



Radar Transmitters



Advanced RF Systems



Power Converters

PowerMod™

Pulsed Electric Field Lab and Pilot Units

Systems in Action



Laboratory/Pilot scale PEF unit. The front-mounted PLC provides quick and precise control, while the treatment chamber is located on the side to allow for ease of cleaning and assembly. Pulsed electric field is applied to the fluid as it flows through the treatment

Pulsed Electric Field (PEF) processing passes liquid foods, biomass, or other pumpable products through a treatment chamber, where the product is subjected to multiple short (1 μ s – 20 μ s) pulses at very high voltage. The high voltage field created across the product (approximately 35-50 kV/cm) ruptures the organism's cell via electroporation, killing the organism and promoting the release of intracellular fluids. In a typical system multiple treatment chambers apply pulses to a stream of fluid, achieving kill ratios of 5-9 log, similar to those of pasteurization. Experiments have demonstrated that the shelf life of PEF processed food is comparable to that of pasteurization, with no adverse impact on the taste or nutritional value of the food. The same system, operating at lower electric field strength, can be used to make plant and meat tissues permeable to support extraction, drying, and other processes. No chemical or radiation treatment is involved in the PEF process.

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.
- **Dehydration.** The PEF system ruptures cellulosic cells, allowing physical pressing to remove greatly increased quantities of water, reducing the need for energy-intensive drying.
- **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 sugar beets or fruits) into the surrounding solution, increasing product yield.
- **Wastewater Treatment.** The PEF system 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.

PEF Lab and Pilot Unit Characteristics

| | |
|-------------------------------------------------------|-----------------------------|
| Field Strength | to 50 kV/cm |
| Peak Voltage | 10 - 30 kV |
| Peak Current | 100 - 300 A |
| Pulse Frequency | to 7 kHz |
| Max Output Power | 10 - 25 kW Models Available |
| Throughput | 10 - 200 liters/hour* |
| All Systems Include Pump and Single Treatment Chamber | |

*Processing capacity will depend on other parameters including conductivity

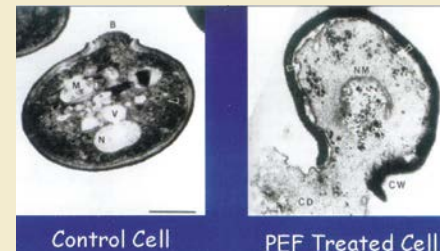


Electroporation

Originally developed to destroy microorganisms as an alternative to pasteurization, PEF also provides a high-throughput approach to effective dehydration and fluid extraction from, and treatment of, biomass. This is accomplished by electroporation.

In a PEF processing system, organic material is subjected to microsecond-scale pulses of very high voltage, generating a strong electric field and polarizing the cell. The polarization creates a voltage difference across the cellular membrane, which causes existing pores in the membrane to expand and, when potent enough, rupture. The ruptured cell then releases intracellular fluid into the surrounding solution.

This freed fluid may then be removed or harvested at a significantly reduced cost compared to traditional means.

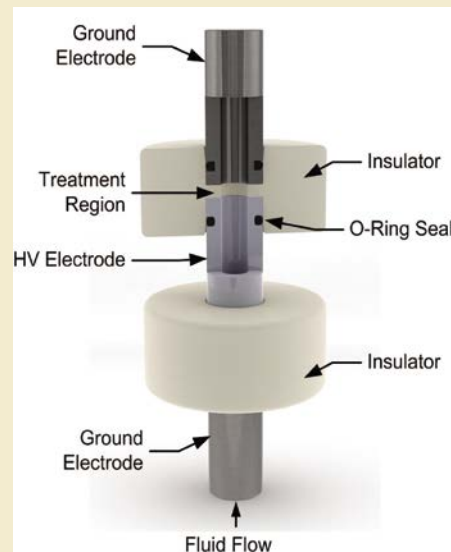


Comparison of control cell (saccharomyces cerevisiae) and PEF treated cell, showing damage to the cellular membrane and released intracellular fluid. Source: Washington State University.

Diversified Technologies, Inc.

Drawing on decades of experience and expertise with high power technologies in applications ranging from radar transmitters to particle accelerators, DTI produces systems recognized globally for:

- Efficiency. 99% power conversion.
- Durability. Rugged design for years of reliable operation.
- Safety. Redundant failsafes and total internal arc protection.
- Compatibility. DTI's systems are fully customizable to fit a customer's need and seamlessly integrate into existing systems.



Cutaway view of a typical PEF treatment chamber, showing a single treatment zone. The pulsed electric field is applied to the fluid as it flows through the treatment zone.

