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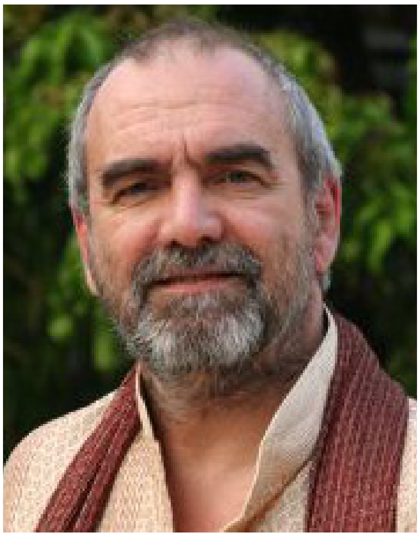
Axeon depends on Creo™ Elements/Pro™ and Windchill™ to boost success in the electric vehicle industry

Feature Article

Axeon, of Dundee, Scotland, is Europe's largest independent lithium-ion battery systems supplier, processing over 70 million cells a year and supplying volume production of batteries for global markets. The company designs and manufactures large-scale automotive grade battery systems for electric and hybrid-electric vehicles, Axeon has developed a market-leading and proven Battery Management System giving warranted performance that is reliable and safe. Axeon also provide battery solutions for other applications including Bosch power tools.



"Using Creo Elements/Pro we are able to optimize our product designs at an early stage in the development cycle, avoiding expensive and time consuming rework phases late in our projects."

– Simon Dobson, Chief Mechanical Engineer, Axeon, Dundee, Scotland

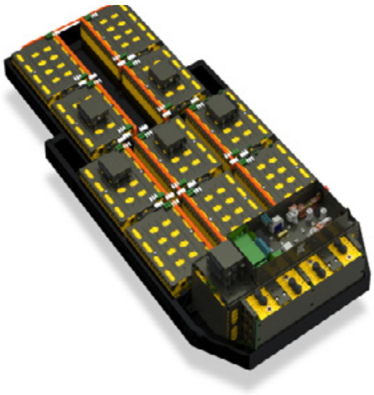
The challenge: design a strong and lightweight battery for the electric vehicle market

Over the past few years, Axeon's electric vehicle market has expanded due to the high interest in electric vehicles and all things "green." Prior to this expansion, the company's focus was on a lot of mobility products, such as battery packs for power tools, and small AA batteries. Now, due to an environmental push, the company places more of an emphasis on larger scale vehicle Battery Management Systems. However, these larger batteries, with their greater weight and structural loading, require a more in-depth engineering analysis.

Axeon produces many battery designs for its growing customer base, and new customers often need time to understand how to apply this technology in their application. Because of the current technologies available for cells (the building blocks of batteries), Axeon had previously needed to use heavy and bulky cells to get sufficient energy into the system. Axeon's challenge was to design a strong, yet lightweight battery for the growing electric vehicle market, and to be able to test the design before producing the product. As a result of using Creo Elements/Pro for this architectural design, ONL was able to customize the building components that make up the bridge, and to use the firm's File-to-Factory (F2F) computer numerical controlled (CNC) fabrication processes to build the bridge on time and on budget.

The solution: design an optimal strength system with Creo Elements/Pro; manage documents and templates with Windchill PDMLink

Axeon chose the PTC 3D product design software solution Creo Elements/Pro to develop the various components of the battery. Specifically, they are using Routed Systems Designer to design the electrical and wiring schematics, Creo Elements/Pro for the mechanical design, Cabling Extension to route cable directly on the Creo Elements/Pro model, and Creo Elements/Pro Mechanica to simulate prior to manufacture. Creo Elements/Pro enabled Axeon to subject their battery designs to a simulated real world environment (typically SAE J2380). By also incorporating Windchill PDMLink, Axeon was better able to manage the entire process.



