ETHARRON

Keep it fresh by measuring ethanol

Mechatronics has improved the technique of measuring very low concentrations of ethanol. Fruit is stored in a controlled atmosphere and the ethanol concentration in the atmosphere in the storehouse is monitored. By doing this, the amount of oxygen, carbon dioxide and temperature can be controlled close to ideal values. This is called Dynamic Control System, or DCS ®.
The technique of storing fruit in a controlled atmosphere is commonly used worldwide, but up until now a reliable method for measuring very low concentrations of ethanol was the missing key factor.

Dynamic Control System (DCS)

The idea of storing the product in a controlled atmosphere is to put the product in a sort of dormant state. By reducing the amount of oxygen and sometimes reducing the amount of carbon dioxide the storage period of the product can be increased. However, when the atmosphere is not precisely controlled, storage damage may be introduced or the effect is too small. Hence, controlled atmosphere storage is always a compromise between conditions.
With DCS the ethanol concentration in the atmosphere is measured. The amount of ethanol is used to determine the optimal conditions for the environment. Since the concentrations of ethanol are very low (± 500 ppb for some types of products!) it is difficult to measure. Mechatronics developed a new sensor system using novel techniques and electronics. Detection of ethanol is now possible from levels as low as 50 ppb through the EthaRRon.

DCS in practice

Intergration of the EthaRRon with DCS, developerd by The Dutch Agro Technological Institute, known as ATO at Wageningen in the Netherlands known difficulties in measuring low quantities of ethanol, were solved, enabling detection of very low level ethanol concentrations is now possible. It has been shown that using EthaRRon, oxygen levels can be decreased to an incredible 0.2% without loss of quality! Connected to a computer, the sensor continuously reports measurements, complete with time synchronization. The information is used to control the atmosphere the apples are stored in.

Limitations

The limitations of the new sensor are known as well: Ethylene affects the reliability of the measurements. While the new sensor is 20 times more sensitive for ethanol then ethylene, high levels of ethylene will have a distorting influence on the measurements. It can't be used for all products yet.

DCS commercial

The DCS module (a third party development of Van Amerongen) completes the DCS system, together with the new EthaRRon sensor. With two tubes connected to the storage atmosphere, the flow is sampled into the EthaRRon, measuring the actual concentration of ethanol. Data is transmitted to the DCS control unit. The module is an extension of the storage room so inspection is easy without health risks for the operator. In 2005 the module will become commercially available for the market.

®DCS is a registered method of ATO at Wageningen, The Netherlands

KEMA CERTIFICATE EN ISO 13485:2003 DUTCH COUNCIL FOR ACCREDITATION C 013

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AIRRMONIA

Environmental Ammonia Monitor

mechatronics

Application fields

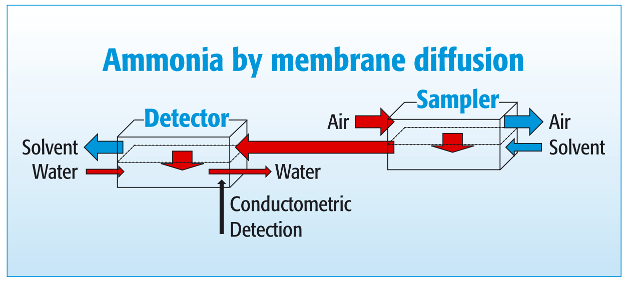
Ammonia is an important gas in relation to environmental issues such as acidification, eutrophication, human health and climate change. Therefore, there is a growing need for instruments for determination and monitoring, enabling research into emission, dispersion, conversion and deposition of Ammonia and Ammonium. New fields are encountered in the medical sector, where ammonia may be monitored in exhaled breath and from emission of skin surface, which is seen as an indicator for diseases. Mechatronics has developed the AiRRmonia. This instrument measures ammonia concentrations in ambient environmental conditions at very low levels.

AiRRmonia

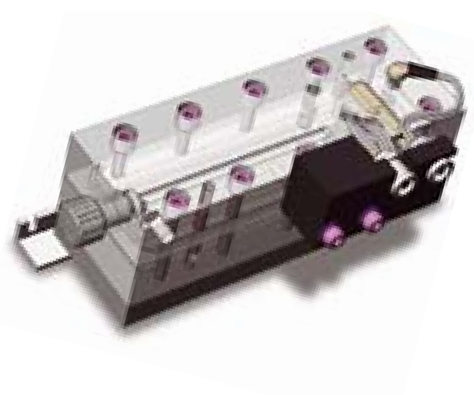
The AiRRmonia, is an easy to use monitoring instrument with an ultra low detection limit of 40 ppt of ammonia. Based on the elaborate R&D of ECN (Energy Research Centre of the Netherlands), AiRRmonia was further on engineered by Mechatronics Instruments towards an easy to use instrument, capable of reliably monitoring the environment for one month unattended. AiRRmonia comes in a ruggadized box or in 19" version.

