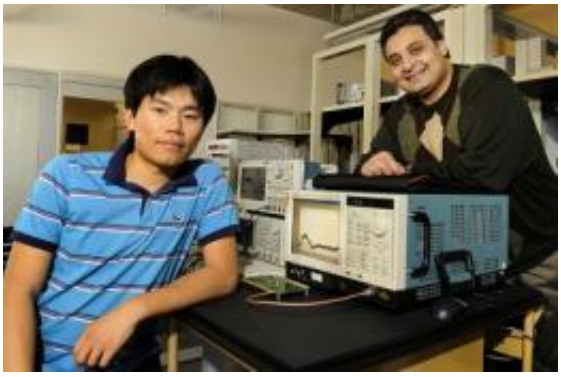
Iowa State engineer developing technology to enhance battery life in portable devices

February 14 2011



Iowa State University's Ayman Fayed, right, an assistant professor of electrical and computer engineering, and Chengwu Tao, left, a doctoral student, are working to improve battery life by reducing the power consumed by portable devices. Credit: Photo by Bob Elbert/Iowa State University

Soldiers carrying sophisticated communication and navigation devices into the field have the same battery headaches as civilians working their smart phones at the airport.

One way to assure that soldiers have an adequate power supply for their electronic tools has been to strap extra batteries to their backs. But Ayman Fayed, an Iowa State assistant professor of electrical and computer engineering, is sure he's found a better way.

Fayed, who admits to frustrations with the battery charge in his own

smart phone, is focusing his solution on improving power management in portable devices. He's using a $117,944 grant from the Grow Iowa Values Fund, a state economic development program, to work with engineers at Cedar Rapids-based Rockwell Collins to test his technology beyond his campus laboratory.

"The biggest problem with these portable systems is how long they can run on a single battery charge, or what we call battery life," Fayed said. "And because the power capacity of batteries is not improving as fast as we would like, improving battery life through reducing the power consumption of the system is our focus at the moment."

Fayed's target is to build energy-efficient power regulators that convert a battery's uneven voltage into stable power for a device's sensitive analog and radio frequency circuits.

"It is crucial for these circuits to have well regulated and very low-noise power supplies in order to meet their stringent performance specifications," Fayed wrote in a summary of his research project.

There are two types of power regulators in use today:

- Linear regulators are commonly used to power noise-sensitive analog and radio frequency circuits because of their clean, low-noise operation. They, however, can waste up to 50 percent of the energy they consume from the battery.

- Switching regulators produce switching noise and are unsuitable for noise-sensitive circuits. But, they send 95 percent of a battery's power to a device's circuits.

Fayed has developed technology that eliminates the spurious noise from

switching regulators while maintaining their energy efficiency. The technology allows the switching regulators to directly power analog and radio frequency circuits. The Iowa State University Research Foundation Inc. has filed for a patent on the technology.

Working with Fayed on the project are Chengwu Tao, an Iowa State doctoral student in electrical and computer engineering, and Rockwell Collins engineers.

Haluk Sasmazer, the principal engineering manager for Rockwell Collins, said he's happy to be working with Fayed.

"Any innovative technology that improves our product offering is something that our company is interested in," he said.

The project is the result of a company visit to campus about two years ago, Sasmazer said. Rockwell Collins engineers wanted to hear about research projects at Iowa State and explore potential collaborations. And Fayed's work in power management and integrated circuit design caught their attention.

Fayed knows a lot about working with industry engineers. He spent nine years with Texas Instruments Inc. in Dallas where he worked to solve problems with products and technologies. He has a shelf full of plaques representing the patents he's been awarded.

And he thinks his latest project will add one more to his collection.

"This project has been very successful," Fayed said. "We have shown a dramatic improvement in analog and RF (radio frequency) circuits when they're powered directly from our switching regulators. We've seen fantastic performance, almost similar to the ideal power supply."

Provided by Iowa State University