



**++ The Future of Baking**  
**- Science - Technique - Technology**  
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### Vacuum conditioning

The second big subject that has been discussed in the baked products sector in the past few years is vacuum conditioning. The idea and initial implementations already occurred in the previous century. Early this century, the baking sector began to develop an increased interest in using vacuum to rapidly cool products. It has turned into a success story in recent years.

The background is the law of physics which states that the boiling point of water is directly related to atmospheric pressure. As the pressure is reduced, water boils and evaporates at lower temperatures. The energy needed for this is abstracted from the product that is to be cooled, and the product cools outwards from the inside. Post-gelatinization occurs during the cooling process, and retards retrogradation. Baked product volume is retained, the crust is crisper, shelf life is longer and so is storage time. Nonetheless, it has now been realized that the process must be individually customized to the product, and possibly to downstream processing steps as well, in order to obtain an optimum result. What is certain, however, is that vacuum conditioning baked goods allows a reduction in baking time and thus in the expenditure of energy. The shorter baking time also leaves more moisture in the baked products than a conventional baking process.

The product also passes quickly through the microbially critical temperature region, thus enabling

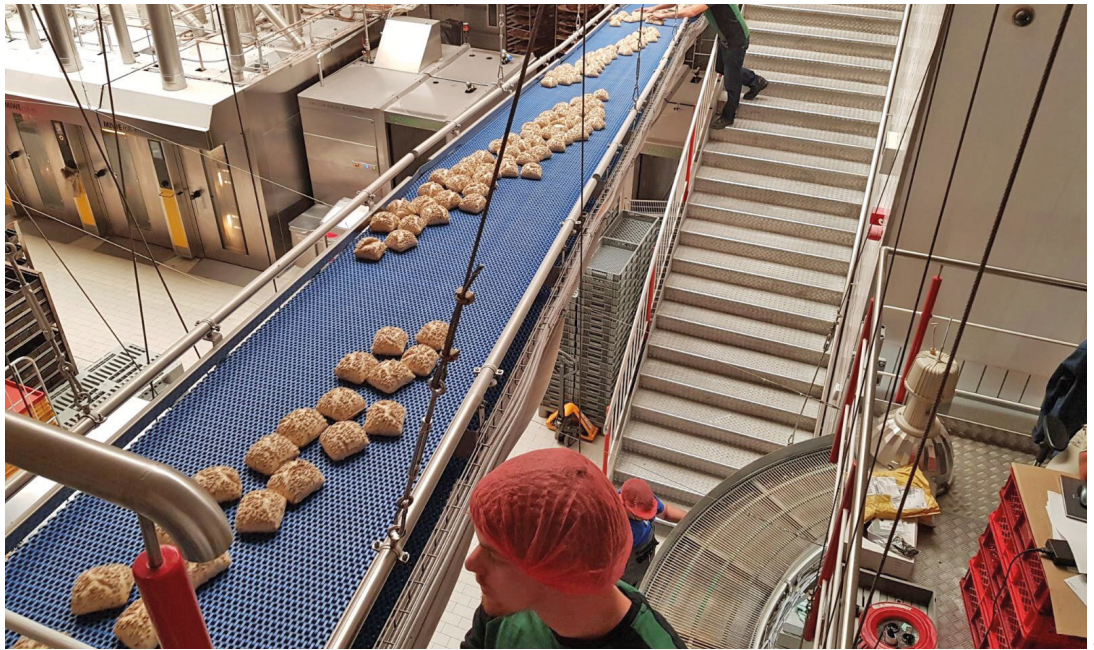
a shelf life of several days, even at lower positive temperatures.

Vacuum cooling is used nowadays by many chain store bakeries to maintain the crispness of goods delivered to shops in the morning, thus ensuring the initial stocking of the shop with products from the central production facility. The shop's sales staff start baking off products delivered par-baked only after the morning's surge of breakfast goods business has finished. As a general rule, individual vacuum cells are used for this.

The second area of use is to cool down fully baked breads, which can be sliced quicker thanks to the shorter cooling process. Toast-breads, which otherwise often tend to develop a "waist" as they cool down, benefit particularly from vacuum conditioning, because the technology stabilizes the volume. Not only do the slices have 90° corners, they also have straight sides.

Producers of premium class frozen baked goods like fredy's, the company owned by Fredy Hiestand, who once gave his surname to the first company he founded. Nowadays that's part of an international group, and the quality fetishist's first name represents his second company foundation. He uses vacuum chambers to cool down part-baked fine pastries such as croissants, Danish, cheesecake, carrot cake and even tinned breads and kilogram loaves faster before shock-freezing. "Basically, what we achieve as a result is that the  $\Delta t$  is bridged more quickly, and the ice crystals formed during freezing stay smaller than without the use of vacuum. That helps maintain the structure. Simultaneously we save baking time, so more moisture remains in the product." We were able to shorten baking time by 40% for cranberry bread rolls, toast or baked products containing ingredients with essential oils. For breads – soft, tinned and kilogram loaves – it's still 30% less baking time. Hiestand says: "The crusts are better, the volume nicer and there are no longer any sad layers. The products have a nicer gloss if the process is stopped at the right time and the crusts haven't started bursting. Croissants are

++ This continuous vacuum-system from Cetravac cools semi-baked goods at a German chain store, which are then delivered to the almost 200 stores and baked there



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crisper, and that's a great help especially with lye croissants."

Vacuum technology has additional benefits: all the products delivered to customers now need only the selfsame baking program and the same remaining baking time for finishing.

There are now so-called "continuous" vacuum plants for businesses that either supply a large number of branches, or supply correspondingly large quantities to the food retail. They consist of vacuum cells stacked one on top of another and loaded one after another with products from a conveyor belt. The compartment is then closed, sealed and vacuum is applied, after which the goods are passed forward to an outgoing conveyor belt.

The retail supplier "Kuchenpeter" in Hagenbrunn near Vienna has used such a plant since 2006 to deliver par-baked bread rolls, high-quality bread varieties and Danish pastries to the retail, frozen or at ambient temperature.

A well-known baked goods manufacturer in Spain uses vacuum technology to cool down parbaked bread.

One of Cetravac's latest continuous vacuum plants stands in Lübeck at the premises of one of the Big Twelve in the Federal German chain store bakeries landscape, with nearly 200 sales outlets. Five vacuum chambers one above the other are continuously loaded with approx. 12 – 15,000 par-baked items that were in the oven only 8 – 10 minutes previously. They are baked in a multi-hearth thermo-oil tunnel oven. After a processing time of only 90 seconds in the vacuum plant (plus loading, pressure equalizing and unloading), the conditioned products move onwards to packaging.

Here they are sorted into the usual retail crates and the crates are wrapped in film, stacked, and afterwards stored at ambient temperature for up to 4 days. Sample tastings and test sales, with the involvement of external professional tasting experts, showed that scarcely any difference was detectable between standard frozen products and the products stored at ambient temperature for up to 4 days. If there were any differences, they were in favor of the vacuum-conditioned products.

In return, the company saves shock freezers and frozen storage, in both the production facility and in the shops, and of course the frozen food logistics as well. +++