



UNIT 5 INSTRUMENTATION AND SENSORS FOR FOOD INDUSTRY



Practical consideration for implementing online measurement in food industry

When implementing online measurement in the food industry, consider factors like sensor accuracy, real-time data integration, regulatory compliance, and system reliability. Additionally, ensure that the measurement system aligns with industry standards and can effectively handle variations in food properties and production conditions. Regular calibration and maintenance are crucial to uphold measurement precision over time.

Radiation thermometer principles of measurement and application

A radiation thermometer, also known as an infrared thermometer, measures the temperature of an object by detecting the infrared radiation it emits. The basic principle is based on Planck's law, which describes the relationship between the temperature of an object and the amount and wavelength of radiation it emits.

The key points:

Infrared Radiation: All objects with a temperature above absolute zero emit infrared radiation. The amount and characteristics of this radiation depend on the object's temperature.

Detector: The thermometer uses a detector sensitive to infrared radiation. Common detectors include thermopiles or bolometers.

Optics: The thermometer often has optics to focus the infrared radiation onto the detector. Lenses or mirrors help collect and concentrate the emitted radiation.

Temperature Calculation: The thermometer converts the detected infrared radiation into an electrical signal, which is then used to calculate the object's temperature based on the Planck's law and the Stefan-Boltzmann law.

Applications include:

Medical Use: Non-contact temperature measurement in healthcare for quickly assessing body temperature.

Industrial Processes: Monitoring temperature in manufacturing processes, especially those involving high temperatures or moving objects.

HVAC Systems: Checking temperatures in heating, ventilation, and air conditioning systems.

Food Industry: Ensuring food safety by measuring the temperature of surfaces or products without physical contact.

Maintenance and Diagnostics: Detecting temperature variations in electrical systems or machinery to identify potential issues.

Research and Science: Used in various scientific fields for accurate and non-intrusive temperature measurements.

Radiation thermometers offer advantages such as speed, non-contact measurement, and suitability for remote or hazardous environments

Biosensor equipment e-nose

Biosensor equipment and electronic noses (e-noses) are advanced technologies used for detecting and analyzing biological and chemical substances. Biosensors typically incorporate a biological element, like enzymes or antibodies, to recognize specific analytes. E-noses, on the other hand, are sensor arrays that mimic the human olfactory system, identifying and quantifying odors or volatile compounds.

Both biosensors and e-noses find applications in various fields, including healthcare, environmental monitoring, food safety, and industrial processes. They offer rapid and sensitive detection capabilities, making them valuable tools for real-time analysis.

Food components analysis using NIR and FTNIR

Near-Infrared (NIR) and Fourier Transform Near-Infrared (FTNIR) spectroscopy are widely used for food component analysis. These techniques rely on the absorption of light in the near-infrared range to provide information about the composition of a sample.

NIR and FTNIR can analyze various food components such as moisture, fat, protein, and carbohydrates. The basic principle involves shining light onto a sample, measuring the reflected or transmitted light, and then analyzing the spectrum to determine the concentration of different components based on their unique absorption patterns.

These methods are advantageous for their non-destructive nature, speed, and ability to analyze multiple components simultaneously. They find applications in quality control, process monitoring, and research within the food industry. Keep in mind that calibration models specific to the type of food and components of interest are crucial for accurate results.