Luminometers - Rapid Hygiene Monitoring

It is essential to determine the cleanliness of food processing equipment and manufacturing areas before they are used for food production. Unclean surfaces may contaminate food products and compromise product safety and quality. Luminometers help processors to validate and monitor the hygienic status of food contact surfaces.

Luminometer

The luminometer evaluates surface cleanliness by measuring the chemical marker adenosine triphosphate (ATP), a compound found in all types of plant, animal and microbial cells.

The science behind the luminometer is based on the enzyme luciferase – the same enzyme that makes firefly tails glow at night. Residual ATP interacts with luciferase to generate light which is measured by the luminometer and expressed in relative light units (RLU).

The amount of light generated is directly proportional to the amount of ATP present - an indication of the total biological contamination level.

Testing Swabs

Visually clean surfaces are sampled using swabs pre-moistened with water, buffer or a solution that enhances ATP extraction from microorganisms and food residues.

Following sampling, the swab is placed back into its swab tube for activation with its self-contained, liquid luciferase reagent and inserted into the luminometer for analysis.

Specialized swabs are also available for water and allergen testing:

- **water:** the presence of ATP in water may indicate a loss in process control. These swabs are used for ATP detection in clean-in-place (CIP) systems or in water quality assessments for food and beverage purposes.
- **allergens:** these hyper swabs are 1000 times more sensitive than normal surface testing swabs and detect ATP common to allergenic foods (e.g., egg, milk). The ATP detection levels indicate potential contamination similar to protein-based allergen tests

Swabbing Procedure Example

- Identify a small surface area for sampling (four by four inches or 10 by 10 centimeters).
- Maintain constant pressure while slowly rotating the swab to ensure maximum surface contact.
- Apply 10 zigzag strokes over the surface – back and forth and then up and down across the area

Manitoba

Data Management

Many luminometers store data on swabbing location and test results. This information is transferred to a computer for analysis using accompanying data management software which allows the processor to:

- analyze trends
- exhibit corrective actions and due diligence

Hygiene Monitoring

Luminometers display RLU results as a number count or a pass/warning/fail reading:

- **Number counts** indicate the amount of ATP detected and counts will decrease with an improved sanitation process.
- **Pass** indicates low levels or no ATP, which validates the sanitation process.
- **Warning** suggests that ATP counts are higher than expected and a review of cleaning procedure and/or re-training of sanitation personnel may be necessary.
- **Fail** means that high ATP counts were found and immediate corrective actions are required.

Purchasing Considerations

- **Cost:** luminometers with photomultiplier tubes have superior sensitivity but are more expensive than luminometers outfitted with less sensitive photodiodes.
- **Product characteristics:** the instruments size, weight, battery life and general durability.
- **Adequate technical support from suppliers:** ensures the device is properly operated and test results are correctly interpreted.

Benefits

- Test results are generated within seconds.
- Supports hands-on training by allowing personnel to visually compare surface cleanliness with test data.
- Swab testing is easily applied to most food processing plants, food service or retail sites as well as delivery vehicles and incoming materials (e.g., packaging).
- Dedicated laboratory space, specialized staff or extensive training is not required.
- Validates sanitation standard operating procedures (SSOP).

Limitations

ATP testing does not replace routine microbiological analysis which provides complementary information on any background or specific microorganisms.

- Test results are sometimes mistakenly thought to reflect only microorganisms, instead this non-specific test detects ATP from all various components of any given soil (e.g., microorganisms, food residues).
- Although ATP may not be detected, some other types of contamination may exist.
- Luminometer models differ significantly in detection limits and reproducibility.

For more information on food safety please contact the Food Safety and Inspection Branch at foodsafety@gov.mb.ca.