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Smoother ice creams, greener peas and ecological tomatoes

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There are different reasons to adapt new technologies in food processing. First, the industry hopes to create new foods that will provide **a better taste and new sensations in the mouth**. Second, it looks for ways **to extend shelf life**, preferably without being chilled. Furthermore, the food sector is also continuously on the lookout for new ways **to reduce costs in the processing industry without compromising on food quality.** These were the underlying reasons for three initiatives that were presented at the EFFoST conference this autumn, one of the leading conferences on food technology in Europe.

Southern Italy is the world's key producer of processed tomatoes, explains Giovanna Ferrari of the University of Salerno, who has conducted a series of experiments to verify how **electric pulses could be adapted at a tomato processing plant**. The technology, tested under the EU project FieldFOOD, is called **PEF that stands for Pulsed Electric Field Preservation**.

Ferrari and her team decided to include the electric pulses while the tomatoes undergo the first washing cycle. During this process, the tomatoes travel along a tube filled with water, where electric pulses under 1000 Volts/cm2 are fired onto the tomatoes.

But what does it do to the tomatoes? **The electric field opens a pore in a cells' membrane**, causing a loss of vitality and increasing the permeability of the peel. **This is an advantage at a later stage, when the tomatoes are peeled using steam**. In the end, PEF can help to reduce steam for peeling, the water required and the overall energy use.

Giovanna Ferrari and her team were able to show **that the tomato processing plant was able to save more than 20% of the overall energy costs.** This is impressive, as just the F.P.D. plant in Salerno, which produces around 30.000 metric tons of processed tomatoes a year (and took part in the research project), would be able to save 52 tons of CO2 in one season, if they adopted PEF for all their processing production lines.

Improving the quality of food while increasing shelf life was the aim of researcher Silvia Garcia de la Torre from the Spanish National Centre for Technology and Food Safety CNTA. She coordinates the HIPSTER project, where an international consortium **tested a new industrial process that first moderately heats the products and then applies very high pressure for a short time** inside a pressure chamber (HPT technique).

To do this, the team selected different food samples, like green peas, tomato soup or chicken filet. They were first preheated to around 80°C, and then applied an immensely high pressure of up to 600MPa, which is equivalent to six times the pressure at the bottom of the oceans.

By the thermal law of physics, the food heats up homogenously as the pressure rises. And it cools down again as the pressure is released again. The researchers are thus able to switch on and off the heat to their products almost instantaneously – which is not really possible with other methods of heating food.

"And this way, we were able to heat our food samples for much less time than you would be able to do in a thermal process", explains Silvia Garcia de la Torre. Her team investigated both the food safety issues, like the inactivation of microbiological pathogens, and the effect the treatment had on the food characteristics, like colour, taste or firmness. "We have noticed that green vegetables like peas made a real improvement in the quality of the food", says de la Torre. "The green colour became even more intense than in the untreated food. When you compare it to pre-cooked or tinned peas, our HPT-treated peas look much more appealing."

Volker Lammers from the German Institute of Food technologies (DIL) presented how his team of the i3food research project adapted a well-known processing tool – **the planetary gear extruder – to ice-cream production.**

He explained that in the final process of ice-cream making, when the product is usually sent to the packaging line**, the researchers added one more process: the temperature of the aerated ice cream is lowered from -4°C to -13°C**, as it is pulled through an extruder, a kind of very powerful roller that flattens the cream.

The extruder pulls the mix along a 2-metre process section while it is cooled down. Inside this extruder, the cream

is continuously rolled out with low shear energy input, which would usually increase the temperature. But **constant cooling inside the extruder and a precise temperature control tool ensures that the ice-cream is kept cool and thus avoids the formation of additional ice crystals.**

“On microscopic images we can see that the entire cream still holds the same amount of air bubbles and ice crystals, but the entire structure is more homogenous after the ice-cream has passed through the tube.” explains Volker Lammers. The scientist reassures us that the extruded ice-cream samples are considerably softer after the treatment and provide a better sensation in the mouth compared to the traditional ice-cream mix. The adaption of this technology is therefore particularly interesting for premium ice cream producers.

Peeled tomatoes, green peas, or premium ice-cream, Europe’s food processing technology is advancing to serve the customer and the environment in many new and unexpected ways. The EFFoST representatives of food industry were watching closely whether these new findings could soon be adopted by their processing plants. To find out, check the shelves of your supermarket in the coming years, to see which technology will achieve a break-through.

By Elmar Bartlmae