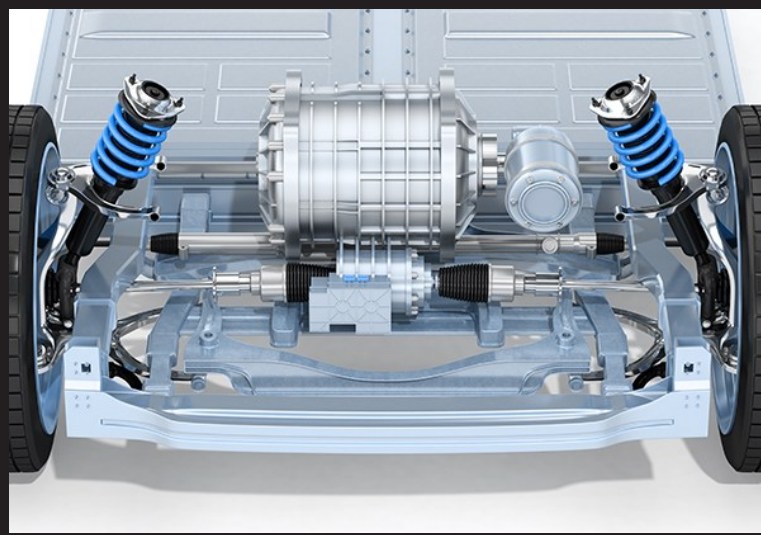


UNICO DEVELOPS INDUSTRIAL AUTOMATION SYSTEMS USING AMD SPARTAN™ ULTRASCALE+™ FPGAs

CASE STUDY



Unico builds variable speed drives and control systems for industrial automation aimed at companies on the cutting edge of new technology. A variable speed drive (VSD), also referred to as a variable frequency drive (VFD), is an electronic device used to control the speed and torque of an electric motor. Its primary function is to regulate the flow of electrical energy from the main power supply to the motor. The company develops products for a variety of applications, including test stands for electric vehicle (EV) components (batteries, inverters, e-motors), systems for the oil and gas industry, and control applications for metal forming. These solutions are customized to meet every application requirement.

Unico's primary focus is on drive and control systems for testing EV propulsion systems, maximizing oil production with artificial intelligence at the well, optimizing metal forming with control applications embedded into the drives, and delivering precision control systems for a wide range of applications. "If there's an application that we can optimize through motor control, we can tackle it," said Edgar Duarte, a principal engineer at Unico.

CHALLENGES

"Traditionally, we had been working mostly with AC motors, but with the electrification of vehicles, we've started moving into battery pack testing and simulation," Duarte said. "We have products for both testing the battery pack as well as simulating the battery performance. Lately we've been moving to battery cell testing and simulation for lower-voltage, higher current applications."

In the automotive space, Duarte said Unico's products, like e-axle dyno drives, support drive-train testing. Automakers specify desired battery performance, and Unico's systems supply the DC bus for their inverters and test their AC motor, measuring the entire electrical drive train's power output for optimal performance at the design stage.

"We do model-based design and use Matlab Simulink, as well as the Model Composer tool from AMD. We also use an HDL coder from MATLAB®. We go from the SIMULINK® model down to HDL and that's what we put into the AMD FPGA, which does the data acquisition and control for the power electronics," Duarte said.

"We work with customers to get all the desired characteristics into our simulation environment so we can recreate it as soon as possible and assess feasibility," Duarte said.

INDUSTRY

Industrial; Automotive

CHALLENGES

Unico used to only focus on AC motors requiring high voltage testing, but the company expanded its market into EV with battery cell testing and simulation for lower voltage, higher current applications.

SOLUTION

For its battery testing and validation products, Unico needs secure devices that can handle large amounts of data. The cost-optimized AMD Spartan™ UltraScale+™ FPGA family helps designers rapidly move through these challenges by offering low cost, power efficiency with modern security features.

RESULTS

Unico expanded into EV battery and cell-level testing, boosted by its acquisition of Present Power Systems. By moving from a competitor's solution to the AMD Spartan™ UltraScale+™ FPGAs, it gained better support, efficiency, and scalability, strengthening both its EV testing and energy storage solutions.

AMD TECHNOLOGY AT A GLANCE

AMD Spartan™ UltraScale+™ FPGA family

TECHNOLOGY PARTNER

Avnet and Sapphire

"There are also end-of-line testing applications, where Unico drive systems make sure every battery pack coming off the line is the same, and conforms to strict quality control levels."

"A few years ago, we were more in higher power battery packs testing environments, but we realized we were missing something on the lower end of the spectrum for cell testing," Duarte said. "We were seeing a lot of customers wanting lower voltages to test and we didn't have a solution for them. So, we acquired Present Power Systems (PPS), and they brought a set of technologies that helped us cover all those market needs we were missing. The acquisition allowed us to get into battery cell-level testing."

SOLUTION

For its battery testing and validation products, there is a need for enhanced security in devices that can handle large amounts of data. The cost-optimized AMD Spartan™ UltraScale+™ FPGA family helps designers rapidly move through these challenges by offering low cost, power efficiency, with modern security features.

