An automated product-inspection prototype is under development by Georgia Tech researchers working with Flowers Bakery in Villa Rica, Ga.

The perfect bun: That's one of the goals of an automated product-inspection prototype under development by Georgia Tech researchers working with Flowers Bakery in Villa Rica, Ga.

The first phase of the work is introducing continuous imaging technology to the large-scale production of sandwich buns for fast-food restaurants, which hold to exacting product specifications.

The fresh-baked buns are scanned by a digital camera as they move along Flowers' production line. Items not measuring up in terms of color, shape, seed distribution, size or other criteria are identified by the computerized eye's imaging software and eventually removed automatically from the conveyor.

The system concept is under development by engineers from the Georgia Tech Research Institute’s (GTRI) Food Processing Technology Division in association with researchers from Georgia Tech’s School of Electrical and Computer Engineering (ECE) and BakeTech, a baking equipment manufacturer in Tucker, Ga.

The project was made possible, in part, by funding from Georgia’s Traditional Industries Program for Food Processing, a 10-year-old research and development program designed to improve the market competitiveness of Georgia's food processing industry -- the state's second-largest employer. The Food Processing Advisory Council (FoodPAC) oversees such state-funded research grants.

The computerized imaging system in development will automate the inspection process at Flowers. Ultimately, the new approach will save money and time by increasing yield and reducing waste, says Doug Britton, a GTRI research engineer and co-principal investigator for the project.

“It should reduce the time between noticing a problem and fixing it,” Britton explains. Also, the system will automatically record data, such as product count and the number of out-of-spec buns, to generate

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production reports. “Flowers will have all this
data immediately for doing statistical process
control so they can implement changes that
reduce the number of poor-quality buns,” he adds.
“They'll get a better handle on what they are
producing.”

The second phase of the project will
extend automation by providing in-line
mechanisms to correct the vagaries leading to
poor-quality products. Proofers and ovens -- the
heat- and humidity-controlled chambers where
dough is sent to rise and bake -- are subject to
normal disturbances that can affect product
quality. Automatically compensating for those
disturbances reduces time spent correcting
problems.

School of Electrical and Computer
Engineering researchers, working with the GTRI
team, are using data from the screening and
image-processing phase and from additional
sensor inputs to build a supervisory control
system. It will be able to make changes in the
proofer and oven settings to fix problems as they
are detected.

“Baking is both a science and an art,” says
Professor Bonnie Heck, Britton’s colleague from
ECE. “Good bakers know both and are able to
react based on experience and feedback from the
process. We're trying to enhance the ability of
expert and novice bakers alike to make better
quality-control adjustments, while also adding
automation that can mimic some of those
adjustments dynamically.”

While the computerized quality-control
and self-correcting production system holds great
commercial promise for the baking industry,
Britton says, generic aspects of the technology
may be adapted to other food processing
industries as well.

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