

# Application of Microwave Technology to Bakery Products

Roy Lee Mast

Good morning and greetings from America. First I should apologise early on for possibly the English that I may use. I find it's a little different here than over in the States. I recall the first time I was making a trip over here I received a fax to say that they would collect me at the airport. I looked at that word collect and I said do they think I'm going to arrive in pieces. If you come to America we'll pick you up at the airport. So if you find some strange words being used, there is a difference so please bear with me. We want to focus this morning on application of microwave technology in bakery products. We were allowed to flow into some other products, but very briefly to show the work that we've done in other areas. To bring you up to speed, if you know of susceptors. Susceptors was introduced to the industry some 15 years ago, and may be just by a raise of hands would show us who are acquainted with susceptors material so that we wouldn't have to get into detail on it. How many know of susceptors material? There is quite a number that doesn't know. Let me very briefly tell you what susceptors material is for the microwave. Basically we take a 48 gauge polyester, we put it into a vacuum chamber and in that vacuum chamber is a deposition of aluminium. We actually feed the aluminium melted into the chamber and it's a very low optical density, in the vacuum chamber the aluminium is attracted to the film and basically it ends up somewhere around 0.27 optical density. Now that is your normal average susceptors material. We're going to be talking about that, but even beyond that we're going to be talking about heavy metal applications and that's where some of these patent pendings are occurring.

## Introduction

The introduction of this technology includes ingredients and packaging. Even though the first microwave susceptor was introduced fifteen years ago, there is still no "magic package" for microwaving bakery products. However, in just the last three years several advances have been made by focusing on two key areas. First, the selection of proper ingredients has created the parameters needed to control moisture migration. And second, by utilising specially designed susceptors for browning and crisping, while still maintaining the proper moisture retention, bakery products have reached unparalleled results. Research and development in these two fields have unlocked the principal concepts to produce superior products baked in the microwave.

This paper will outline the key issues that need to be addressed to produce microwaveable products and will give specific examples of baguette and pizza products.

## Products

The following are examples of current applications using microwave ingredients and packaging technology:

- Self Rising Pizza
- Self Rising Deep Dish Pizza
- Self rising Gourmet Cinnamon Roll
- Par Baked Baguette Roll
- Fresh Baked Hot Pockets
- Crispy Fried Chicken
- Seasoned Hot Wings
- Breaded Fish Fillet

The products listed above are the foundation for many other products to be developed. It is essential to be aware that one must be creative and think "outside the box" to further develop this concept.

## Special Microwave Ingredients

Selected ingredients are used to control moisture migration, as well as, enhance browning and crisping. The three different ingredient blends listed below are currently being used to accomplish the desired properties required for different products.

Product A - blend of cellulose powder, food starch, gums and vegetable oil. Designed to enhance the moisture retention in dough products.

Product B - blend of alginate, cellulose powder, milk protein, gums and enzymes. Designed to control moisture migration and enhance volume and strength of cell structure in dough products.

Product C - blend of sugar powders, dextrin, microwave shortening, browning agent and vegetable oil. Such ingredients have good dielectric properties that enhance browning and crisping of dough products when blended with other carrier agents.

## Microwave Packaging

Moisture Retention Package - Allows the product to be microwaved using susceptors and shielding to create steam and pressure above atmospheric pressure, to bathe the food product with heat and steam. This controls the moisture loss during cooking, as well as crisping and browning the outer surface of product.

Heavy Metal Formations and Methods - Using 2.8 to 3.5 optical density metal film to create a primary susceptor, secondary heating susceptor and partial shielding denietted from one laminate of metalized polyester.

Here are some examples of microwaveable packaging. I have deliberately chosen not to show specific bakery products to avoid commercialising this presentation. However similarly packed filled baguettes and pizzas are today on the market.

### Microwaveable Baguettes and Pizzas

Microwaveable filled baguettes have now been successfully developed to serve the retail and food service markets.

The baguettes are generally fully baked, filled and then frozen. Pizzas can be raw, part baked or fully baked and made with a thin base, deep base or baguette base.

Each product will have its own specific requirements for ingredients and packaging.

### Baguette

There are a number of conditions to be satisfied before a good quality microwaveable filled baguette can be successfully produced.

The bread improver and baking process must be optimal for the production of a quality baguette, which will freeze well.

Water binding ingredients must be selected to enhance moisture retention during microwaving.

The filling must be prepared to both reduce migration of water into the baguette and avoid moisture loss during microwaving.

The packaging must be carefully selected and designed to give defrost heating, crisping of the crust and protection to the filling.

Each of these parameters, and their interaction with each other must be taken into account if a satisfactory end result is to be achieved.

### Pizza

The factors to be considered in the production of microwaveable pizzas are similar for the baguette, although the individual solutions to the problems will depend upon the type of product to be produced.

Additional factors specific to pizzas will include avoiding shrinkage and toughening of the base and drying or boiling out of the topping.

## Next Development

The examples I have given so far are now fairly well developing and are rapidly moving to the commercial application stage - but what of the future? One of the most interesting areas of development in what we are calling a "Micro-emulsion system".

The micro-emulsion system is designed to develop a coating for bakery products by creating interfacial tension sufficient to separate water and a surfactant coating to brown and crisp. The mix comprises of the following:

- Carrier agent - water/food grade chemical
- Special starch | HLB surfactant | Triglyceride vegetable oil
- Dielectric ingredient
- Stabiliser.

This coating forms an edible susceptor capable of crisping, browning and has the ability to provide a better, even heating of the product by focusing the dielectric properties of the micro- emulsion system.

## Summary

The market trend of home cooking being replaced by convenient to prepare meals and eating out of the home, and particularly on the move can be satisfied by the production of microwaveable products.

Good quality microwaveable baked products require a combination of ingredients and packaging technology.

Bakery applications in filled baguettes and pizzas are already on the market. The technology could be applied to many other bakery products and gives the baking industry a chance to profitably satisfy the demands of the modern customer

*Sessional Chairman.*

Thank you very much. So we have some time for questions if I could ask you again if you would give your name and your town that would be very helpful.

*Question*

Well, whilst you're thinking about it. I have one, Roy, which is really about the application on a mass production as opposed to just the home use of microwaves. Clearly, or I presume, most of it was for home application, but do you see that for a mass produced product that we could use microwaves in the future.

*Answer.*

I think there are two areas here. Of course we have focused on the consumer side of it and in that area I think there was one question someone asked last night. The difference in wattage in microwaves. That is one of the strong aspects of the package that we have, the moisture retention package. It is very forgiving in the different wattage of microwaves from 650 watts up to 900 watts. We see very little variations on the cooked times in that area, because again we're holding in all of the moistures and heat within a given area. That's the container itself. I use the expression - if you put something in a microwave open and try to heat that, you'll be trying to heat the whole walls around it, where you are controlling it within the given confines of the package. To broaden your scope there, on your question, Peter, that is in the food service side of it, we do see some good potentials in that area. It's a little different in as much as we would not go to a full packaging. There is an oven that we have designed, it's a plastic style oven, small, an oven in an oven. So that you could actually go to a lesser package, not have the total overwrap for food service, and this is a re-usable concept, where you place it in this little plastic oven, I don't know if you've seen the plastic popcorn poppers that have been on the market. It basically has a little door, and it's 15 pressure sensitive, and you can slide your product into it, bake it up, pull it out and re-use it over and over again. So it cuts down the cost of the packaging.