

# Microwave Foods



## Microwavable Foods Satisfy Need for Speed and Palatability

Food processors, ingredient vendors, and packaging suppliers are teaming up to meet the demands of on-the-go consumers who want quick food preparation and superior taste and texture.

Kate Bertrand

**M**icrowavable foods are changing, thanks to consumers' increasing time pressure, nutritional awareness, and desire for foods that taste and smell like they were cooked in a conventional oven.

To meet these demands, food processors are creating a new generation of microwavable items for use at home as well as away from home, via convenience-store or office microwave. In many cases, the products' success hinges on a combination of product reformulation and package redesign.

"The World According to Shoppers," a research report from a recent study of consumer shopping behavior conducted by TNS NFO on behalf of the Coca-Cola Retailing Research Council of North America, provides insight into the phenomenon of time pressure.

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According to the report, “In most families, both parents work outside the home. Many people are working longer hours, yet their other chores are no less time-consuming. As a result, consumers have become more impatient and less tolerant of delays—they want what they want, they want it right, and they don’t want to wait for it.”

Bill Bishop, President of Willard Bishop Consulting Ltd., Barrington, Ill., explains, “Microwave cooking is not simply a shorter way to heat things, but rather it is an integral part of the way people live. This is a very positive environment for microwavable food.” Bishop was a key member of the research team for the Coca-Cola study.

In fact, data from the 2002 National Eating Trends Survey, conducted by NPD Group, indicate that 93% of consumers own a microwave oven. And they’re not just using them to pop corn.

The new generation of microwave products includes meals, snacks, and everything in between, from fresh chicken and fish dishes, precooked entrees, and side dishes to grilled cheese sandwiches, French fries, biscuits, and pizza.

The expanding range of microwavable foods reflects trends occurring in the larger grocery marketplace. For example, organic and natural foods are becoming available in microwavable form.

Fresh prepared foods that perform well in the microwave also are emerging. In addition, to meet consumer demand for on-the-go eating, a growing number of microwave products are entering the market in single-serve, portable packages.

### Organic and Natural Foods

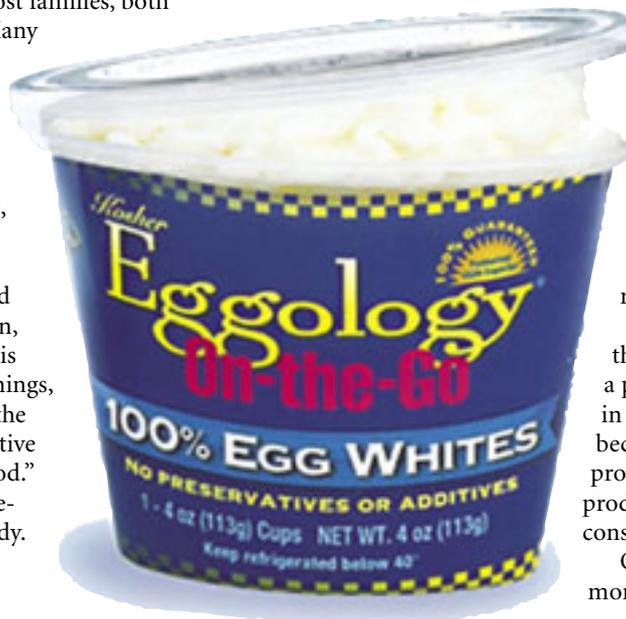
In the natural and organic space, Eggology, Inc., Canoga Park, Calif., recently introduced its liquid egg whites in a microwavable package. The product is available in Original and Certified Organic varieties.

Eggology’s *On-the-Go 100% Egg Whites* are pure, pasteurized egg whites with no additives or preservatives. The microwavable product comes in single-serve plastic cups that are sold individually and in four- and eight-packs.

Each cup holds 4 oz., the equivalent of four egg whites. The product is sold refrigerated. Eggology holds patents on both the package and the food concept.

To use the product, the consumer shakes the single-serve cup, removes the portion of the full-body shrink seal that secures the lid to the cup, and places the cup in the microwave for 95 sec. The eggs expand as they cook, and the lid automatically pops up.

