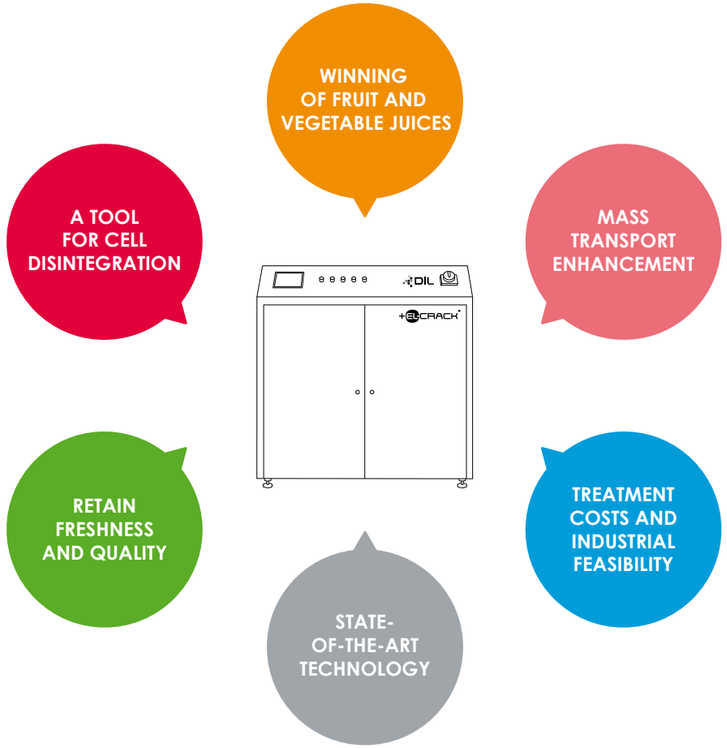
+ELCRACK®

GENERATORS + TECHNOLOGY

developed by DIL

CELL DISINTEGRATION AND
MICROBIAL DECONTAMINATION



PULSED ELECTRIC FIELD GENERATORS AND PROCESS TECHNOLOGY

A TOOL FOR CELL DISINTEGRATION

THE PROCESS

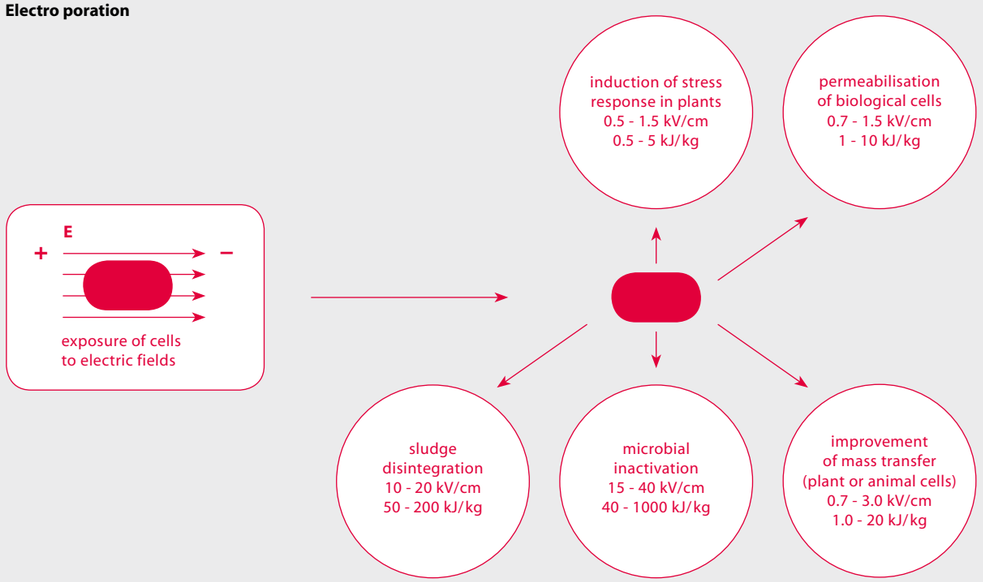
The cell membranes of microorganisms, plant or animal tissue can be made permeable by using a pulsed electric field. This effect, known as electroporation, can be used for a variety of purposes in the field of food and bio-processing.

