

# Expanding regional boundaries via shelf-life extension

This LSU retort project provides a proof of concept for a packaging system that gives local flavors the shelf stability to go global. The results may eventually reverberate in commercial markets.

## JOHN KING CONTRIBUTING EDITOR

**D**r. Louise Wicker, Director of the School of Nutrition and Food Sciences, Louisiana State University AgCenter, is confident that shelf-stable meals, side dishes, and snacks can be part of a healthy diet for many consumers. A vegetarian of 20 years who prefers home cooking, she realizes that most shoppers don't have the time or inclination to cook, so they want convenient, wholesome alternatives.

"As a food scientist and educator, my job is to help interested consumers learn about nutrition, portion size, and how foods can and should enhance someone's life," she says. "We know that taste, price, healthfulness, and convenience, in that order, are the reasons that foods are chosen. However, when shopping, we all see ideas that communicate 'fresh,' 'natural,' 'healthy,' and 'tasteful.' These and other suggestions that resonate with consumers may contribute little to a wholesome diet that fits the lifestyles of many consumers. And if we consider how supermarkets continue to drive shoppers to the periphery, away from center aisles, it is no wonder that many consumers may not be attracted to the idea of eating shelf-stable foods."

Overseeing a nationally ranked program at LSU, Dr. Wicker's interest in shelf-stable foods has evolved during her career. "Over the years, I have had countless conversations with students, faculty, and government and industry professionals about ways to encourage consumers to make good food choices," she says. "Personally, I love the idea of preparing and eating grains, nuts, vegetables, and fruits. But that's not for everyone. Shelf-stable foods offer tremendous convenience, from



**Allpax Products' loaned this 2402 Shaka R&D batch retort to the School of Nutrition and Food Sciences at Louisiana State University's AgCenter for the study.**

keeping a pantry stocked without numerous trips to the grocery store, to individually portioned heat-and-eat meals. If a shelf-stable food product in a metal can or plastic package is good for you, easy to prepare, affordable, and wanted, we should help industry meet that need."

Her vision led to a meeting with Greg Jacob, General Manager at **Allpax Products** ([www.allpax.com](http://www.allpax.com)), a ProMach company and Covington, LA, manufacturer of static and agitating batch retort systems. "Dr. Wicker told me how she wanted to grow the program at LSU to include shelf-stable food development," he says. "We worked out a plan to loan a 2402 Shaka R&D batch retort to be installed in their Animal Food Science Laboratory building on campus. Because the retort will be placed near their test kitchen and sensory science laboratory, we realized that she and other faculty have an incredible opportunity to create products, retort them, and quickly determine consumers' perceptions."

The 2402 Shaka R&D retort is versatile. It can process foods in water immersion or agitation with water spray at 180 cycles/min or less. The

# LSU retort project



**Dr. Louise Wicker (left) and Sharon Hymel (right) demonstrated that retorting can produce good-tasting, safe, shelf-stable foods regardless of package type.**

latter is what Dr. Wicker is excited about. "Greg told me that preliminary data has shown that rapidly moving foods back and forth during come-up [the time it takes the retort to reach operating temperature], cook, and cool-down can improve their taste and appearance compared to other retort methods," she says. "It may also improve nutritional content. We decided early on that the Shaka method is how we would begin our research."

One of the early planning sessions she had with faculty and staff was to determine what foods to start with. "The culture of Louisiana is wrapped around so many good foods that during our first meeting, we thought about Louisianans living in other parts of the country who can't get authentic Louisiana food," she says. "Sharon Hymel, one of our technical staff who graduated from LSU and lived in North Carolina for a while, started talking about how hard it was to find authentic gumbo, shrimp po'boys, shrimp etouffee, and shrimp creole outside of Louisiana. Dr. Witoon Prinyawiwatkul, our sensory scientist, picked up on the taste and appearance characteristics of fresh shrimp and wondered how a shelf-stable shrimp snack would be perceived. With that, we had our first product to pursue."

Hymel led the development of a shelf-stable shrimp snack. "Whenever I have had boiled shrimp, a seasoning mix was added," she says. "So I created two recipes, one from a dry mix boil and another from a wet mix boil. Using four 10.5-oz rectangle thermoformed oxygen barrier packages, I placed a thermocouple into two of them and secured a shrimp [41 to 50/lb] to each using a cage. In total, all four packages were filled with eight to nine shrimp according to weight. Two packages were then filled with a predetermined weight of dry seasoning in water, and two were filled with a predetermined weight of wet seasoning in water."

