

Crustless without waste

MAKING CRUSTLESS BREAD WITHOUT WASTING PARTS OF THE PRODUCT CAN BE ACCOMPLISHED WITH MICROWAVE TECHNOLOGY. THE FRENCH COMPANY MO2 HAS DEVELOPED POSSIBLE APPLICATION RANGES TO PERFECTION



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+ Products can be cooked with microwaves and this is also possible for bread. The French company MO2 has developed a system which turns this basic knowledge into an economically interesting process that is currently being put into practice in France. Microwaves cook a product from the inside to the outside as opposed to common baking ovens where the product cooks from the outside in. Core temperature curves as well as the cooking process are therefore quite different. Plain toast bread which requires a baking time of up to 28 minutes in a conventional oven will be found to develop structure and stability in a microwave oven in less than 100 seconds. A conventional electrical oven integrated into a toast bread line with an average capacity of 2,700 kg/h needs a connecting load of 1100 kW. The microwave oven needs only a connecting load of 356 kW. While a classical toast bread oven has a length of about 30 meters, a microwave oven with the same

performance is only 11 meters long, including safety zones.

Francois Gelé and his staff came up with the idea of exploring microwave technology when the demand for crustless bread increased steadily. Commonly, toast bread is baked in a normal oven and the crust is removed after the baking process. This is an enormous waste of raw materials and energy and, according to Gelé, highly problematic economically as well as ethically. As a result, they began in the company lab near Nimes, Southern France, to take a closer look into the process of microwave cooking and its use for professional baking processes. The result is a complete line for the production of crustless bread for which the oven, the molds and their use had to be completely reinvented. The bread baked on this line is “common” toast bread, without any crust. The surfaces of the products are covered by a thin, doughy-white skin which is as tender and as elastic as the crumb itself.

The line has been constructed in cooperation with the Kaak Group who supplied all of the engineering features including proofing plant and transfer into the microwave oven. The dough is deposited in plastic molds which can be inserted in stainless steel support frames. The frames have the same dimension as common strapped pans, thus eliminating the need for special designs. The plastic molds are finely perforated. The finished bread will not stick to the pan so no coating with silicone or Teflon is required. This also contributes to a higher operating efficiency.

The dough is deposited into four molds which form one pan strap. Immediately before the microwave oven, the molds are removed from the frame and placed in supports on a transport belt. In this way, they move through the microwave oven. To keep the throughput on an industrial scale, four microwave ovens are operated parallel to each other. The supports on the belt make sure that the microwaves can penetrate the molds and dough not only from above and from the sides, but also from below.

Baking with microwave technology clearly removes less water from the product than conventional baking. In covered molds, the water collects at the outer surfaces and this is when the perforation holes of the patented molds come into play.

An alternative would be the addition of a conventional oven segment with turbulence air flow which would do the same

job. Such a combination, however, would provide for a second benefit, namely not only to bake crustless bread with white surfaces but also to brown the product in a short time which would give the bread a tender crust. Tests with brioche dough have already been successful. Currently, the development team in Nimes is looking into applications for pre-proofed and even unproofed croissants. According to Gelé, croissants need a baking time of 25-28 minutes in a conventional oven. "We are trying to achieve a baking time of only 8 minutes, even for an unproofed croissant." Another research project is based on the idea of baking bread in a 25 kg block (300x400 mm and 130mm thick) which is later cut up for canapés. The third research subject is the production of bread crumbs from endless dough sheets. An hourly ca-

Microwaves

A microwave oven works by passing non-ionizing microwave radiation through the food. Microwave radiation is between common radio and infrared frequencies. Water, fat, and other substances in the food absorb energy from the microwaves in a process called dielectric heating. Many molecules (such as those of water) are electric dipoles, meaning that they have a positive charge at one end and a negative charge at the other, and therefore rotate as they try to align themselves with the alternating electric field of the microwaves. This molecular movement creates heat as the rotating molecules hit other molecules and put them into motion. (Source: http://en.wikipedia.org/wiki/Microwave_oven)

The energy in a four tunnel microwave oven by MO2 is generated by 128 magnetrons which are cooled with a mixture of water and glycol. In the optimum case, the energy applied is completely absorbed by the product. If this is not the case, the excess energy must be collected in water because otherwise it would affect the magnetrons and cause interferences. This means that the control of the magnetrons is very important and elaborate. The product dependent control is the decisive know how in microwave oven design.

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Professional for rent

The company Concept Convergence provides for consultation services for bakeries; implementation of building projects; development of products; assists with nutritional advice and also with the training of employees in bakeries on a worldwide scale.

The starting point was the order of a French company to set up a bakery with seven production lines in Russia within one year. In order to fulfill this task, Francois Gelé established a network of experts who worked parallel to each other and jointly on this project. This was the beginning of Concept Convergence; an agency that is adept at handling industrial bakery production processes from the procurement of raw materials to the final packaging and then markets this knowledge as a service which is most commonly associated with the construction of new lines and production. Concept Convergence assumes all tasks from plant design to the planning, budgeting, search and evaluation of suitable suppliers and the supervision of the execution of the construction work and commissioning. This means that the CC people will be on site seven days a week. They make sure that deadlines and budgets are kept and that the necessary know how is transferred to the employees of the client.

Besides providing these experts for the construction and furnishing of industrial bakeries, CC also develops new products including legal and nutritional assessments, searches, evaluates suitable raw materials and supports the marketing departments with the respective background information. Another part of the business includes the training and education of service personnel on site and the compilation of manuals and documentation.

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capacity of between 8,000 and 10,000 kg may be possible with a pre-set degree of browning.

Francois Gelé is convinced that microwave technology will succeed in the baking industry. “There are many processes where microwave technology can be applied, either alone or in combination with conventional ovens. The product range includes bread and brioche, cakes, croissants and even pas-

try products. It is completely independent from the shape of the product. The production volume is two to three times higher than for conventional baking processes and the energy consumption is reduced by half and therefore reduces the CO₂ emission. Added to that, combination ovens need significantly less floor space. Therefore, in conclusion, they provide for economical, ecological and ethical benefits. It seems a good combination.” +++



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