Besides its use in non-thermal preservation, ELCRACK® can improve the extraction of cell contents like fruit and vegetable juices, sugars, colours or other active substances. Material transport processes, like the removal of water from plant or animal tissue or the intake of marinades, spices or auxiliary substances, can be sped up.

In contrast to conventional technologies, this treatment is conducted at room temperature with a processing time of only a few seconds.

The technology is commercialised by DIL using state-of-the-art technology for pulse generation as well as for treatment chamber design. Treatment times of fractions of a second, continuous operation and energy efficiency are the key advantages of ELCRACK®.

Electro poration

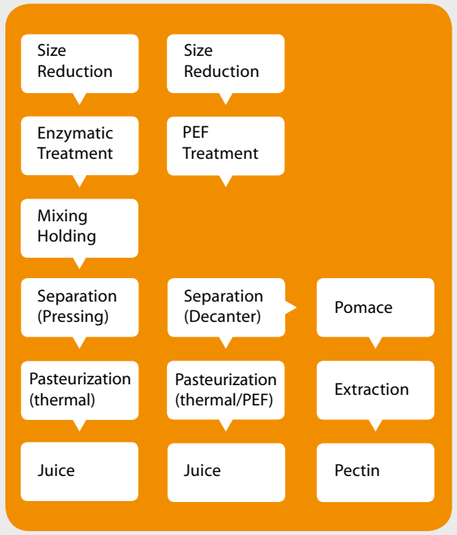


ENHANCE YOUR YIELD

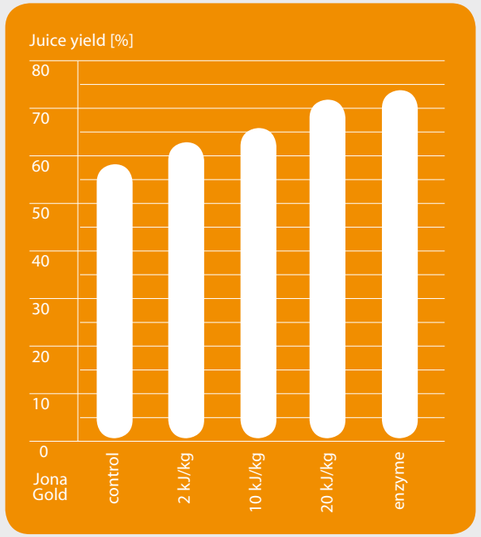
High-quality juices with high nutritive and physiological quality can be efficiently and very gently extracted through the use of the ELCRACK® process - without heat or other additives. In contrast to conventional cell disruption technologies, the value adding substances are preserved.

For a fruit juice processed in a decanter centrifuge, an increase in juice yield from 58 to 72 % can be obtained. Compared to a time-consuming and costly enzymatic maceration, ELCRACK® can be used continuously with total treatment costs between 1 and 2 €/t of raw material.

