

# Ammonia / Sulphide Analyser

Online Analyser for Water and Waste Water Treatment Plants



# Ammonia / Sulphide Analyser

The UVpcx ammonia/sulphide analyser is a state-of-the-art water monitoring system specially designed for high reliability, low operating cost and compact size. It is backed by more than ten years of expertise.

Ultra-violet spectroscopy, the most reliable and stable method, is used to analyse specific parameters: ammonia / sulphide, COD, hydrocarbons, nitrate and fluorescent tracers.

Optical methods are also used for turbidity and colour while electrodes are used for pH, dissolved oxygen and conductivity.

Based on a modular design, the UVpcx can be configured as

**Mono-parameter system:** on many process control applications, only one parameter is critical. In that case, the UVpcx offers a cost-competitive solution.

**Multi-parameter system:** water chemistry is complex and to meet the regulations for drinking water or wastewater, many parameters have to be taken into account.



These parameters are traditionally measured by chemical methods. However, this is convenient for laboratory use but not applicable for on-line analysis.

The automation of these methods involves a complex system that would require high maintenance and have poor reliability. Moreover, the cost of reagents is prohibitive and some of these are dangerous pollutants. Also, the measuring time is generally not compatible with process control.

The Forbes Marshall UVpcx analyser uses optical methods for specific parameters like ammonia / sulphide, COD, hydrocarbons, nitrate, fluorescent tracers and colour, for stable, fast and reliable measurements. There is no drift in measurements as compared to the electrode based system.

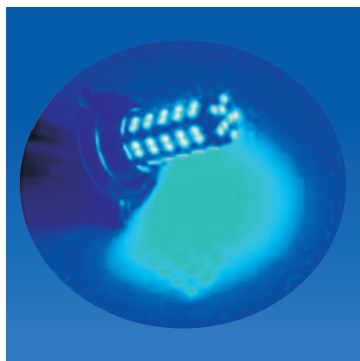
On some applications, the results on UVpcx can be more accurate than those obtained by standard colorimetric methods that are subject to many interferences, for example chloride for nitrate and COD analysis.

The analyser is designed in compliance with CE electromagnetic standards, using a watertight IP54/Nema 4x box. It is ideal for industrial applications such as

- Water treatment plants
- Industrial effluents monitoring
- Sewage water treatment
- Chemical and oil industries
- Food industries
- River water

## Features

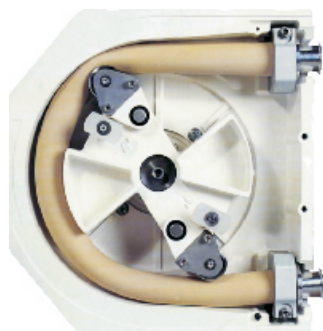
### Longer Lamp Life



The UV xenon lamp is specified for  $10^9$  flashes ensuring longer lifespan with minute-by-minute measurement.

This considerably reduces maintenance required and the risk of wrong measurement due to aged lamps. Lamps also need to be replaced less frequently.

### In-built Sampling Pump

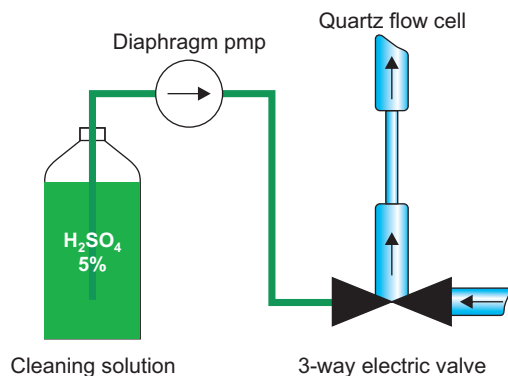


A in-built peristaltic pump to take samples directly from rivers, reservoirs or open channels with a maximum pumping height of 5 meters.

A strainer prevents large suspended solids from entering the analyser.

The easy-to-load pump head facilitates tubing replacement.

### Automatic Cleaning System



Once a day, a low cost cleaning solution (5% sulphuric acid) is automatically injected into the flow cell to clean it. An auto-zero is performed at the same time.

The autonomy is about 2 weeks with the built-in 2-litre tank. An alarm is generated if the cleaning solution tank is empty.

## Benefits

### No filtering with river water or waste water

Facilitated by a large bore tubing and a German patented inlet electric-valve with pivoting armature, unfiltered water can be admitted into the UVpcx analyser with very low risk of clogging.

This significantly reduces the initial cost of the measuring system, especially the cost of maintenance.

