monitoring strategies are now possible, even at previously inaccessible measurement points

According to Tony Fischer, Process Engineer at HAMBURG WASSER, the advantages of the NH6000sc became clear very quickly. Thanks to its self-cleaning and automatic calibration every 24 or 48 hours, the team rapidly gained confidence in the quality of the measurement results. After validating the analyser with a few lab comparisons, they began using its readings as a reliable reference for process control.

## Conclusion

The FX620 + NH6000sc combination has proven to be a game-changer for Hamburg’s WWTP. It enables reliable, low-maintenance ammonium monitoring across the entire process chain from primary outlet to final discharge.

