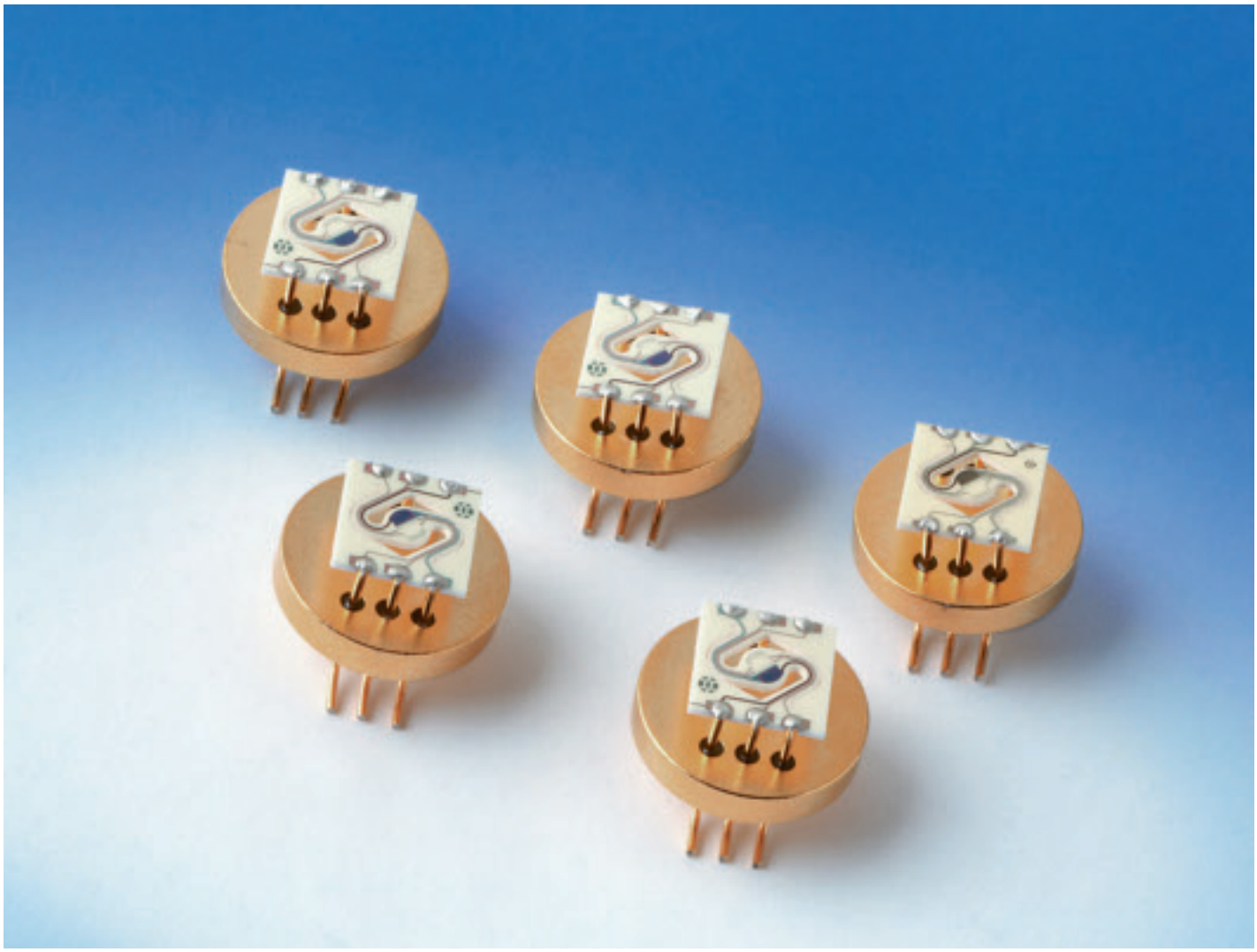
The demand for better ammonia detectors led Vaisala to develop a new sensor, the AMMONICAP®. In 2001 Vaisala launched the AMT100 Ammonia Detectors which utilize the new sensor technology and operate over a wide temperature and humidity range. As the sensor is highly specific to ammonia, it significantly reduces costly false alarms. The AMT100 Ammonia Detectors are available in two measurement ranges: 0-100 ppm and 0-1000 ppm.

