Quick And Continuous Measurement Of Quality Variables For Bakery Products After Baking

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The color, moisture, geometry and figures are of great importance to define product quality of the bakery products. It is unable to check the continuous quality of so many products that flow at high speed on conveyors in the industrial applications manually. Additionally, it is not easy to eliminate quality defective products. Some devices; such as color-optic sorters, x-ray are used that can control and sort automatically extract some quality errors in some applications.

In order to ensure the accuracy of these products and similar quality features by existing methods, laboratory-based measurements and statistical approaches made at regular intervals are used. For this reason, process settings can be made with a delay. Some analyzes may last up to 10 minutes meanwhile the products keep flowing on the conveyors. Since the quality defects can not be corrected simultaneously, products can be caused waste or inadequate quality.

In this study; new systems that can perform simultaneous reading and evaluation of bakery products high speed. Digital cameras for color, figure and geometry; infrared sensors to detect moisture content in baked products were tested. The data obtained is processed through computers with developed software to create infrastructures that can give feedback and report.

Consecutive measurements were taken at high speed by placing devices covering conveyor width and 100 % product control has been achieved. The data obtained is compared to the reference data transferred to the computer, deviations from the defined intervals are determined, reported and feedback signals are generated. For precise color reading, dark and insulated cabin have been used. The received images were evaluated using known image processing algorithms. The product diameter, circularity and the correctness of the figures are taken into consideration with discrete color analysis of different regions of the products.

The water molecules that absorb energy (surface energy) on the adjacent layer of the surface of the product has been used for moisture control. The correlation between the surface energy and the moisture of the product made in the laboratory have been proved by a number of tests. The read data was converted into moisture data with the aid of the defined correlation and the improved software. Signals for automatic control of the process have been obtained with reference to moisture data. The obtained signals can be sent (speed, temperature, pressure, heat flux, etc.) to the related points of the process for automation.

As a result; it has been determined that faster and more continuous data can be obtained than measurements made by methods known in the laboratory. In addition, rapid processing of the read data is expected to result in less product waste and inadequate products, via automatic controlling of the processes. It has also been observed that color measurements at different areas of complex figured products are more discriminating and sensitive than the current laboratory conditions.

Instead of known process controls; it has emerged that a product quality control system can be used that is supported by proprietary software which provide repeatable, faster and more reliable results. In this way, product quality and process control will be managed better by fast, simultaneous, continuous reading and evaluation of moisture, color, figure and geometrical properties of baked products flowing continuously and at high speed through conveyors; reports can be generated in different formats.

The quality measurements of baked products such as color, geometry, figure and humidity can be done at high speed with the new combined system. The generated signals from the sensors applied on the line can be used for automatic control of the process and reports can be generated.

Keywords: Infrared sensors, NIR sensors, color measurement, RGB, humidity measurement.