

Danish Specialist in Sensors and Switches

Interview with Michael Elstroem, Technical Director and founder of the company HB Products A/S

The Danish company HB Products, is a manufacturer of sensors and switches for refrigeration systems using natural refrigerants. Due to the amended F-Gas regulations, the market for natural refrigerants and the sensors required for working with them is tremendously. We spoke with Michael Elstroem, Technical Director of HB Products to learn what this means for a manufacturer such as HB Products, the sensor technologies which are currently available and the new products in development.

Question: Mr. Elstroem, for those readers who are not familiar with HB Products, could you tell us briefly about your company?

Michael Elstrøm: HB Products has comprehensive experience within the field of refrigeration systems and more than 25 years of experience in development and manufacturing of electronic sensors to the Refrigeration Industry.



Michael Elstroem, Technical Director and partner in HB Products A/S

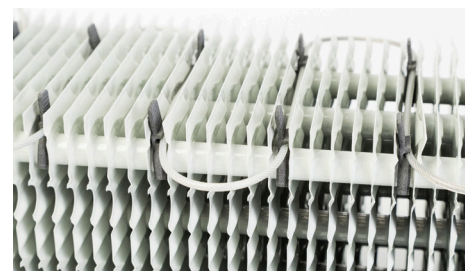
The company HB Products is driven by innovation with great focus on safety, energy optimization and automation as well as user friendly technology, all as part of our DNA. We have the vision that our sensor technology can optimize most refrigeration systems in both industrial and commercial refrigeration systems.

Our core competence is optimization of evaporator control with our patented Vapor Quality sensor technology. Our sensor technology optimizes of all types of evaporators by measuring the vapor-quality/dryness of the gas in the evaporator outlet, so there will only be supplied the required refrigerant according to the evaporator load.

Question: You have focus on applications with natural refrigerants. Did the very strict controls on refrigerants in Denmark contribute to the fact that HB Products has developed the necessary expertise for working with natural refrigerants? Are you working with solutions for natural refrigerants rigorously across your product portfolio?

Michael Elstrøm: From the beginning our focus was mainly on natural refrigerants. We started this work many years ago together with the companies Sabroe and Gram (now JCI) and later on with the company ADVANSOR.

The refrigerant Ammonia created real challenges for our sensor design. However, our sensors can also be used for plants with CO2 and HFC. We comply with the requirements of the F-Gas directive where we have introduced new sensor types for monitoring refrigerant liquid in receivers and vessels on HFC plants as well as safety sensors for leaking alarms on ammonia/CO2 cascade systems.



Question: The handling of ammonia has been a popular practice in refrigeration technology for many decades. Nevertheless, working with ammonia still remains a puzzle for many equipment builders. Do you offer advice to companies to use your expertise?

Michael Elstrøm: Yes, our main focus the last 7 years has been on "Low Charge Ammonia Systems". We are working with leading pioneers regarding design and we have wide spread our experience and knowledge in relation to system, design, safety aspects, reduced refrigerant charge and optimized energy consumption.

Question: From your perspective, what are the biggest technical problems that can occur with natural refrigerants and how can they be managed with your controllers and sensors?

Michael Elstrøm: There are a number of challenges. For example the safety aspects of pump circulation plants with very large charges of ammonia

refrigerant as well as high pressure losses in riser pipes and wet suction lines which result in limited cooling capacity and increased energy consumption. Especially at part load operation, this is a challenge.

With our new HBX vapor quality sensor, we have the possibility, independent of the actual evaporator load, to measure and regulate the circulation rate according to the phase and dryness of the refrigerant. This way we can reduce and even avoid system dependent pressure losses in suction pipes and risers.

In addition, the sensor opens up the possibility of achieving 20% higher energy efficiency on DX systems (dry expansion systems with NH3) as there is in pump operated or flooded systems, mainly because of high pressure losses in riser pipes and wet suction lines.

