PENTRONIC NEWS

PENTRONIC Scandinavia's leading manufacturer of industrial temperature sensors

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The right temperature balances a sterile environment and good bacteria

Gary Nilsson, Hans Olofsson and Ifran Dzinic prepare the packaging machine for a new product. The machine has a number of temperature sensors to ensure the quality of the product and packaging.

Emå Dairy in Hultsfred, Småland in Sweden balances on a knife's edge between a sterile environment on the one hand and good bacteria on the other.

"We must completely control the temperature all the way from the farmer to delivering the products in the store," says production manager Dan Henriksson.

Emå is Sweden's smallest industrial dairy and competes by supplying fresh, high quality products made locally. The company is owned by two big dairy farms nearby.

"What's milked one morning is in the shops the next morning," Dan says.

The dairy has a very sophisticated traceability system. Every packet is marked with the name of the farm the milk came from plus the date and time it was milked.

This is achieved by having separate compartments in the milk tanker vehicles for each farm and pumping the milk over to separate containers at the dairy.

Temperature is most important

Although the dairy is small it has an extensive product range and makes everything from milk, sour milk and cream to butter, crème fraîche and three kinds of cheese. With everything under one roof, staff must know what they are doing. For instance, sterilising in the wrong place can kill the bacteria that make sour milk and yoghurt.

"Temperature is our most important measurement reading," Dan says. "It has to stay within a very narrow range.

"For instance, with pasteurisation if we overheat the milk the taste is affected and we also use energy unnecessarily. But to kill the bacteria, we must achieve a specific temperature for a certain length of time."

High availability

Temperature is equally important when packaging the milk, including when sterilising and sealing the containers. If the sealing clamps are too hot, consumers cannot open the milk packets by hand. If the temperature is too low, the packet will break open.

Another requirement is high availability. For today's milk to reach the shops tomorrow, the whole process including every temperature sensor must function flawlessly day in and day out.

As a result, a dairy has more temperature sensors than most other process industries. The wrong readings will immediately cause problems like tainted flavours, yoghurt with a poor consistency or cream that cannot be whipped.

"We have to chill the cream for several hours before packing it so it builds crystals that make it possible to whip," Dan says.

Pentronic's expertise

Emå Dairy also sells milk from farms in the neighbouring county of Östergötland. The milk is kept separate from the Småland milk in order to guarantee that consumers get locally produced food.

Temperature measurement in food production, especially liquid foods, is one of Pentronic's core competencies. The company's temperature sensors are used throughout the production processes at dairies worldwide.

"Milk handling places very high demands on reliable measurements," says Pentronic's sales manager Roland Gullqvist, adding that Pentronic's long experience of food in general and milk in particular is also very useful for customers in other industries.

Production manager Dan Henriksson with TetraPak Rex packaging for the dairy's two product lines, Emåmejeriet and Östgötamjölk.

Emå Dairy adjusts its products to the seasons. Apple cake is the current flavour.

Pentronic turns forty: From one among many to the biggest in Scandinavia

Torsten Lindholm, the founder and CEO of Pentronic until 1990, when it was acquired by a company listed on the Stockholm stock exchange.

The laboratory is an important source of Pentronic's temperature expertise and was accredited in 1988.

One important success factor is competent customers who have received training from Pentronic.

Pentronic today is very different from what it was like when Lars Persson joined it forty years ago. Then it was one of a number of temperature sensor manufacturers; now Pentronic is the Scandinavian leader.

When Pentronic was started in 1977 its owner, Torsten Lindholm, had a vision: "To be the best in the world in temperature sensors for our customers." That vision made the company, now celebrating its fortieth birthday, into Scandinavia's leading manufacturer of industrial temperature sensors, with customers around the world.

When the vision was formulated the company was not called Pentronic but was part of a larger organisation called Telemetric. The Stockholm department had outgrown its premises, and the search for bigger ones led to the current location at Västervik on the Swedish Baltic Coast. This was in 1973 and now the former "Västervik department" can celebrate its fortieth birthday.

"Back then there were several manufacturers of temperature sensors in Sweden, and big companies also had their own instrument departments making their own thermocouples," explains Pentronic's current managing director Lars Persson.

Customised production from the start

Lars was hired when the company moved down from Stockholm. There were fewer than ten employees but that did not stop the family who owned the company from setting a high goal: to be the best in the world for its customers.

"For Torsten Lindholm it was no vision – that's how he believed we should behave," Lars remembers.

Right from the start Pentronic's most important product was customised temperature sensors, although systems of measuring and control instruments for industrial processes formed a greater proportion of sales than today. At that time temperature controllers were used – later, computers took over. Instead of going with the crowd, Pentronic chose to stay with what it did best and focus on temperature sensors.