This FPGA presents advanced I/O capabilities, low-power consumption, and state-of-the-art security features for a broad array of applications (see Figure 1 below), in addition to extended FPGA lifespans of 15 years or more, and in-field upgradeability for maximum design longevity.

"Semiconductor chips are at the heart of our systems," Duarte said. "We do model-based design and use Matlab Simulink, as well as the Model Composer tool from AMD. We also use an HDL coder from MATLAB®. We go from the SIMULINK® model down to HDL and that's what we put into the FPGA. The FPGA does data acquisition and control for the power electronics."

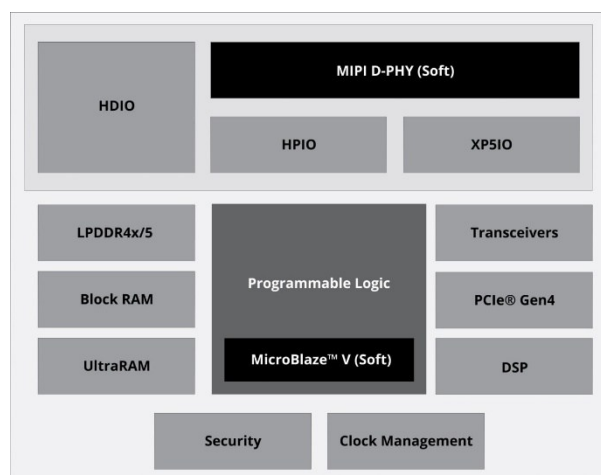


Figure 1: Block diagram of AMD Spartan™ UltraScale+™ FPGA

RESULT

"The acquisition of PPS included a control platform based on

another vendor's FPGA," Duarte added. "Once we started to see issues with the tools and maintenance, we decided to go with a more unified flow, and migrate the designs to AMD. That's where the AMD Spartan Ultra Scale+ came into play. "One of the main reasons we wanted to change to AMD is support," Duarte added. "The support for other FPGA's is sometimes difficult. And just from a knowledge base perspective, when you do an Internet search you can find hundreds of solutions for AMD parts, but the knowledge base is just not out there for other tools."

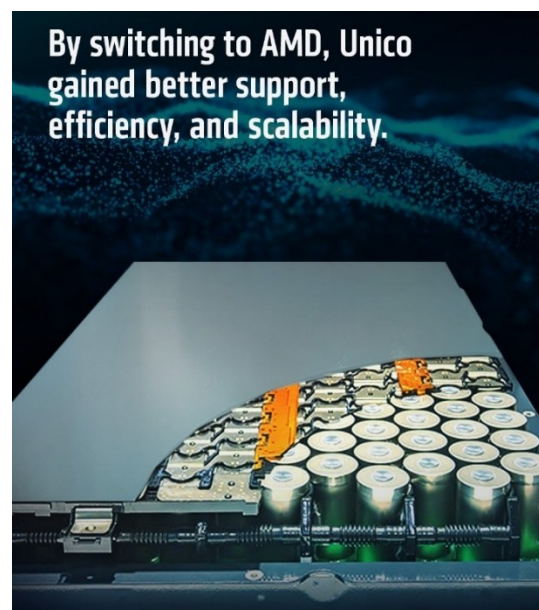
In addition to its focus on EV battery testing and validation, Unico has seen a noticeable increase in demand for energy storage systems. Participation in the power grid

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market requires the development of large, utility-scale, battery storage systems for the grid.

"These are systems where you're going to have an inverter that goes to the grid, and then you have a pretty large bank of batteries; subsequently, you're going to need converters that are going to move energy between the grid and the batteries and the location where this energy is going to be used," said Duarte. "In the future, companies could purchase energy from the grid when pricing is low and store it on batteries."

"We also enable grid reliability for energy storage systems," Duarte said. "If you have microgrids distributed around the country and you have a large power failure event, you can use distributed storage systems to bring the grid back up while you work through the underlying issues. The AMD Spartan UltraScale+ FPGAs could play a big role here as well."



ABOUT Unico

Unico builds leading-edge variable speed drives and controls systems for companies on the cutting edge of new technology. It's among the leading automation companies with experience spanning more than five decades. Unico's team is focused on accelerating a digital future with drives and controls systems for testing electric vehicle propulsion systems, maximizing oil production with artificial intelligence at the well, optimizing metal forming with control applications embedded into the drives, and delivering precision control systems for a wide range applications in the converting industry. Unico is committed to quality throughout its organization. Its Quality Management System has been certified to comply with the requirements of ISO 9001:2015 by Preferred Registrar Group. For more information, please visit: <https://unicous.com/industry/ev-powertrain-test-system/>

ABOUT AMD

For more than 50 years AMD has driven innovation in high-performance computing, graphics, and visualization technologies. Billions of people, leading Fortune 500 businesses, and cutting-edge scientific research institutions around the world rely on AMD technology daily to improve how they live, work and play. AMD employees are focused on building leadership high-performance and adaptive products that push the boundaries of what is possible. For more information about how AMD is enabling today and inspiring tomorrow, visit the [AMD website](#) (NASDAQ: AMD), LinkedIn, and X pages.

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