Another healthful, microwavable product comes from Rice Expressions, Clearwater, Fla. The company has introduced a line of pre-cooked, microwavable rice products that includes three organic varieties: *Organic Long Grain Rice*, *Organic Brown Rice*, and *Organic Tex Mex Rice*. The product cooks in 3 min; in contrast, conventional rice can take up to an hour to



**Eggology’s On-the-Go 100% Egg Whites come in a 4-oz. plastic cup. Consumers shake the container and heat in a microwave for 95 sec. The eggs expand as they cook, which pops open the lid.**

cook on the stove.

Sold frozen, Rice Expressions’ products are packaged in a flexible pouch that expands during cooking, creating a steam-cooker effect. Each carton holds two or three 10-oz pouches. In addition to greatly reducing cooking time, the product saves consumers the time and effort of cleaning a sticky rice pot.

As with many organic products, the Rice Expressions products carry a premium price tag. Retail pricing is in the range of \$4.00–4.50/carton. But because of the perceived value of the product, plus the time savings and the products’ high-quality taste and texture, consumers are willing to pay the price.

Organic products “cost a little bit more, but people who are concerned about their health and welfare are willing to pay more for the organic product lines,” says Lee Sucharda Jr., Chairman of Design North, a brand consulting firm in Racine, Wis.

### Microwave Steam Cooking

Rice Expressions’ approach presages a trend toward harnessing the power of steam to enhance microwave cooking. Steam cooking is opening the door to products that contain fresh fish or chicken. Traditionally, precooking has been required for high-protein foods to perform well in the microwave.

United Kingdom-based retailer Marks & Spencer has introduced *Steam Cuisine* fresh-prepared meals. The individual meals require about 6 min of heating time to “cook from raw” in an 850-W microwave oven, according to promotional information from the company.

The *Steam Cuisine* packaging acts as a pressure cooker. The tightly sealed plastic container holds a meal composed of fresh foods such as chicken, fish, vegetables, pasta, potatoes, rice, couscous, and sauce. Marks & Spencer also sells *Count on Us Steam Cuisine* microwavable meals, a version of the product with reduced fat, salt, and calories.

As a *Steam Cuisine* meal heats in the microwave oven, the water in the vegetables creates steam. This builds up in the container, and the food begins to cook. The pack gradually expands, and excess steam vents through a valve on the package lid.

A packaging concept from Finland-based Huhtamaki also is suitable for fresh or frozen chicken, seafood, and vegetables. Called *Steam Chef*, the concept helps foods retain their nutritional value and color, thanks to what the supplier calls “Intelligent Double Pressure Cooking Technology.”

In the first cooking phase, when the food is still cold, the microwave energy penetrates deeply into food tissue and converts into heat. The food’s water content transforms into steam, which cooks the food from the inside out. In the second phase, as the steam exits the food tissue, it is captured and retained inside the *Steam Chef* package. As the steam pressure builds, the food cooks from the outside in.

The *Steam Chef* concept combines a self-venting film with a tray made from polypropylene or crystalline polyethylene terephthalate (CPET). With this concept, a fresh fillet of chicken or fish can be cooked in 5–7 min in a 750- to 850-W microwave oven.

Microwave steam cooking is finding a place in precooked foods, as well. Jennie-O Turkey Store, Inc., Willmar, Minn., uses this approach for its *So Easy Fully Cooked Stuffed Breasts*. The product is packed in the *Cryovac Simple Steps* easy-open, microwavable package from Sealed Air Corp., Saddle Brook, N.J.

The product is fully cooked, whole-muscle turkey stuffed with cheese and ham, broccoli, or rice. The package uses Cryovac's vacuum skin packaging technology and a self-venting feature.

"You put it in the microwave for 3 ½ minutes, and the top film vent puffs up like a *Jiffy Pop* package. The steam cooks the turkey and rehydrates it, so it's nice and juicy. It keeps the moisture in the product," explains Steve Venenga, Group Product Manager for Jennie-O Turkey Store, a wholly owned subsidiary of Hormel.

### Products, Packaging Complement Each Other

As these examples illustrate, packaging can be almost as important as food formulation in the overall success of a microwavable product. That is particularly true for products that include pastry or bread.

