Point-of-Use Pulsed Electric Field Device for On-Site Disinfection of Water

By

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Abstract

Many microorganisms including known waterborne pathogens (e.g., Legionella pneumophila, Pseudomonas aeruginosa, Aemonas sp and Mycobacterium sp) could thrive in municipal water supply network and building water distribution system. Also, some open water features such as water ponds and fountains are common in modern architecture and interior design. When improperly maintained, they could become a reservoir for microbes and pests. Chemical disinfectants (i.e., chlorination) are often used, but can lead to malodor and material corrosion. This work examines an alternate water disinfection technology based on pulsed-electric field (PEF). Microbes subjected to pulsed-electric field often experience a change in cell permeability and on occasion irreversible poration on the cell membrane that leads to cell death.

A point-of-use PEF device using a portable circuit and electrodes was designed and fabricated. Laboratory studies showed that the PEF is effective against 90% of common Gram-negative bacteria (i.e., Escherichia coli) commonly found in water without changing the water quality (i.e., pH, hardness and ion content). The device was also tested in Queen Elizabeth Hospital’s drinking water system and a water feature located at Hong Kong University of Science and Technology (HKUST) to measure its effectiveness under practical use conditions. The field test studies showed that the point-of-use PEF device has effectively inactivated the total number of coliform bacteria in the water.

Date: 15 January 2015 (Thursday)
Time: 10:00am
Venue: Room 4577 (Lift 27-28)

Examination Committee:
Prof. Guohua Chen, Chairman
Prof. King Lun Yeung, Supervisor
Prof. Joseph Kwan

ALL ARE WELCOME