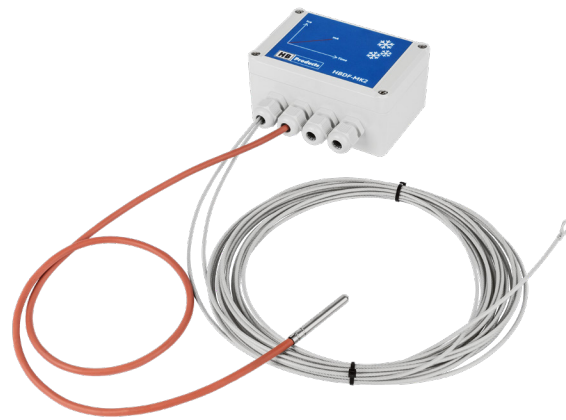
Question: Please tell us more about the technology of your controllers and sensors.

What types of sensors and measurement methods do you have in the product range and in which applications are they used?

Michael Elstrøm: The X-Sensor (vapor/gas quality sensor) measures the degree of dryness based on the capacitive measuring principle. Here, two or more electrodes (conductors) measure the charge/dryness in the suction pipe and convert this into an electrical signal.

The difference in the dielectric properties of the various media, like gas or/and liquid amounts, will change the electrical signal. The ratio of vapor and liquid mixture is measured without any delay as a void fraction measurement.





The measurement is running constantly in real-time and for example, is not delayed by incorrect temperature/superheat measurement. The measured capacitance (measured in pF) depends on the ratio of the gas and liquid content/mixture passing the electrodes. The same principle is also used to measure the ice thickness on the surfaces of evaporators in order to control Defrost only when needed (Defrost on Demand).

Question: Has the wheel now been invented, or are there real innovations and new measuring methods still to come? What new innovations does HB Products have coming out?

Michael Elstrøm: We are now busy completing and launching our new “zero super-heat control”, named HBX-CO2-CU-XX, which consists of a “X” vapor quality sensor with integrated valve control and universal stepper-motor driver, including cable for direct valve connection. Because CO2 is a very dynamic refrigerant where phase change is rapid, the vapor quality measurement ensures a more homogenous, accurate and fast control without the influence from pressure and tem-

perature fluctuations motor driver, including cable for direct valve connection. Because CO2 is a very dynamic refrigerant where phase change is rapid, the vapor quality measurement ensures a more homogenous, accurate and fast control without the influence from pressure and temperature fluctuations.

We also work on a decentralized evaporator controller which is based on our HBX and HBDF sensors (i.e. gas quality sensors and defrost sensors) with connection to all external devices such as temperature and flow sensors, fans, liquid valves and hot-gas defrost valves. The communication takes place via a digital Mod-Bus with flexibility and the possibility for connection to existing main control systems.

The optimization and savings potential is significant because this decentralized evaporator unit and connected sensor measures key parameters which are highly depending on changes in the system load. At the same time, the ice that has been built up between the evaporator fins is measured and calculated to

control the defrosting process. All necessary functions for safe hot-gas defrosting are included.

Question: Refrigerant sensors in refrigeration systems are responsible for important tasks, safety, efficiency and environmental protection. What quality assurance measures do you take in the production and development of your products to ensure your customers can rely on them?

Michael Elstrøm: All our sensors are specially designed for refrigeration applications and the sensors are resistant to low temperature, heat, moisture as well as the chemical impact from ammonia. We use stainless steel for all mechanical wetted parts and our seals are made of PTFE and PEEK. The electronic parts of the sensors consist of electronics with EMC protected circuit boards like the ones used in the automotive industry and they are therefore very robust.

We are ISO9001-2015 certified, our production is approved according to IECEx, ATEX and cULus. Further, our technicians in the quality department are certified specialists according to IPC standards.



Interview with Michael Elstroem, originally from an article made by the German Kälte magasin KKA 2017.