Impartial monitoring

The advantage of family-owned companies is they can make decisions quickly and prioritise differently than public companies. After the 1973 energy crisis, customers' demands for accuracy increased, making traceability to the temperature scale necessary. That was done by calibrating to e.g. Sweden's national testing institute.

"We needed our own resources to quality control our products," Lars says.

In the mid-80s Pentronic invested in its own calibration laboratory. At that time the move was a bold one – would it really pay off? As the first company manufacturing temperature sensors in Sweden, Pentronic applied for accreditation. After extensive assessment the application was granted in 1988. This year the laboratory marks its 25th anniversary of becoming accredited.

The accreditation was a consequence of the company's focus on speciality sensors. Their most important component is neither protection tubes nor resistors but rather knowledge about temperature. A sensor merely measures its own temperature. The challenge is to get that temperature to correspond to the one that the customer wants to know.

A driver of development

Over the years the laboratory has been an important stimulus for the company to acquire new knowledge. And it was not long before customers also realised the usefulness of accreditation. The eye opener was a line in the ISO 9000 quality management system that measuring equipment: "must be traceable to national standards."

Another realisation was that customers also needed to be knowledgeable about measurement and calibration. Pentronic began providing training courses in 1991, first for a few large customers but then as a regular offering, which is now part of a number of companies' introductory programmes for their new employees. After being family owned, then owned by its own staff, and since 1991 owned by companies listed on the Stockholm stock exchange, since 2000 Pentronic has been part of the listed company Indutrade AB. Even this shift from a private to a public company happened at the right time.

"A company listed on the stock exchange has a completely different set of muscles, which Pentronic needed to continue its development," Lars explains.

Flexible and reliable

Over the span of forty years the number of employees has increased tenfold. The growth in terms of the number of sensors produced has been far greater, because production has become flow oriented and more rational.

Even though the production of temperature sensors is still a handcraft, the work has become more efficient, with standardised sub-components, new methods and as much automation as today's technology allows.

Nowadays just having high-quality products is not enough – equally important are flexibility as well as fast and above all reliable deliveries. Pentronic has 99 percent delivery reliability calculated by the day. This is the result of a conscious focus on this aspect plus having employees who are aware of the consequences that errors and delays have for the customer.

Investing in the future

Industry's ever-increasing demands for accuracy are leading Pentronic back to the time when it supplied entire measurement systems including cabling and controllers. Customers' requirements can be more stringent than sensors' tolerances according to the relevant standard. The solution is to fine tune and calibrate an entire measurement system as a whole. As a result, Pentronic has developed sensors with built-in transmitters to be connected via a bus system. These provide a performance that was not previously possible in an industrial environment, whilst also making installation far simpler for the customer.

Forty years have passed – so what does the future look like? Lars Persson answers that the founder's words are still just as valid today: ***Pentronic will be the world's best supplier of temperature sensors to its customers.***

What does the temperature sensor in a waste incinerator measure?

Questions should be of general interest and be about temperature measurement techniques and/or heat transfer.

QUESTIONS ? ANSWERS !

QUESTION: To measure the temperature inside our waste incinerator, one device we use is a type N sheathed thermocouple mounted in a protection tube. Its temperature readings are one of the parameters we use to control the incinerator. Which temperature is the thermocouple actually measuring?

Jan L

ANSWER: The combustion temperature inside waste incinerators is normally about 1000 °C. If we measure the temperature inside the incinerator using a sheathed thermocouple inside a protection tube that lacks a radiation shield, we are measuring a temperature that is being influenced by many factors, such as: the temperature of the fuel bed, the temperature of the gas inside the incinerator, the temperature of the flames, and the temperature of the incinerator's cooled walls.

The thermocouple

Heat is transferred to the protection tube enclosing the thermocouple via convection and radiation from the gas and the burning fuel. From the protection tube, heat is transferred via radiation to, among other things, the cooled walls of the incinerator. In addition, inside the protection tube and thermocouple there is an axial heat flow via thermal conduction to the measuring equipment's attachment to the incinerator wall. It is therefore impossible to measure only the gas temperature by using this type of measuring equipment. The thermocouple only measures its own temperature, which in this case consists of a mean temperature, of which the gas temperature is one of the components. The measuring equipment's often robust construction also causes a relatively long response time.