Kraft Pizza Co. addressed both product formulation and package structure when it developed *DiGiorno Microwave Rising Crust Pizza*. The product, which serves two, comes in four varieties: *Four Cheese*, *Pepperoni*, *Supreme*, and *Three Meat*.

For this product, which is sold frozen, the "consumer drivers were on-the-go, hectic life-styles and the need for convenience," says Sean Marks, Brand Director for DiGior-

no Pizza at Kraft Pizza Co., Glenview, Ill.

But even with the high premium on convenience, "What consumers don't want to give up is the taste and texture," he says. Therefore, in developing the product, Kraft chose toppings optimized for microwave cooking and used a specially formulated rising crust that bakes crispy and brown on exterior surfaces.

Working in tandem with the product formulation is Kraft's patent-pending packaging, which includes modified-atmosphere packaging for the pizza. At the point of use, the consumer opens and discards this flexible pouch. The modified-atmosphere packaging ensures that the crust will rise properly.

To cook the pizza, the consumer flips over the tray in which it is shipped and places the crisping ring over the pizza. The

ring covers only the exposed crust at the pie's periphery, while the cheese and toppings in the center remain exposed. Both the tray and the ring use susceptor materials, which help to eliminate problems such as soggy or tough crust.

During cooking, the crust visibly rises, pushing up the crisping ring. When the cooking cycle is complete, the product emerges from the microwave smelling and tasting like a product baked in a conventional oven.

Microwavable pizza, as a component of the greater frozen pizza market, repre-



**Kraft Foods' DiGiorno Microwave Rising Crust Pizza uses a susceptor tray and crisping ring. The ring browns the pie's exposed crust during microwave cooking, and helps to prevent a soggy or tough crust.**

## Susceptor Technology Delivers Frying Experience from a Microwave

For foods designed to be cooked in conventional ovens, packaging's primary job is to protect and extend the shelf life of the product between packing and point of use. For microwavable foods, packaging often takes on the added role of cooking aid.

New susceptor-based packaging materials are making it possible to successfully cook a much larger range of foods in the microwave. These materials make crisp, browned microwave pizza, snacks, baked goods, and French fries a reality. Susceptors absorb microwave energy, directing extra heat to certain areas of the food. The result is crispness that is not achievable with conventional paperboard or flexible packaging.

H.J. Heinz Co. uses proprietary dual-susceptor packaging technology, which it developed in collaboration with Graphic

Packaging International, Inc. (GPI), to make sure that its microwavable *Ore-Ida Extra Crispy Easy Fries* live up to their name.

Heinz's patented *Crisp-n-Serve* package and proprietary *X-Crisp* production process ensure crispy, golden-brown fries after cooking for 4 min in the microwave. The product, with a suggested retail price of 99 cents, is sold in single-serve, 4.75-oz packages.

Schwan's Consumer Brands North America uses a different type of susceptor packaging to ensure perfect microwave delivery of its single-serve *Red Baron Stuffed Pizza Slices*. The product comes in six varieties: *Pepperoni*, *Five Cheese*, *Sausage & Pepperoni*, *Supreme*, *Italian Sausage*, and *Tomato Garlic Chicken*. In each slice, the ingredients are wrapped in a crust garnished with Italian cheese and herbs. Each carton contains two pizza slices, and the

sents a solid opportunity for companies like Kraft. In the United States market, “Pizza as a whole—including restaurant, carry-out, and delivery pizza—is about a \$20-billion category,” says Marks. “Of that, frozen pizza represents about \$2.6 billion. We’re looking at the opportunity to go after some of that market share.”

He adds that currently “only about 17% of frozen pizzas can be cooked in the microwave.” This suggests that there is plenty of room for new microwavable or dual-ovenable frozen pizza products.

Sepp’s Gourmet Foods Ltd., Burnaby, British Columbia, Canada, also tackled product formulation and package structure when it developed its breakthrough microwavable grilled-cheese sandwich. The product, recently introduced in Canada, will be launched in the U.S. this month.

“We took a traditional grilled-cheese sandwich and reformulated it to work with the packaging in the microwave,” says Carl Tillberg, President of Sepp’s Bakery Div.

