

Engineer Turns Blow-up Into Hot Automotive Electronics Startup

A blown engine sparked the design of a novel air-to-fuel ratio gauge using a Xilinx FPGA. Ultimately, a new company grew up around it.

Paul Lowchareonkul

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It's not just the universe that started with a big bang. So did one of the hottest new companies in Silicon Valley, PLX Devices, an automotive electronics startup that owes its existence to its founder's blown engine.

PLX's latest product is a plug-in device that monitors gas usage and encourages fuel-efficient driving. Its first was an air-to-fuel ratio gauge that Paul Lowchareonkul, the 28-year-old CEO, crafted after ruining his car's engine following a losing race with a Mercedes. Both are built on Xilinx FPGA platforms.

Lowchareonkul, who had long nursed a passion for cars and for racing, drove a souped-up Honda Prelude during his years at UC Irvine, where he created his own double major in EE and computer engineering. One day he pulled up next to a brand-new Mercedes SLK-320 and challenged the driver to race.

"I thought I had my car tuned perfectly and I thought I could beat him, but he beat me by a car length," said Lowchareonkul. "I then went and bought a turbo charger for my car, but it wasn't a perfect fit—it was for a different year of Prelude. I thought, 'I'm an engineer, I can figure it out.'" So Lowchareonkul installed the turbo charger and raced a few times, upon which the engine promptly blew up. "It turns out it wasn't tuned properly, and when I took the engine apart, the pistons were cracked," he said. "I said to myself, 'there has to be a way to monitor the safety of your engine.'"

Lowchareonkul searched the Internet and found a few do-it-yourself fuel-to-air ratio circuits for sale. "But they were ugly and not advanced, so I designed one that is sexy," he said. With a Xilinx FPGA, he developed a gauge that users could plug into the OBD II/CAN port in their automobiles to get instantaneous readouts from their engines (all cars built after 1997 have OBDII ports).

“I designed a circuit that controlled your car’s oxygen sensor, which monitors your air-to-fuel ratio,” Lowchareonkul said. “Essentially, if you are running too lean, meaning not enough gas, you can detonate the gas in your pistons too early, destroying the pistons. And if you are running too rich, meaning too much gas, you are wasting gas and losing a lot of power, dumping fuel out your exhaust. So this product measured the amount of oxygen to the point that people can tune their engine so precisely, they can squeeze every bit of horsepower out of their car.”

The Cupertino, Calif., native was no newcomer to Xilinx platforms. His father, Teratum Lowchareonkul, is an engineer at Xilinx, and during his junior and senior years at college, the younger Lowchareonkul interned with the company under the tutelage of Xilinx veteran Bill Pabst. “During this internship, I learned how an FPGA works and all the interesting stuff you can do with one,” Lowchareonkul said. “What was neat about the internship was, I was given the opportunity to experiment and play around with the technology.”

Turning a Blow-up into a Business

After building that first gauge for his own use, he started selling a few of the systems to his classmates. Lowchareonkul then decided to see how his invention would do on eBay. “I sold it with no reserve, and the first one went for \$600, which was around \$300 below [the price of] commercially offered sensors,” Lowchareonkul said. That sale marked the start of PLX Devices, Inc., which Lowchareonkul owns outright.

He immediately began to develop a sophisticated product lineup, including a gauge that allows users to check 50 aspects of engine performance, including the fuel-to-air ratio, as well as a multigauge system. All of the company’s more-advanced gauges are powered by Xilinx FPGA platforms.

Lowchareonkul’s designs use an organic LED rather than a mechanical needle. This allows users to customize the display to suit their tastes, and to switch what aspect of engine performance they want to monitor using a keychain fob-type remote control. What’s more, the device can record data for

a driving instance. For example, after a race (on a legally sanctioned track, of course), drivers can download the data to their PC to analyze their engine’s performance.

The gauges have made a splash in the automotive market. In 2007, PLX won two awards (Best New Interior Product and Best New Mobile Electronics) at the Specialty Equipment Market Association conference, beating out products from

PLX, the device both saves money and reduces emissions. This “green” focus has garnered widespread media coverage in print and on radio and TV for the Kiwi and PLX. “We’re also now signing deals with mainstream distributors, and Kiwi is available in mainstream stores—it’s a consumer product,” said Lowchareonkul.

Lowchareonkul said Xilinx plays a critical role in PLX Devices’ products. “Because



PLX Devices’ Kiwi, powered by a Xilinx FPGA, helps customers drive more fuel-efficiently.

much larger, established companies. PLX gauges have also won 18 media awards.

The latest offering, the Kiwi, catapults the company out of the auto enthusiast niche and into the consumer realm. The Kiwi—named for the green fruit and built around a Xilinx FPGA and OLED display—has arrived at a propitious moment. With gas prices spiraling ever upward, this system allows users to monitor their fuel efficiency and even awards a “Green Score” from 0 to 100 to promote fuel-efficient driving habits.

“It’s a device that you can plug into your car in minutes,” Lowchareonkul said. “You plug it in, start driving and the device monitors your driving habits to make sure you are driving for gas efficiency.” The Kiwi keeps score based on four parameters: acceleration, drag, smoothness and deceleration. It also monitors miles per gallon in real time.

The Kiwi comes with several tutorials to train drivers in how to get the most mileage out of every gallon. Thus, according to

we used the FPGAs, we were able to create a design quickly to get into the market at the perfect time,” he said.

So, now that the company is on the road to success, one might wonder if the CEO is looking for an automotive upgrade. He currently drives a souped-up Honda S2000, but like any auto buff, Lowchareonkul dreams of buying new wheels. The car of his fantasies isn’t a Porsche, Mercedes, BMW or Ferrari. Instead, Lowchareonkul said his next vehicle is going to be the all-electric Tesla.

“I’m always looking for the next best thing, and the Tesla’s such an elegant design,” he said. “You don’t have to change the fluids, you don’t have a radiator and it has a very efficient electric motor. I want to get it so we can learn what to do with it.”

If the last eight years have been any indicator, the highly driven Lowchareonkul will no doubt do something amazing.

For more information on PLX’s products, visit www.plxdevices.com. 