IR pyrometer

If you want to continually measure only the gas temperature inside an incinerator, you can use an IR pyrometer, which is mounted outside the incinerator in question. Temperature readings are taken via a sight glass and within a narrow wavelength range so as to reduce the influence of various types of disturbance. Sophisticated filter technology and data processing of the readings are then used to increase the accuracy of this method. The pyrometer must also be fitted with some kind of equipment to purge it with e.g. bursts of compressed air in order to avoid the optical system becoming dirty.

Suction pyrometer

For inspection purposes and temporary readings we can use a suction pyrometer to determine the flue gas temperature, see Figure 1. A suction pyrometer is a long, water-cooled instrument, which we can insert via the existing inspection hatches in the incinerator wall in order to reach the relevant areas of the incinerator to measure the flue gas temperature. The gas is sucked at a very high velocity past a sheathed thermocouple, which is surrounded by a radiation shield to minimise the effect of the radiation. Suction pyrometers are not designed for continuous measurement of flue gas temperatures.

READ MORE

Read more on www.pentronic.se > News > Technical information > Examples of heat transfer

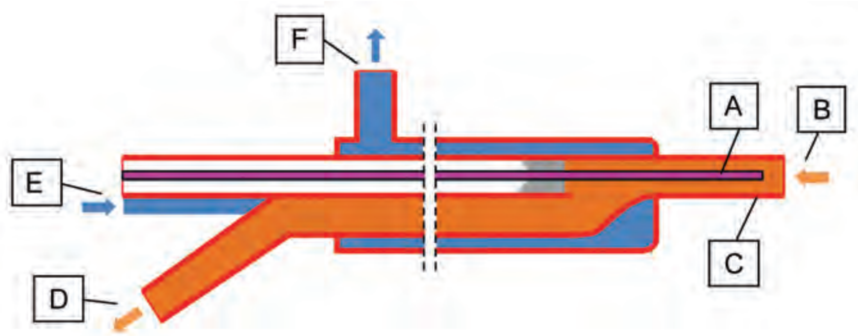

Figure 1.
An example of a suction pyrometer. A) The sheathed thermocouple, B) The entry for the flue gas, C) The radiation shield for the thermocouple probe tip, D) The exit for the flue gas, E) The entry for the cooling water, F) The exit for the cooling water.

If you have comments or questions, contact Professor Dan Loyd at the Institute of Technology at Linköping University: dan.loyd@liu.se

STRAIGHT FROM THE LAB

Order a calibration recall

A missed calibration can cause problems during an audit of a company's quality system.

That is why Pentronic is offering to recall the equipment for calibration in good time before the calibration certificate expires.

"Many companies have ten to fifteen instruments and sensors that require calibration at various times. A calibration recall reduces the risk of forgetting one of these," explains laboratory manager Lars Grönlund.

The service was introduced this summer but for many years Pentronic has had a programme for the calibration recall of measurement systems used by many of Sweden's municipal environmental and health protection administrations in exercising their official duties. In this context a missed calibration can, for instance, result in a food inspection losing its legal standing.

Every instrument and sensor returned for calibration must be accompanied by the customer's contact details etc. To facilitate handling there is a PDF form for customers to fill in on screen and print out.

The form can be downloaded from www.pentronic.se. You will find it under About Pentronic/Returns/Calibration of Equipment.

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Pentronic's laboratory is accredited since 1988

Accurate thermometer for food

The Thermapen gives a temperature reading within ±0.4 °C in the space of four seconds as long as the tip is sufficiently inserted into the liquid. The thermometer is primarily designed for the food industry: for institutional kitchens, restaurants and shops for such purposes as monitoring and controlling the cooling chain, and for the industry's food laboratories.

The Thermapen is pocket size and the probe tip can be folded in and out like in a clasp knife. The image shows an intermediate position.

Model 11-35011

IR pyrometers: specify your needs before you buy

Are there universal pyrometers? How can some models cost only 30 or 40 euros while others are many times more expensive? How do the low-price versions differ from the industrial ones? We discuss these issues here.

There are no universal pyrometers that cover all measurement needs. To think there are is about the same as expecting a universal vehicle that can cover all transport needs from a sports car to a truck. However, within well-defined limits the term 'universal' can suffice.

Fundamentally, all IR pyrometers consist of similar functions. See Figure 1. An IR pyrometer measures the intensity of the radiation that enters its opening (1). In the simplest case, a plastic window provides enough protection against dirt, which creates a diverging field of view and a target surface that increases along with the distance to the measurement object. If you want to measure small objects you need a lens system to zoom in on a small target surface (the "spot"). A pyrometer normally measures the average temperature across the entire spot, so the measurement object itself should be considerably larger than the spot. See Figure 2. Even with these few factors, the complexity of the possible components already varies widely, and thereby so does the price of the pyrometer.

