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problem solution"

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Physics and occupational safety

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16.1.

Фізика та професійна безпека

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4. Analysis of food products using optical methods

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Introduction. Optical methods are essential for food product analysis. Their applications include quality control of raw materials and finished products (for sorting, impurity detection, labeling, identification, etc.).

Materials and methods. The materials for the research include food products, in particular, berries, fruits, vegetables, eggs, meat, fish, honey, etc. For their comprehensive analysis, various optical methods are used, including infrared spectroscopy, ultraviolet spectroscopy, visible spectroscopy, refractometry, X-ray fluorescence, and others. These methods allow for the determination of the product's physicochemical properties, the content of the main components, the detection of impurities, traces of pesticides, heavy metals, as well as the evaluation of their freshness, degree of ripeness, and quality (including during technological processes and in the process of storage).

Results and discussion. There are several ways to use optical methods in the technological processes of food production. Among them are:

- visual quality control of products (video cameras and visual control systems are used for this purpose, which can automatically detect defects and flaws in products; for example, eggshell cracking, damage to packaging or labels on it, inconsistencies in product shape or color, allowing for timely detection and removal of substandard products);

- sorting and selection of products (optical sorting systems can automatically screen out defective products, i.e., berries, fruits, and vegetables with various types of damage or signs of drying are sorted);

- measurement of product parameters (optical sensors can measure size, shape, weight, color, brightness, transparency, etc.);

- detection of foreign objects (optical methods of infrared spectroscopy or X-ray fluorescence can be used to detect foreign objects in food products, such as metal or glass particles, fragments of packaging material, and other undesirable items or chemical contaminants);

- measurement of temperature, humidity, and chemical composition of products (optical thermometers and hygrometers can be used for non-contact measurement of temperature and humidity, which is an important condition for quality production and storage of products; spectroscopy and refractometry methods can be used to control the moisture content and chemical composition of grain, honey, meat, fish, etc.);

- labeling and identification of products (optical labels, i.e., barcodes or QR codes, allow tracking their production and supply history, while providing convenience for consumers in obtaining product information).

Therefore, optical methods enable non-contact and highly accurate analysis of various parameters which directly affects the quality of the finished product. These technologies help to quickly identify defects or deviations in the production process, optimize the consumption of ingredients or energy resources, and increase production efficiency and speed. Optical non-contact measurement guarantees the maintenance of high quality standards.

Conclusions. The analysis of food products by applying optical methods allows for monitoring without the need for intervention in the technological process, which helps to reduce the risk of contamination or damage to products and guarantee the high quality of the final product.