The product reformulation also included a focus on creating a healthy product. “We used canola oil instead of the traditional butter, to remove the *trans* fats without sacrificing flavor. This is a zero-*trans*-fat product,” Tillberg says. “And we did extensive work with our cheese and bread suppliers to formulate components that would ensure the product was not soggy when microwaved.”

For the package, Sepp’s collaborated with Graphic Packaging International, Inc., Marietta, Ga., to design a form-fill-seal pouch made of GPI’s *Quilt Wave* susceptor material. The objective was a package that would enhance microwavability and also provide portability for the single-serve sandwich.

The product ships frozen and can be microwaved in 1 min, delivering the quality and texture of a traditional grilled-cheese sandwich.

The consumer cuts off one end of the pouch before placing the product in the microwave oven. During heating, the pouch material expands, and channels in the quilted-susceptor structure funnel moisture out the cut end. The sandwich emerges brown and crisp, as a result of the intimate contact between the

suggested retail price is \$2.99.

Inside the carton, each slice of pizza is bundled with a triangular paperboard “crisping sleeve” made of GPI’s *MicroRave* susceptor packaging material.

For microwave cooking, the consumer slips the slice into the sleeve, which has open ends and strategic die-cuts to allow venting. This structure, together with the susceptors, ensures correct heating of the center and tips of the slice. The paperboard side of the sleeve is printed with food-contact grade ink.

By making the microwave practical for heating these kinds of snacks, susceptor-based packaging materials are helping food companies target students, kids, and anybody else who craves a crispy snack—fast.



**Pillsbury Microwave Biscuits and Dinner Rolls from General Mills use a proprietary product formulation, rather than packaging, to stay soft after microwaving. The frozen products go from freezer to dinner plate in 25 sec or less.**

pouch material and the bread.

The expansion of the pouch material also creates insulating air pockets that keep the exterior of the pouch cool enough to handle, even immediately after cooking. Thus, the sandwich is truly amenable to on-the-go consumption. The individual sandwiches retail for \$1.00–1.20.

Product formulation, not packaging, makes microwave preparation successful for another bread product, *Pillsbury Microwave Biscuits and Dinner Rolls* from General Mills, Minneapolis. In this case, the package is not used for microwave cooking.

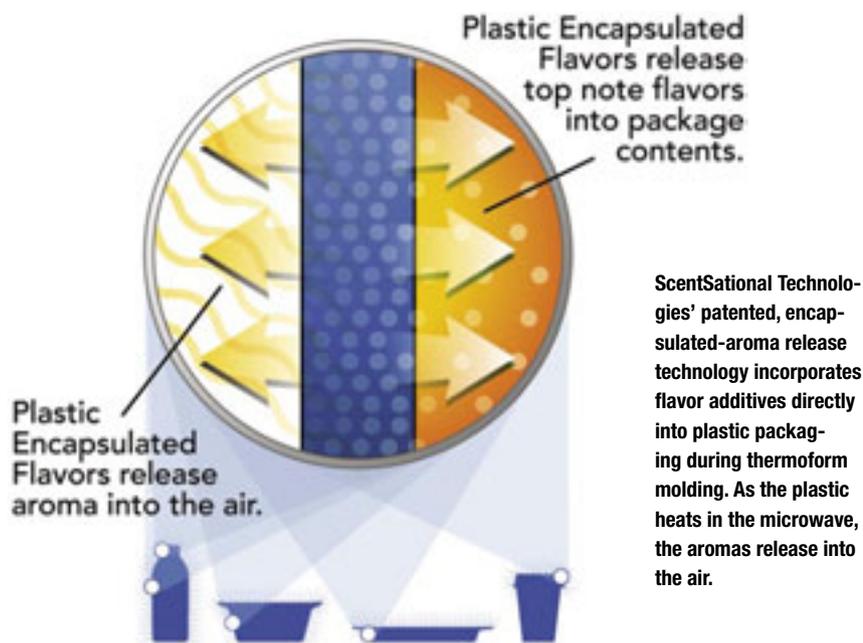
The company promotes the products as the first line of frozen breads specifically designed for the microwave oven. Cooked, the products are soft biscuits and dinner rolls which, in contrast to conventional breads heated in a microwave, stay soft after microwaving. The patented product formulation was developed in-house.