The lens is the sensitive part

If the radiation intensity encountered by the lens is high, then the lens must be able to withstand it, that is, it must be made of a material that is not deformed by high temperatures but allows the desired wavelength interval to pass through. The need to cool the pyrometer and repel dirt can require an air purge, sometimes accompanied by bursts of compressed air. In very hot environments, the pyrometer housing may also need water cooling jackets. Industrial pyrometers are often already prepared to take these accessories. In general, the higher the temperature you want to measure, the shorter are the wavelengths that the wavelength filter (2) must let through. A high temperature gives the highest signal output, for instance of metals, typically within 0.7–4.5 µm of the infrared spectrum, which comprises the wavelengths 0.7–20 µm. Organic materials under 500 °C have the best resolution within 8–14 µm. Wavelength filters can of course be manufactured with various precisions.

Varying response times

The IR detector (3) is the heart of the measuring device. Various types exist, from simple thermopiles to photoelectric versions. Thermopiles must be physically heated by the radiation, which takes some time, whilst electrons in industrial photoelectric versions are excited directly by the radiation. This means that the photoelectric response times can be at the level of ≤ 1 ms. For the best reproduction of the radiation intensities across the spot, the detector and filter must be precision manufactured. Here, too, there is a lot of room for large variations in quality. Signal processing (4) can be solved in various ways. A small amount of drift improves the measurement performance, as does expensive compensation for the temperature of the pyrometer housing. (Compare with the cold junction used when measuring with thermocouples). Before the measurement data is displayed (5) the signal must be linearised and digitised. There are also various control possibilities, such as an adjustable emissivity factor for adapting to the emissivity of the measurement object. An object normally emits its own radiation as well as reflecting other radiation. The emissivity is the proportion of the object's own radiation at the object's thermal equilibrium.

The power supply (6) can, in the simplest case, consist of dry batteries, but industrial pyrometers often need continuous operation powered by an external source.

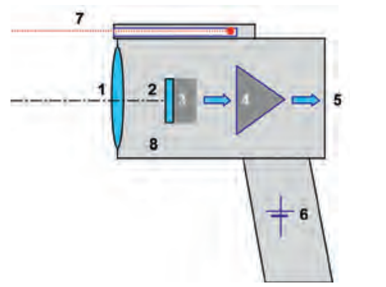

Figure 1. Hypothetical construction of an IR pyrometer: 1) Lens or window, 2) Wavelength filter, 3) IR detector, 4) Amplification and digitalisation, 5) Readings display and settings, 6) Power supply, 7) Laser sights, 8) Housing. See further in the text.

The laser sights (7) can differ in their design. The diagram shows a simple type of laser, which aims in parallel with the radiation's sight path and gives some indication to within a few centimetres of where the target surface's centre lies. A more effective version is found on some industrial instruments. It is a laser beam that is reflected into the radiation's sight path and thereby indicates the target surface's true centre regardless of the distance.

The IR pyrometer's housing (8) can be made of plastic or metal. Plastic most often involves a fixed construction with basic equipment for use at low temperatures, and can therefore be manufactured in large series at low cost. Pyrometers designed for industrial use are more rugged and customers can choose the components, such as the lens system and cooling devices, to best suit their measurement requirements.

Specify the requirements first

Because the quality of pyrometers can vary widely in a number of ways, it is not surprising that prices can differ a great deal between simple handheld devices and lavishly equipped industrial IR pyrometers. It is therefore important to first draw up a specification of your measurement requirements with regard to the measurement environment, measurement object, performance, required settings, and similar factors before you select your IR pyrometer. Only then can you determine what quality level is required for your particular measurement task.

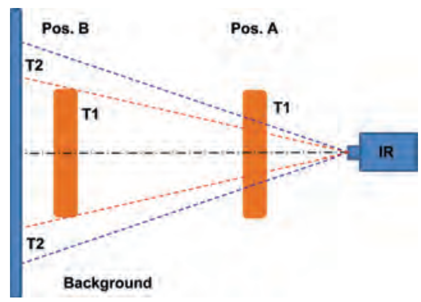

Figure 2. The pyrometer (IR) measures what it perceives inside the blue sector. With the measurement object at Position A, the pyrometer only perceives the surface temperature T1. If the measurement object is moved to Position B, the pyrometer perceives the temperature T1, inside the red sector, but also the temperature T2 from the background. In this case, Position B gives a mean temperature across the total measurement surface inside the blue sector. With a lens system a pyrometer can also zoom in on small details from a long distance away.

If you have questions or comments, contact Hans Wenegård: hans.wenegard@pentronic.se