Scheme of conventional and ELCRACK® enhanced juice production

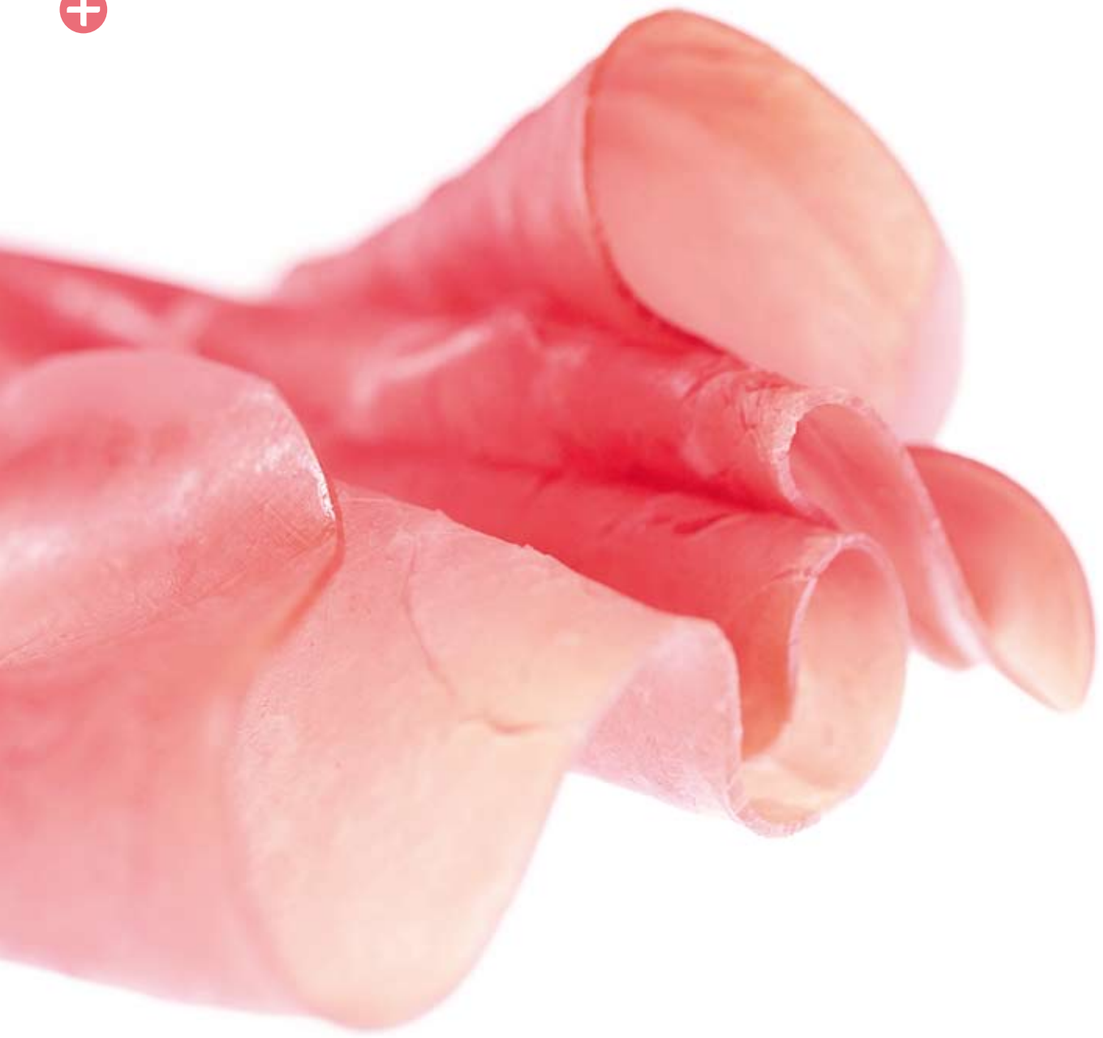


Apple juice yield improvement by ELCRACK® application



Apart from the increase in juice yield, the juice contains more valuable components such as pigments, antioxidants and vitamins. Other possible uses of the process include the pre-treatment of oil seeds, marine organisms or cell cultures for the production of functional ingredients for food, cosmetics or pharmaceuticals.