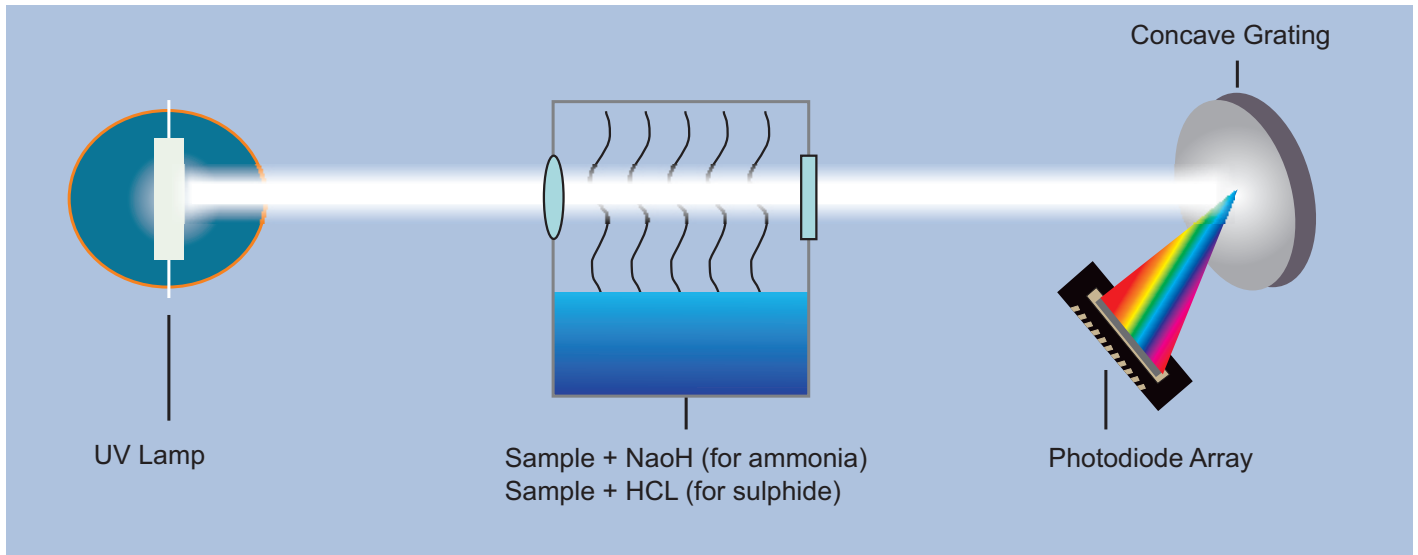
A double wavelength measuring system compensates the effect of turbidity and suspended solids for COD, nitrate, hydrocarbons, fluorescent tracers and colour measurement.

### Low operating cost

The operating cost is limited to the refilling of the 2-litre tank of cleaning solution every two weeks with 5% sulphuric acid on distilled water. For effluent measurements, tap water instead of distilled water can be tolerated after checking.



## Ammonia / Sulphide Measuring Principle



The measuring principle is based on UV light absorption spectrum of ammonia gas  $\text{NH}_3$  in equilibrium with dissolved ammoniac gas in the water sample.

For ammonia measurement, a small quantity of sodium hydroxide (NaOH) is added to the sample to increase the pH for transforming  $\text{NH}_4^+$  to  $\text{NH}_3$ .

For sulphide measurement, 30% HCL is added to water sample, which reacts with sulphide compound to form  $\text{H}_2\text{S}$  gas.

A fast fourier transform (FFT) is applied on the spectrum to extract the absorption signal typical to ammoniac gas. This method is very selective and no interference is known on river or waste water.

Moreover, turbidity or color of the water has no influence as the measurement is performed in the gaseous phase.

Waste water with suspended solids as activated sludge can be admitted without filtering.

This method is known since mid 20th century but requires strong mathematical signal processing that only powerful microprocessor-based instruments can handle. Hence, it is now possible to establish accurate analysis using this method.

The stability of the measurement opposite to the electrodes avoids the use of costly standard solution. An auto-zero is performed at each measuring cycle.

The detecting system is in a separate enclosure for good accessibility.

## Applications

### Waste Water



Waste water treatment plants need a fast and reliable ammonia / sulphide measurement to control the nitrogen removal process. Only the UV spectroscopy method can really achieve this.

The measurement on the gaseous phase avoids any interference with turbidity or suspended solid and the use of large bore tubing makes possible the measurement on activated sludge.

The automatic cleaning system maintains the tubing clean.

## **Ammonia in Water and Waste Water**

Wastewater may contain high levels of nitrogen and phosphorus. Excessive release to the environment can lead to overgrowth of weeds, algae, and cyanobacteria (blue-green algae). This may cause an algal bloom, a rapid growth in the population of algae. In addition to causing de-oxygenation, some algal species produce toxins that contaminate drinking water supplies.