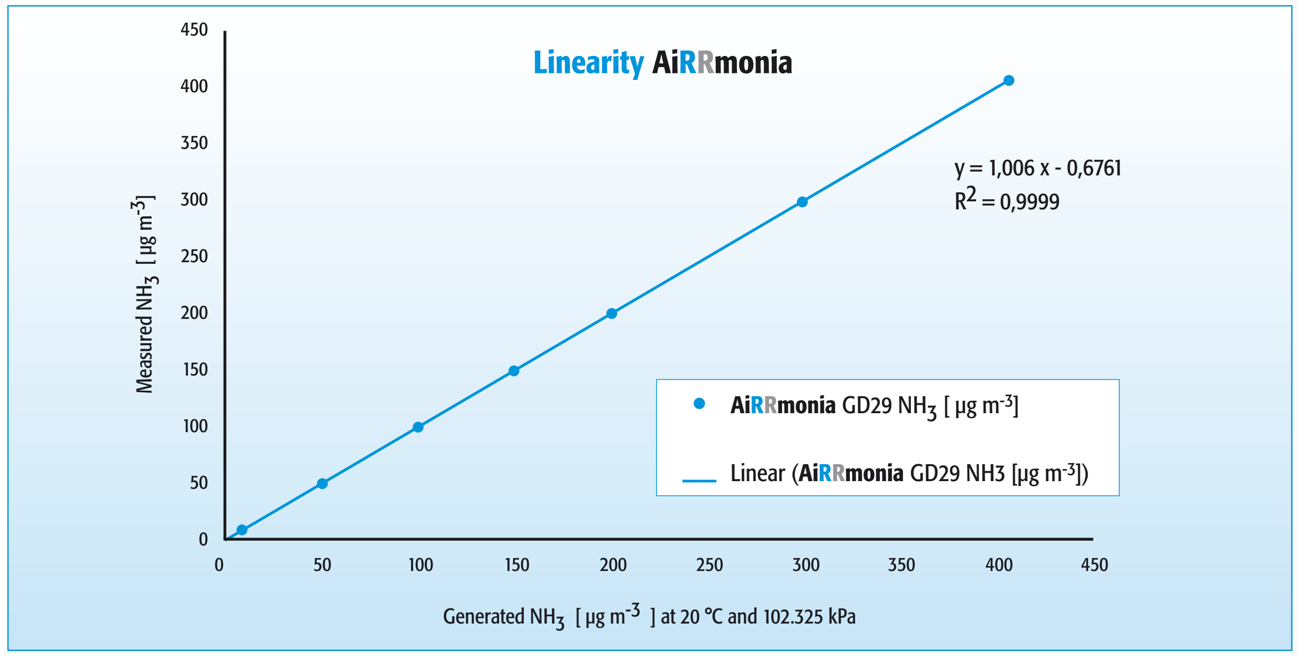
Working principle

The air sample is drawn by a syringe pump system through a folded channel positioned on a Teflon membrane, permeable for gases. On the opposite side of this membrane an absorption solution flows in counter-flow direction. The sampling channel is dimensioned in such



a way that all Ammonia will pass the membrane at an air flow of 1 liter/min, forming Ammonium in the absorption solution. A three channel syringe pump displaces the solution with a fixed flow rate. All flows entering the detector block are led through a de-bubbling chamber first. In the detector block a hydroxide solution is mixed with the sample revealing gaseous ammonia again. Then passing the sample along a Teflon membrane again the gaseous ammonia is able to penetrate the membrane again. This is the Ammonia selective step in the process since apart from small volatile amines, no known airborne compounds will be gaseous at this stage. A purified water flow at the opposite side of the membrane dissolves the Ammonia that penetrated the membrane. One conductivity cell monitors the initial conductivity, while a second conductivity cell monitors the Ammonium content after the membrane exchange. The difference in both readings of the conductivity cells is a measure for the original Ammonia content in the sampled air. A temperature correction is applied on the conductivity measurements.





Specifications

Measuring range :	0.05 – 500 µg m^{-3} NH_3
	0.04 – 400 ppb
Accuracy :	3%
Precision :	3%
Time resolution :	10 min
Temp. range :	5-35 °C
Airflow :	1 liter/min
Absorption solution :	demineralized water
Reagent :	diluted NaOH
Sample solution :	0.15 ml/min
Stand alone time :	> 1 month

Connectivity

The AiRRmonia has a standard RS232 data communication. Data is send every 1-second in standard ASCII format and is readable in any communication software such as ProComm or Hyper Terminal.

Overall dimensions

Dimensions wxdxh :	620 x 400 x 500 mm
Weight :	23 kg
Power supply :	12 VDC: 8VA
	90-264 VAC; 50/60 Hz; 10VA

Features and options

- Mass flow controlled
- Syringe pumping
- Automatic calibration
- No gaseous interferences apart from small volatile amines
- Negligible interference from NH4 containing aerosol
- Weather proof housing
- Easy to use
- Suitable for monitoring networks
- Service contract possible
- Optional 19" version

References

Erisman,J.W., Otjes,R.P., Hensen,A., Jongejan,P.A.C., van den Bulk,P., Khlystov,A., Mols,J.J. and Slanina,J. 2001. Instrument development and application in studies and monitoring of ambient ammonia. Atmospheric Environment, 35, 1913-1922