Food without preservatives -- thanks to self-cleaning equipment

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A dough machine that automatically cleans itself will make the production of pastry easier in the future. Credit: Fraunhofer IGB

Eclairs and other pastries should taste light and fluffy. If the pastry dough contains too many microorganisms, though, it will not rise in the oven. Now, researchers have devised a system that cleans itself automatically after every batch of dough. This means the dough is sterile -- and for the first time, it can be made in large quantities off-site for delivery to bakeries.

Researchers will showcase these and other combinations of cleaning

methods and equipment at the parts2clean trade fair, October 25-27, 2011, in Stuttgart.

Sitting in a cozy French sidewalk cafe, watching passersby and enjoying a chocolate-cream éclair – for many of us, this is a portrait of a relaxed summer vacation. For the bakers who make the éclairs out of pastry dough, though, the entire procedure is far less relaxing: they make the dough using a special machine that they operate by hand. Once made, the dough must be processed at once – otherwise microorganisms will work to ensure that it does not rise when baked. The baker also has to disassemble the machine and clean it thoroughly before it is ready for the next batch of pastry dough.

In the future, a baker's life could become a bit more relaxing: As part of ProEclair, an EU-funded project, researchers at the Fraunhofer Institute for Interfacial Engineering and Biotechnology IGB in Stuttgart, Germany, have developed a dough machine that automatically cleans itself after each batch of dough – there's no longer any need to disassemble the system. "The dough we make with the machine is also sterile, so it remains fresh comparatively long. We can pack the dough in bags for delivery to the individual bakeries," notes IGB group manager Alexander Karos, pointing out yet another benefit.

From the outset, the scientists planned to include the cleaning feature in the new system. The researchers' main task involved the interplay of individual parameters: the machine had to be designed to be free of corners and edges where dirt can become trapped. Which material is the best for the job? What characteristics does the surface have to have if it is to be easy to keep clean? The cleaning agents sprayed in series at certain points must also be coordinated with one another – the type of agent and its concentration have to be right, and exposure time and temperature play a role as well. "To make sure the system really is clean after the cleaning procedure is complete, the last rinse water is

automatically tested for proteins, fats, carbohydrates and residues of cleaning agent," Karos explains.

The researchers have already developed a prototype of the machine and commissioned it in an industry partner's operation. At the parts2clean trade fair researchers will present the process – as an example of the combination of cleaning and system design. "PreserveWine," another EU project that IGB researchers will be presenting at the trade fair, goes another step further: Here, scientists are not only developing machinery that cleans itself but are also preserving the wine produced. "With the alternating-pressure technology we have developed, we can ensure that the wine has a long storage life – without the use of preservatives," Karos points out. Heating, for instance, as with milk, is not a solution, because it would rob the wine of its flavor. Heat also kills valuable ingredients. So researchers have taken another approach instead: "We subject the wine or other liquid food product to a pressure of 300 bar - or 300 times ordinary atmospheric pressure – while adding inert gases at the same time. As a result of the high pressure, these gases diffuse into the cells of the microorganisms in the liquid. If we then drop the pressure back down, the cells burst – the microorganisms have been killed. And the inert gas escapes," Karos continues.

Scientists from a total of six Fraunhofer Institutes will be on hand at the joint Fraunhofer stand to present their latest developments. These include the gentle redirection of dry-ice blasting pellets, improved coating adhesion through material pretreatment in a vacuum, and laser beam-based cleaning.

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