

Power baking

THE GERMAN COMPANY WIESHEU, IN COOPERATION WITH THE INSTITUTE FOR CEREAL PROCESSING (IGV) HAS DEVELOPED A NEW IN-STORE BAKING OVEN



++ figure 1

The introduction of the pre-series of the new oven is scheduled for 2008

Dough piece 26°C

- + Baking time, traditional
18 minutes, energy consumption 1.5 kWh
- + Baking time, with microwaves
13 minutes, energy consumption 1.25 kWh

Dough piece 10°C

- + Baking time, traditional
21 minutes, energy consumption 1.65 kWh
- + Baking time, with microwaves
14 minutes, energy consumption 1.3 kWh

Heat transfer

After 3 minutes baking time in a traditional in-store baking oven with hot air circulation, the center of the crumb reaches an average temperature of 49°C. The additional use of microwave increases the core temperature within the first 3 minutes to 92°C. In this way, the center of the crumb has already solidified after 3 minutes baking time with microwaves (compare figure 2). The same condition will be reached without microwave treatment after 5-6 minutes. During the further baking process, the application of microwaves accelerates the evaporation of water from the surface. The browning reactions start much earlier.

According to measurements by IGV; the microwave rays penetrate up to 30 mm deep into the dough piece. This not only heats the baked goods much faster but the oven spring is also accelerated. This is one advantage for rolls because the bloom develops much better than in rolls baked with hot air circulation as the heat is predominately transferred onto the dough pieces via hot air. There is no bottom heat (heat transfer via heat conduction) as in a deck oven. Therefore, rolls baked in a hot air circulation oven develop less volume and with reduced bloom when compared to rolls baked in a deck oven. The additional application of microwaves in the hot air circulation oven improves the bloom development (see figure 3).

Reduced baking time

Up to now, the traditional baking process for rolls took at least 18 minutes to ensure that the crumb had been completely baked and the crumb structure had developed the desired elasticity. Microwaves cause the earlier solidification of the crumb and an earlier browning reaction so that bak-

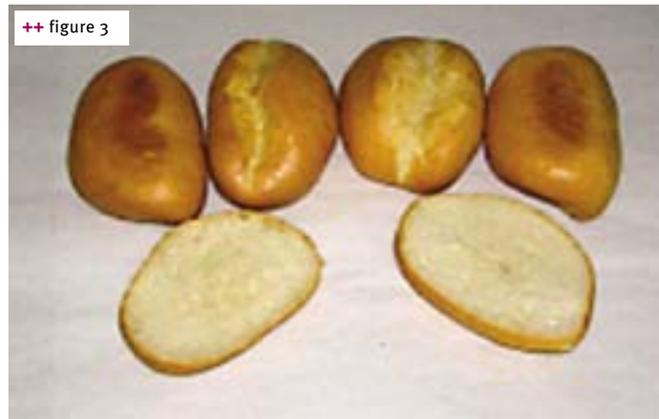
+ DIBAS Power, the new hot air oven with advanced heating technology, is the result of a fruitful cooperation between Weisheu GmbH, Affalterbach, and IGV, Nuthetal, Germany. A combination of conventional heating and microwave technology heats up the inside of baked goods much faster. This reduces the baking time for rolls by up to 40% and for frozen rolls, that are thawed and baked, it is even up to 50%. Another beneficial feature of the oven is its economy. This oven consumes between 15 and 20% less energy than comparable ovens.

In trials, 60 dough pieces per batch (piece weight 60 g) baked for the following times, yielded good quality rolls.



++ figure 2

Baking trials at IGV revealed that the center of the dough pieces developed much faster. The picture shows a cross-section of the dough piece after 3 minutes of baking time. Left without microwaves, right with microwaves



++ figure 3

Baking results of rolls with microwaves (right) and without microwaves (left)

ing times can be clearly reduced. The baking time for rolls is reduced by 30-40%, for frozen rolls which have to be thawed and baked; the reduction is about 50%, according to the baking trials at IGV.

Frozen dough pieces (proofed)

- + Traditional
Baking time 26-28 minutes
- + With microwaves
Baking time 13-14 minutes
- ▶ *Baking time reduction up to 50%.*

Dough pieces (normal proof, not frozen)

- + Traditional
Baking time 18-22 minutes
- + With microwaves
Baking time 12-14 minutes
- ▶ *Baking time reduction up to 35%.*

Variety of baked goods

Dipl.-Ing. Olaf Bauermann, division manager bakery technology at IGV explains that his team, up to now has successfully conducted trials with different small baked goods such as cut rolls, Kaiser rolls, multi-grain rolls, croissants and Danish pastries. "Alternatively, it can be assumed that the additional use of microwaves in the production of different fine bakery wares such as sheet cakes will also result in reduced baking times. Respective trials are currently being conducted", explains Bauermann. The baked goods tested so far had a dough weight of between 60 and 100 g. A reduction of baking time with microwave technology is also possible in bread baking. Breads with a weight of up to 500 g, such as baguettes or ciabatta are best suited to this technology. Microwaves are electro-magnetic waves as are light or radio waves, but they have a different frequency. They follow right behind IR radiation in the wavelength spectrum. As in microwave ovens for household use, the microwave frequency used in the DIBAS Power oven is 2.45 GHz. "The new in-store baking oven will look almost like a conventional oven",

explains Lutz Adam, communications manager at Wiesheu. The oven depth might increase by 3 cm due to the integration of the microwave components. Compared to the first DIBAS Power prototype, the configuration of the microwave antennas has changed. The antennas are no longer installed centrally in the baking chamber but hidden underneath the baking tray supports. They will no longer interfere with the handling of baking trays. This allows the use of common types of baking trays. "The microwave feature is an additional option aimed at reducing the baking time. It is also possible to bake the traditional way in the DIBAS Power without turning the microwaves on", explains Adam. The connected load of the oven does not change and there are no modifications when compared to standard oven types (connected load: 380 V/ fuse: 16 A).

Baking results

"The quality of the products is not impaired by the use of microwaves", explains Bauermann. According to the scientist, the additional microwave treatment during baking is favorable in terms of volume and bloom development. This is, in particular, true for croissants. Browning, flavor and crispness of the crust remain unchanged when compared to traditional baking methods. The introduction of the pre-series of the new oven is scheduled for 2008. +++

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