DIVERSIFIED TECHNOLOGIES, INC.®

PRODUCT BRIEF


Radar Transmitters

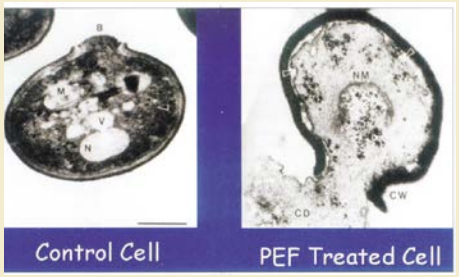

Advanced RF Systems


Power Converters

PowerMod™

Pulsed Electric Field Applications

Systems in Action



Comparison of control cell (saccharomyces cerevisiae) with PEF treated cell showing damage to cell membrane. Source: Washington State University.

Non-Thermal Pasteurization of juices is the most widespread application in PEF processing. PEF is known to achieve kill ratios of 5-9 log at field strengths of 35-50 kV/cm.

Pulsed Electric Field (PEF) processing uses short high voltage pulses to break down cell membranes, killing micro-organisms and promoting the release of intracellular fluids in plant and animal tissues. This technique, known as 'electroporation', has a wide range of applications, and can be used to treat liquids, slurries and solids.

In PEF processing, the delivery of precise high voltage pulses is critical. DTI's ability to produce square pulses, with an exceptionally "flat" top, as well as fast rise and fall times, ensures that the PEF treatment provided to the product is highly uniform. This allows for a precise control of the effects of PEF in the specific application, and optimal energy use. DTI builds lab-, pilot-, and industrial-sized PEF systems.

PEF Applications

PEF has been used in a wide range of applications, including:

- **Algal Oil Extraction**. The PEF system ruptures algae cells, easing access to intracellular oil, which is released into the surrounding solution.
- **Non-Thermal Pasteurization of Liquids and Semi-Solid Foods**. The PEF system kills microorganisms, preserving freshness without heating the product.
- **Sugar/Juice Extraction**. Similar in practice to algae oil extraction, the PEF system opens intracellular material (i.e., juice from vegetables, fruits or other plant materials) into the surrounding solution, increasing product yield.
- **Wastewater Treatment**. PEF can be used to kill pathogens or to open cells for enhanced digestion, reducing the volume of solids requiring disposal and increasing the amount of material available for conversion to energy.
- **Efficient Drying/Dehydration.** PEF can reduce energy usage in drying processes by up to 50% in comparison to traditional drying methods.
- **Tissue Modification.** PEF can be used to modify plant and meat texture by increasing tissue permeablility. Texture modification is known to enhance food quality and promote efficient manufacturing processes, reducing the cost of downstream operations such as slicing or peeling, significantly.

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DTI's PEF systems are electrically and physically customizable over a wide range of specifications, providing optimal solutions for specific applications. Users are able to vary the voltage, the duration, and frequency of the pulses independently. All DTI systems employ the inherent advantages of solid-state electronics such as long system lifetime, high efficiency, and low operating costs.

A typical PEF system consists of:

(1) A power supply to convert utility power to high voltage DC power.

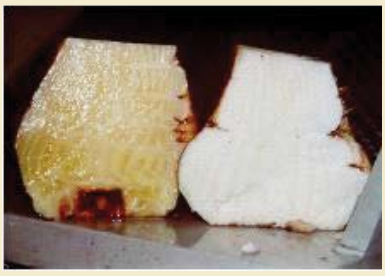
(2) A high voltage pulse modulator to transform the DC power into short pulses

(3) A treatment chamber where the high voltage pulses are applied to the product. Treatment chambers can be customized to treat a wide range of input materials, including liquids, slurries, and solids.

(4) A touch screen user interface for ease of operation.

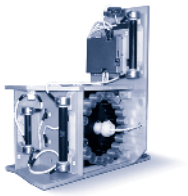
See DTI's other data sheets for more details on lab-, pilot-, and industrial PEF systems.

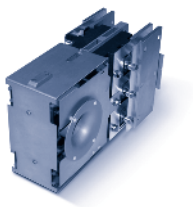
PEF wastewater treatment system with a capacity of 10,000 liters/hour. Comprised of a 150 kW DC power supply, a 40 kV, 500 A pulse modulator, and a treatment chamber with four 15 mm treatment gaps.

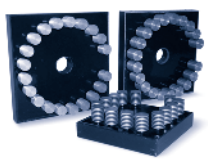


Cross sections of sugar beets after PEF processing (L), and untreated (R). Oozing in the treated sugar beet section is apparent. Sugar extraction through PEF processing required 60 times less energy than conventional thermal processing. Courtesy FZK, Germany.

DTI built the world's first commercial scale PEF food processing system, based upon DTI's PowerMod™ electronics, in association with Ohio State University's department of Food Science and Technology.







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