WINNING OF FRUIT AND VEGETABLE JUICES



MASS TRANSPORT ENHANCEMENT

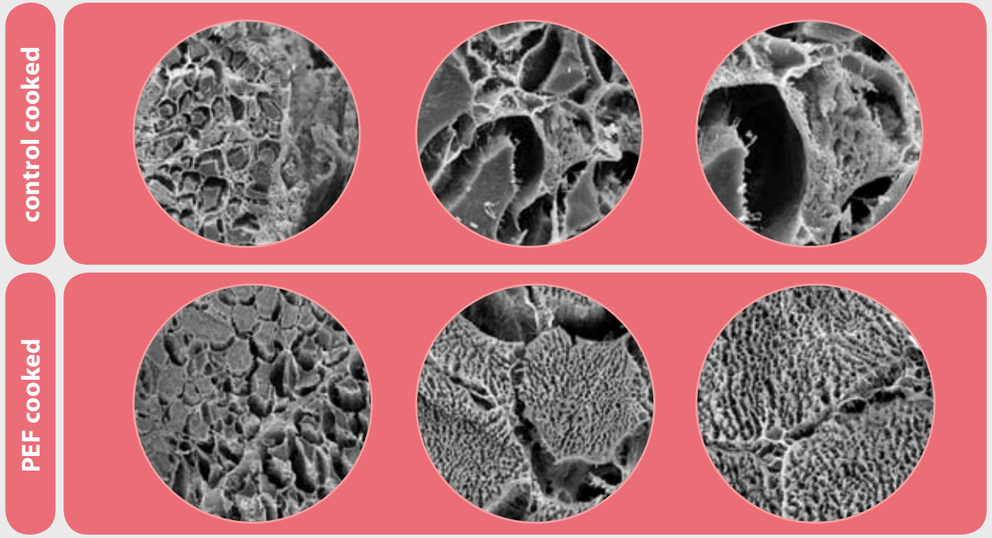
SPEED UP SLOW PROCESSES

Mass transport in fruit, vegetable and meat tissue often is a velocity-determined step during drying or marination of products. For example, moisture removal and salt uptake during the production of dry cured meat products require up to several weeks and air conditioned storage capacities.

ELCRACK® allows an increased uptake of moisture, spices as well as active agents during marination. During cooked ham production a reduction of processing times and increased brine uptake is obtained. Due to the permeabilisation of the cell membranes, the diffusion rates can also be enhanced allowing a reduction of processing times and costs.

The moisture removal is facilitated by speeding up the transport of the water to the product surface, allowing its quick removal. The time required for moisture removal from vegetable tissue can be typically reduced by 20 to 40 %.

SEM micrographs of cooked ham after ELCRACK® treatment



PRESERVATION

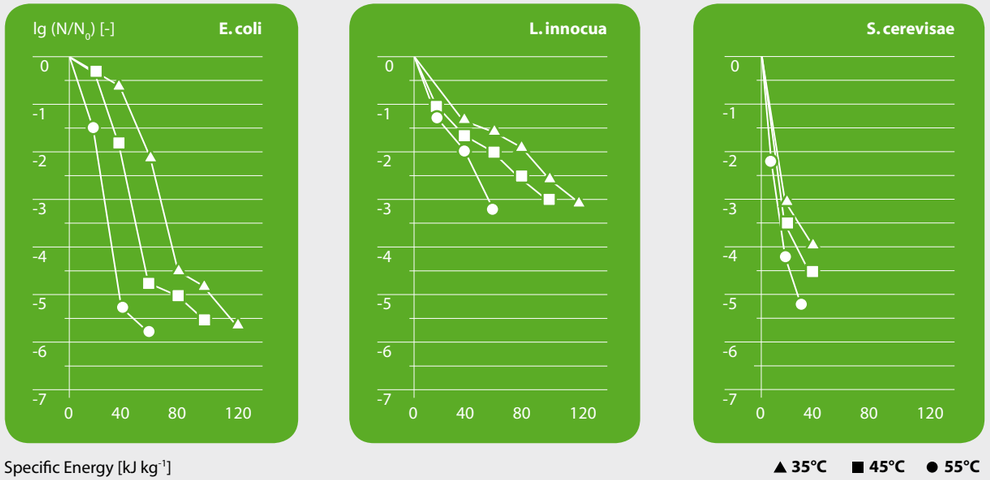
Using ELCRACK® a microbial decontamination of liquid media can be achieved at ambient or slightly elevated treatment temperature. The natural freshness and product appearance as well as the vitamin content are retained.