### The Smell of Things to Come

Moving forward, product formulations and microwave packaging designs will continue to evolve so consumers can enjoy quick-preparation food with the same taste profile and texture, and even the same cooking aromas of conventional cooking.



**H.J. Heinz Co. uses a dual-susceptor packaging technology for its Ore-Ida Extra Crispy Easy Fries. This packaging, along with product formulation and processing, deliver crispy, golden-brown French fries following 4 min of microwave heating.**



## Designing Foods for Microwave Cooking

Designing food products that respond well to microwave cooking is a mixture of art and science, with heavy emphasis on the science. The physical properties of food components such as water, fat, salt, and protein affect how microwaved foods cook, brown, and taste. The phase the food is in when it goes into the microwave—refrigerated or frozen—also influences cooking.

Among the things to consider when designing a food for microwave cooking are the dielectric properties of the food, the wave pattern of the microwaves within the oven, the geometric shape of the food and cooking container, and the effects of ingredients such as salt.

The dielectric property refers to a food's reaction to being bombarded by microwaves. Dielectric properties vary, depending on variables such as the food's salt and water content and its temperature.

"The presence of salt chemically alters the water in a food product, and a lot of reactions happen" in the microwave oven because of that, says Alison Brushaber, Vice President of Culinary Services at the Culinary Innovations Center, a Dallas-based consulting division of TurboChef Technologies, Inc.

Saltier foods heat faster in a microwave oven, and that can cause hot spots in a food with a mixture of ingredients. An example is macaroni and cheese with diced ham. The salty ham cooks faster than the macaroni and cheese. In some cases, a salty food can experience "thermal runaway, which leads to microwave or thermal burn," Brushaber explains.

The food technologist also must consider the amount of water, fat, and protein in the product. Proteins such as raw meat do not perform well in a microwave oven. But vegetables, which are high in water, perform very well, especially if buttered—water and fat attract microwaves.

The shape of the food and container also are crucial. Products microwave better in round or oval containers, and foods that are round or oval perform better than foods with sharp corners.

Browning also is a problem with microwave cooking. To create foods that look brown, as with conventional cooking, ingredient manufacturers have developed browning agents. An example is Mailllose, from Red Arrow Products Co. LLC, Manitowoc, Wis. This sugar-based product generates a golden-brown surface color when it reacts with protein in the food during heating.

To use food aroma as a way to improve the microwave experience, a technology is available that incorporates flavor additives directly into plastic packaging. As the package heats in the microwave oven, the aromas are released into the air.

The result is substantially increased aroma during cooking, when opening the microwave, and particularly when consumers eat the product from a ready-to-serve package. Because approximately 90% of taste is a result of the sense of smell, the taste and flavor of the food are significantly enhanced.

Developed by ScentSational Technologies LLC, this concept—called *CompelAroma*—is a patented and proprietary encapsulated-aroma release technology. The Jenkintown, Pa.-based company incorporates specially engineered Food and Drug Administration–approved, food-grade flavors into microwave trays and other food and beverage packages. The flavors are Generally Recognized as Safe by the Flavor and Extract Manufacturers' Association.

ScentSational can use virtually any flavor profile with this technology. The company has had good success with tomato herb, roasted garlic, sautéed garlic and onions, fresh-cut basil with tomato, herb garlic, macaroni and cheese, maple brown sugar, strawberry jam, butter roasted chicken, chicken soup, teriyaki, and soy ginger.

The flavors are incorporated within the polymeric structure of thermoformed packaging at the time of molding. These heat-stable flavor additives withstand the high heat histories that plastic packaging experiences during extrusion and thermoforming—and while cooking in the microwave.

Although the technology is beneficial to most foods that are microwaved, it adds considerable benefit to healthy-lifestyle foods that often lack the flavor and aroma needed to satisfy consumers' taste buds.

Thus, busy consumers do not need to sacrifice either taste or convenience for healthfulness. Consumers want it all, and food companies are determined to deliver. ●