All packages were sealed with **Fres-co's** ([www.fres-co.com](http://www.fres-co.com)) three-ply peelable TDS-RD-3013 high oxygen-barrier lidding material using a Reycon sealer. "Because we were going to retort shrimp for the first

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time, we didn't nitrogen flush package headspace," Hymel says. "We just wanted to know how shrimp would withstand Shaka retorting."

The initial Shaka retort parameters were 180 cycles/min, 32 PSI overpressure, and 121°C cook temperature to achieve  $F_0 = 6$ . "Come-up took less than five minutes, and cook temperature was reached in 12 minutes. The entire process, including cool-down, took less than 19 minutes," she says. "When we opened the packages, we saw that shrimp in the dry boil looked darker than the wet boil. They had a reddish appearance versus an off-white. Dry-seasoning shrimp also smelled and tasted better than wet seasoning—they reminded me of fresh shrimp right out of a boiling pot. It was really good."

Hymel also added that shrimp from each package had a rough, almost frayed appearance around the edges. "We didn't realize it at the time, but we figured out that the high cycle speed moved them around so much that they were literally getting beaten-up," she says. "We started experimenting with different recipes and cycle speeds. About a month after we ran the first trial, we found that a combined dry and wet mix in water recipe, retorted at 140 cycles/min produced really good looking and tasting shrimp." Preliminary sensory preference tests for color, taste, and texture scored in the "like moderately" and "like very much" range.

Dr. Wicker and Hymel have just begun working with other products.

They are also interested in working with smaller sized shrimp [150 to 250/lb] used in industry for shrimp salads and other foods. They created a shrimp etouffee recipe using smaller sized shrimp [71 to 90/lb] and a sweet potato puree made from Louisiana Beauregard sweet potatoes. Results for each are promising. Dr. Wicker said that their research has just begun. "We are interested in working with other oxygen barrier

**Sonoco's injection in-mold label [IML] oxygen barrier plastic packaging is a target format for Dr. Wicker's project.**



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packaging technologies, including **Sonoco's** ([www.sonoco.com](http://www.sonoco.com)) injection in-mold label [IML] oxygen barrier plastic packaging and **Silgan Containers'** ([www.silgan.com](http://www.silgan.com)) 300 x 407 [imperial] metal cans. We know that food manufacturers and retailers have customers who like different packaging designs and technologies. We have to show that Shaka retorting can produce good-tasting, safe, shelf-stable foods regardless of package type."

Importantly, the School of Nutrition and Food Sciences, LSU AgCenter's Shaka retort aspirations are not only academic. "We want to work with industry," Dr. Wicker says. "Package geometry, size, shelf display, and graphic and text messaging are all used to describe what consumers will experience when a product is purchased and consumed. It doesn't mean anything if we say that 'this product was Shaka retorted,' because shoppers understandably don't care. If a food has increased sensory and nutritional appeal because it was Shaka retorted, and we can effectively communicate that to a target audience, we have something that is commercially viable. I know that we can help the food industry in and outside of Louisiana create good-tasting, healthy-choice foods that consumers want, using our Shaka R&D retort."



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**Researchers at LSU are testing several oxygen barrier package formats, such as Silgan Containers' metal cans, because food manufacturers and retailers have customers who like different packaging designs and technologies.**

LSU AgCenter's success is directly tied to relationships that have been formed with packaging suppliers. "Fres-co, Silgan Containers, and Sonoco have actively supported our efforts," Dr. Wicker says. "They have helped us understand how packaging technical design is associated with food shelf-life quality assessment."

Dr. Wicker adds that the School of Nutrition and Food Sciences, LSU AgCenter plans to host Shaka retort webinars and boot camps. "We are really excited about growing our shelf-stable food and packaging research program," she says. "We expect to publish a lot in the coming months."

To learn more about Shaka R&D research occurring at LSU, contact Sharon Hymel at [shymel@agcenter.lsu.edu](mailto:shymel@agcenter.lsu.edu). **PW**



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