Pulsed Light effectively disinfects food processing conveyors in realistic simulations

Overview

A study conducted at Penn State evaluated the effectiveness of pulsed ultraviolet (PUV) light as a decontamination method for food contact surfaces under varying conditions. Using XENON Corporation Pulsed Light systems, researchers assessed the antimicrobial efficacy of PUV light on conveyor materials including rigid-linked polymer, chain-link, PTFE fabric, and pliable polymer. They investigated different treatment parameters such as energy levels and surface conditions to determine the impact on microbial reduction and surface temperature.

The results demonstrated that PUV light treatment was effective in reducing lactic acid bacteria (LAB) and Escherichia coli K12 NSR on the conveyor materials, and effectiveness is significantly increased on surfaces that had been pre-cleaned. Results of the study show PUV light is a viable decontamination method for food contact surfaces.

Markets/Applications

Food Processing: Conveyor belts, tabletops, and other surfaces involved in food production to reduce the risk of microbial contamination and ensure food safety.

Food Service and Hospitality: Surfaces such as cutting boards, countertops, utensils, and food preparation equipment.

Packaging and Storage: Reduce microbial contamination and extend the shelf life of fresh produce, ready-to-eat meals, and other packaged food items that are susceptible to microbial growth during storage and transportation.

Highlights

- PUV light reduced lactic acid bacteria (LAB) and E. coli on various food contact surfaces without affecting the food products
- Experimental setup replicated real-world food processing environments
- Clean surfaces showed higher germicidal responses compared to soiled surfaces, highlighting the importance of proper pre-cleaning
- Surface complexity and topography impacted the germicidal response
- Changes in surface temperature varied among the materials, emphasizing the need to consider temperature sensitivity

PUV light treatment achieved up to 5 log microbial reduction on food contact surfaces using a XENON Pulsed Light RC-802 Interweave system.

The information in this report was prepared by XENON and does not contain the complete research conducted by Cassar et al. A full version of the research paper is available at https://journals.sagepub.com/doi/10.1177/10820132211049610

Summary of Research

Pulsed Ultraviolet Light Decontamination of Meat Conveyor Surfaces

Original research by Joshua R. Cassar, Edward W. Mills and Ali Demirci

Objective: Study the effectiveness of Pulsed UV (PUV) Light as a food decontamination intervention in a food plant setting, specifically on conveyor surfaces.

Methodology: Pulsed ultraviolet light was generated using an RC-802 Interweave System (model Z-5000; Xenon Corporation, Wilmington, MA). The system had two flashlamps positioned above a stainless-steel mesh conveyor. An important distinction of the current study from previously completed work is that the food contact surfaces were exposed to PUV light on a moving conveyor with the flash lamp mounted above the belt materials. This arrangement represents a PUV light intervention in a real food plant setting.

Experiments were conducted using different conveyor materials, including rigid-linked polymer, pliable polymer, PTFE fabric, and chain-link, to simulate real-world scenarios. The surfaces were evaluated in both soiled and unsoiled conditions to assess whether soil can protect microbes from PUV light. The conveyor materials were also exposed to different energy values by varying the conveyor speed. Microbial reductions were measured by quantifying the logarithmic reduction of lactic acid bacteria (LAB) and E. coli K12 NSR on the surface of the materials after PUV light treatment.

Surface temperature changes during PUV light treatment were measured to evaluate the impact on the thermodynamic characteristics of the materials. Statistical analyses were performed to assess the significance of the results, and the research data compares different materials, treatment parameters, and surface conditions.

Results and Conclusions: The findings showed that PUV light was successful in reducing bacteria on various surfaces. When the surfaces were clean, the light treatment significantly reduced both E. coli bacteria and lactic acid bacteria. The researchers also observed a slight increase in surface temperature during the light treatment, although this varied depending on the material used. This study demonstrates that PUV light can be a promising method for sanitizing surfaces in the food industry. It proved to be most effective when the surfaces were clean, so pre-cleaning methods will be necessary to achieve optimal results. These findings contribute valuable insights into PUV light's potential as a solution for maintaining hygiene in food processing environments.

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