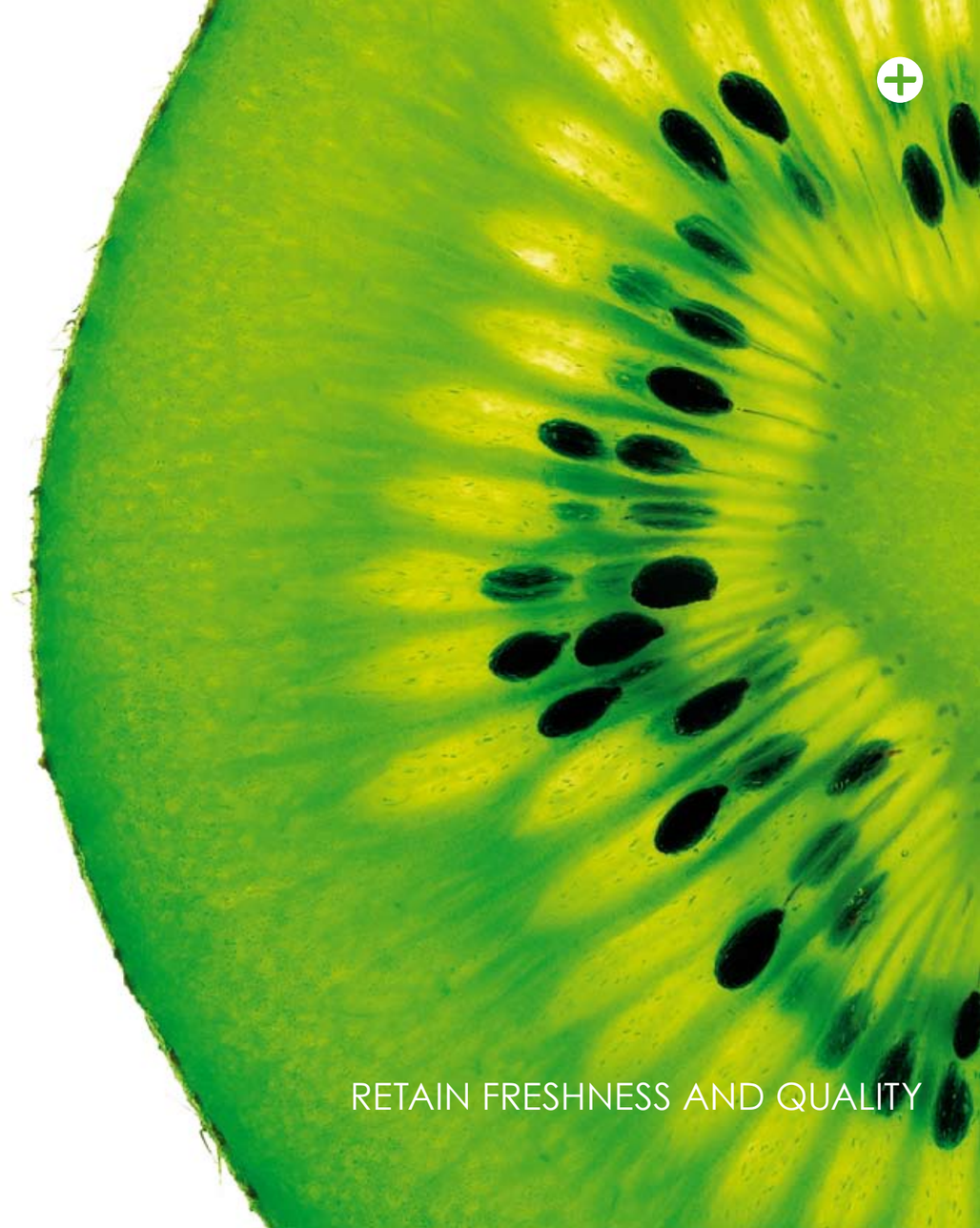
Due to its targeted effect on cell membranes, other constituents such as proteins and their nutritional and technological properties are not affected.

Operating without hot surfaces, the method is highly suitable for heat-sensitive products. The inactivation of pathogenic and spoilage organisms in the range of 5 - 7 log cycles increases the shelf life of the products.

Potential fields of application include the preservation of premium juices, smoothies, milk products, nutrient or protein solutions as well as cosmetic products.

Inactivation of different microorganisms by ELCRACK®





TREATMENT COSTS AND INDUSTRIAL FEASIBILITY

SAVE TIME AND MONEY

The application of ELCRACK® is energy-efficient, waste-free and commercially viable. The costs are dependent on the type of application and the processing properties.
Without the requirement of holding times, ELCRACK® saves time and money and can be easily implemented into existing processing lines.