Irma Ylikangas
M.Sc. (Chem. Eng.)
Product Manager
Sensor Systems Division
Vaisala Helsinki
Finland

New sensing technology

AMMONICAP® for Ammonia Gas Leak Detection



Vaisala's AMMONICAP® polymer thin film sensor.

The AMT100 Series Ammonia Detectors.

Successful field tests prove reliability

The performance of the AMMONICAP® sensor has been tested in several environments: normal outdoor air, a compressor room, piggeries, cold stores, a fertilizer pilot plant and the waste area of a food production site. The last mentioned had various background odors and changing humidity conditions. In all tests, Vaisala's AMMONICAP® technology performed well. Moreover, a long test outside in the Finnish winter proved that the technology operates reliably in diverse humidity and temperature environments.

These tests carried out in different conditions - changing humidity and temperature, special odors and chemicals - confirm that Vaisala' s Detectors with the unique AMMONICAP® sensor offer an excellent and reliable solution for ammonia leak detection. ■

To find an ammonia-specific, humidity-independent sensor has been a challenge for the refrigeration industry. Forklift exhaust gases, background aromas and continuous cleaning processes, especially in the food industry, often cause false alarms which result in extra costs for users.

During the past four years, Vaisala Oyj has been developing a new ammonia sensor - AMMONICAP® - based on capacitive polymer thin film technology. We have drawn upon our 30 years of experience with polymer thin film sensors in meeting the requirements of the ammonia measurement field. The active polymer is designed to attract ammonia and thus the sensor is highly specific to ammonia. This helps to avoid false alarms. The sensor also operates without oxygen, which makes it suitable in fruit stores.

AMT100 Series Ammonia Detectors

The AMMONICAP® sensor is used in the AMT100 Series Detectors which have been specially designed for leaks in the refrigeration sector. There are two models - the AMT101 and the AMT102. The AMT101 is an easy-to-use basic detector with a current output and fault alarm output. This meets most customers' needs.

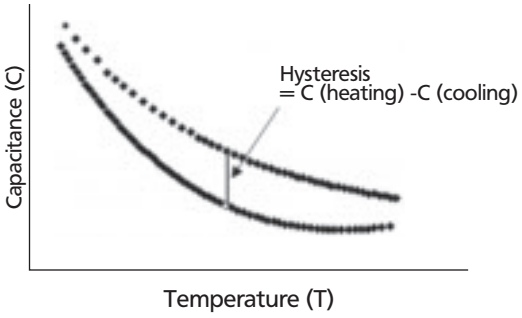
The AMT102 is the right choice if a more advanced model is needed. This detector has additional alarm relays and an optional RS485 connection. The AMT102 can work as a simple stand alone system. Naturally the detector can also be connected to a control system, in which case it offers additional local alarm possibilities.

Both models have a service mode function which disables the alarm relays and outputs for 60 minutes. If a longer service time is needed, the output freezing can be extended to 120 or 180 minutes. The service mode is very useful during maintenance work. For example, when draining the ammonia-contaminated oil, the detector can be locally shut off to avoid false alarms. The service mode also simplifies on-site checking of the detector. Additionally, the probes in both detectors can be replaced for quick and simple field maintenance. The interchangeable probe facilitates maintenance which brings costs savings in both maintenance and service operations.

The AMT100 Series Detectors are equipped with built-in self-diagnostics, which continuously check operations. Possible malfunctions are identified and displayed on the front panel LED display.

Ammonia Sensor Technology

The Vaisala AMMONICAP® is a capacitive sensor with an ammonia-sensitive polymer film. Absorption of ammonia changes the capacitance of the capacitor. Water molecules are also absorbed in the polymer. The effect of humidity is eliminated by a novel measurement technique based on a temperature-controlled measurement cycle. When the sensor is rapidly heated and cooled back and forth, ammonia and water are alternately absorbed and desorbed. Ammonia sorption causes hysteresis between the heating and cooling curves (see figure below).



Capacitance as a function of temperature during a measurement cycle.

Paula Sommarberg M.Sc. (Chem. Eng.) specializes in sensor development.

But as the sorption of water molecules is very fast, water causes little hysteresis. The remaining small effect can be eliminated in the calculation with the help of another variable, i.e. the derivative of the cooling curve. The control of the operating temperature also improves performance in varying ambient temperatures.