Battery system for delivery van

Result: reduced development cycle and lower design costs

With Creo Elements/Pro in place, Axeon was able to design its Battery Systems to have optimal strength in a compact, lightweight form factor, an improvement over previous designs that used more material and made the batteries larger and heavier. Using Creo Elements/Pro, Axeon looked at the structures they created and saw an early view of their performance. Before Creo Elements/Pro, the engineers would have to model the components and then build the prototypes, diagnose any issues and then resolve them. Now, they can design, view and simulate the battery system under real world conditions in order to make an early decision on whether they should continue with or revise the design.

Developing cells for electric batteries

Axeon was established as Europe's largest independent supplier of lithium-ion battery systems to deliver individual solutions for electric and hybrid vehicles, as well as mobile technologies and power tools. Recently, the company has switched to producing more complicated, larger scale battery systems for electric vehicles. The company develops a lot of "one-off" designs to help their customers determine how best to utilize this technology in their electric vehicle applications

Simon Dobson, Chief Mechanical Engineer at Axeon explains, "The biggest challenge we have is providing sufficient energy density in our systems. Current cell technologies require us to utilize many heavy and bulky cells to achieve the required power capacity."

Typical vehicle batteries deliver 300 volts and require approximately 90 cells to create the battery system. Axeon's engineers have a modular approach to the way the cells are packaged, partly for material handling within the plant, and partly to help make subassemblies that can be dropped into the larger battery system. The engineers can test the modules offline to make sure they meet the quality standard, work with the electronics, and then install the modules into a final Battery System.

Choosing Creo Elements/Pro for modeling and design

"Using Creo Elements/Pro for modeling and design helps us to meet the challenge of making a structure that carries all this battery power strong and light, so that we minimize the payload of the vehicles," says Dobson. "Without an optimized design, you could potentially add quite a considerable weight to an existing vehicle."

"One of the reasons we use Creo Elements/Pro is to be able to design the system and subject it to a real-world environment that simulate actual conditions. Using Creo Elements/Pro we can look at long-term effects of vibration on the individual components, using fatigue advisor. So instead of having to go through the entire development cycle and then finding out that the design will fail, we can run the simulation virtually without having to make that initial physical prototype."

Creo Elements/Pro enables Axeon to create multiple iterations to fine-tune and improve the design long before they've had to develop it or spend the money to produce it.

"So basically, if we hadn't done a simulation, and the final product didn't work, we could have lost two months of project time. Incorporating Creo Elements/Pro into the design process makes us much more confident of our designs," finished Dobson.

Windchill helps control and share the documentation

Axeon uses Windchill PDMLink to control their computer aided design (CAD) documentation allowing them to get all of the specifications and design documentation into one environment. Within Windchill, the Axeon engineers can create template models to drive new product structures to the rest of the organization. The engineers are able to share this BoM detail with the procurement team, so they can review the reports and begin to understand the product under development.

The integral change management functionality in Windchill allows Axeon Engineering to keep accurate revision control of all components and assemblies as modifications are made.

Dobson continues, "One of the difficulties in design is the integrity of your data. Knowing that you have the right component, the right path, the right version of anything is quite a challenge. If you get it wrong it can be an expensive mistake. One of the great things about Windchill PDMLink is that there is 'one truth.' It certainly takes a lot of stress away by making sure that you've got the right parts in your assembly."

Axeon designs its battery packs with Creo Elements/Pro

Enabling electric vehicles

As more and more companies plan to incorporate electric battery technology in their vehicles, many of them are turning to Axeon to help develop a lightweight and efficient battery customized for their specific needs. Using PTC's Creo Elements/Pro design tool, Axeon is able to test and model the battery prior to installing it within the vehicle's system, saving development time and money. PTC's Windchill PDMLink also helps Axeon control and share information about the development process within many different departments across the company.

Dobson concludes, "Creo Elements/Pro is a kind of 'warranty protection' for our battery systems. We get a chance to explore multiple iterations to improve our design long before our customers get the product."

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