Approximate total costs for the application of ELCRACK®

ELCRACK® Model			**5 kW**	**30 kW**	**5 kW**	**30 kW**
Application			**Tissue disintegration**		**Microbial inactivation**	
	Average power	kW	5	30	5	30
	Chamber diameter	mm	25	25	10	10
	Electric field strength	kV/cm	10	12	30	30
	Specific energy	kJ/kg	5	5	50	50
Operation						
	per day	h	20	20	20	20
	per year	h	4400	4400	4400	4400
Investment and operation						
	Investment	k €	62	155	62	155
	Depreciation	y	5	5	5	5
Capacity						
	Production	kg/h	3600	21600	360	2160
	Daily production	t	72.0	432.0	7.2	43.2
Operating costs per kg						
	Depreciation	€ cent/kg	0.078	0.033	0.821	0.337
	Maintenance/wear	€ cent/kg	0.002	0.001	0.205	0.084
	Energy	€ cent/kg	0.021	0.021	0.208	0.208
	Total	€ cent/kg	0.101	0.054	1.234	0.629
	Total per t	€ /t	1.011	0.543	12.342	6292
Energy costs		**€/kWh**	**0.120**			

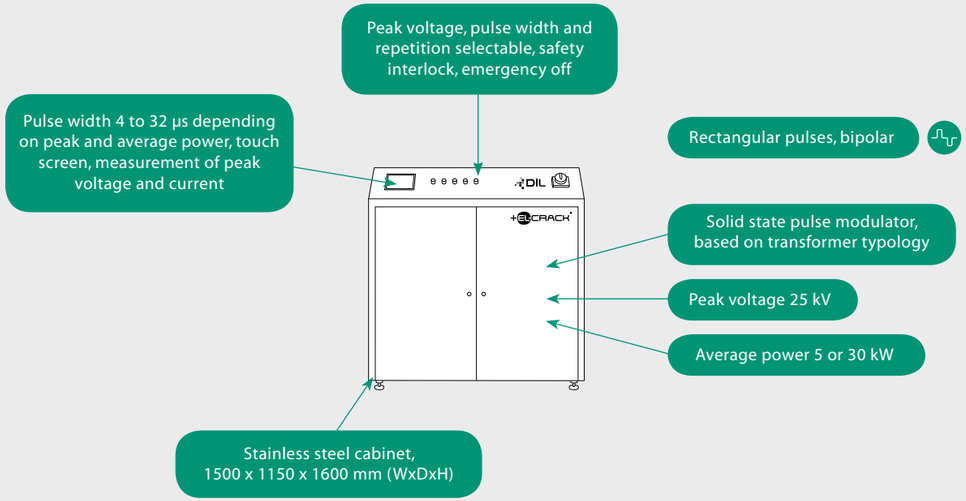
THE EQUIPMENT

ELCRACK® is designed to make use of state-of-the-art pulsed power technology based on a unique design developed by DIL. Based on a pulse transformer design, 5 and 30 kW average power systems are available. Treatment capacity can range up to 2,000 l/h for microbial inactivation and 15 t/h for cell disintegration. Being continuously operable ELCRACK® is easy to integrate into existing processing lines.

The ELCRACK® systems are touch-screen controlled and include a detection of product flow rate for automated adaptation of processing parameters. Important processing parameters are detected internally. During development the focus was laid on simplicity of use.

Our modular treatment chamber design allows quick change of different configuration and replacement. Patented treatment chamber designs are available with a diameter from 3 to 60 mm. For maximum lifetime titanium electrodes and ceramic insulators are used.

Key parameters



USE STATE-OF-THE-ART TECHNOLOGY

German Institute of
Food Technologies
Prof.-von-Klitzing-Str. 7
D - 49610 Quakenbrück

Tel +49(0)5431.183 - 0
Fax +49(0)5431.183 - 114
info@dil-ev.de
www.dil-ev.de

Concept, Design and Realization: www.runningframes.de