Different treatment processes are required to remove nitrogen and phosphorus. In general, activated sludge plants encompass a variety of mechanisms and processes that use dissolved oxygen to promote the growth of biological floc that substantially remove organic material. The process media (culture) under ideal conditions, convert ammonia to nitrite and nitrate followed by de-nitrification (reduction of nitrate to nitrogen gas). Nitrogen gas is then released from the water to the atmosphere. Monitoring ammonia online becomes very crucial to ensure an efficient nutrient removal process.

### **Application Areas**

Sewage treatment plants

Waste water and effluent treatment plants

Fertiliser effluent monitoring

River water

## **H<sub>2</sub>S in Waste Water- Oil Refinery**

Hydrogen Sulphide (H<sub>2</sub>S) is a common compound in the oil and gas industry, specifically found in refineries where crude oil is converted into useable products. H<sub>2</sub>S is very harmful and compromises environmental and safety compliance, has a corrosive effect and produces odours.

In crude oil, the H<sub>2</sub>S occurs naturally and is generated from refining processes, including hydro-cracking, hydrolysis and elemental sulfur production. Refineries and storage facilities, such as tank farms, are likely to encounter severe problems specific to the handling of crude oils, semi-finished and final products that contain or generate H<sub>2</sub>S.

All these areas contribute to H<sub>2</sub>S in the processes, which finally lands up in the waste water treatment plants. Thus online monitoring of H<sub>2</sub>S in waste water becomes far more crucial to understand the efficiency of treatment processes and conform to environment norms.

Since H<sub>2</sub>S is a very aggressive and corrosive compound, non-contact type or optical based analysers are preferred as against selective or titration type monitoring.

### **H<sub>2</sub>S Treatment and Field Services**

Oil reservoirs

Storage facilities

Transport operations

### **Refinery Processes Treated for H<sub>2</sub>S**

Crude oil

Natural gas

Gasoline

Jet fuel

Kerosene

Diesel fuel

Fuel oils

<b>Specifications</b>					
<b>General</b>					
Manufacturer	AWA Instruments, Singapore				
Type	Online monitoring analyser - continuous or batch type				
Series	CX 1000 series				
Channels	Single channel analyser				
Method	UV Absorption spectrophotometry				
Range ammonia (NH <sub>3</sub> )	CX1000-4012 0-10 mg/l	CX1000-4052 0-30 mg/l	CX1000-4022 0-100 mg/l	CX1000-4032 0-300 mg/l	CX1000-4042 0-1000 mg/l
Range sulphide (H <sub>2</sub> S)	CX1000-9012 0-100 ppm	CX1000-9022 0-500 ppm			
Cleaning mechanism	Automatic cleaning system using 5% - 10% H <sub>2</sub> SO <sub>4</sub>				
<b>Sample Conditions</b>					
Temperature	+5 to +80 deg. C				
Pressure	0.3-2 bar				
Flow rate	10-30 LPH				
Suspended solids content	< 150 micron				
<b>Analyser</b>					
Type	Advanced microprocessor based system				
Programming	User defined , freely programmable				
Operation cycle	Continuous or batch type				
Cleaning	Automatic built-in cleaning function. User programmable				
Accuracy	+/-5% of F.S.				
Display type	Alpha numeric display 240 x 128 pixels LCD with backlit, touch screen				
Graphical analysis	Graphical trend analysis, time based				
Keypad	Touch screen type				
Response time	Less than 5 minutes				
Measuring cycle time	Freely programmable / normally 10 minutes				
Analog output	Two analog outputs ; 0/ 4-20 mA. DC, isolated				
Calibration	Online auto zero calibration (cleaning solution) manual SPAN calibration				
Auto zero	Automatic zero during cleaning cycle				
Interference correction	Interference correction by reference photo detector Auto turbidity and color compensation				
Enclosure protection	IP 54				
Enclosure	Epoxy coated steel enclosure				
Alarm signal	4 Relay signals for high or low process value set points, monitor failure, microprocessor failure				
Power supply	110- 230V AC,50Hz; 150 watt				
Digital interface	RS 232/RS 485 MODBUS output. Optional.				
Dimension	409 x 600 x 231 (W x H x D)				
Temp limits	0-50 deg C.				
Weight	18 Kgs (analyser only)				
<b>Accessories</b>					
Analyser	Cleaning canister				
Mounting	Standalone type CRCA panel				
<b>Reagent</b>					
Ammonia	NaOH 30%				
Sulphide	HCL 30%				



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