CYCOLOY™ RESIN FOR LENOVO'S SLEEK NEW IDEAPAD†

A high-performance material solution from SABIC enables ultra-thin walls and boosts stiffness to allow a thinner, lighter metal back plate.

In the laptop computer business, there is no such thing as being too thin. Consumers constantly look for new devices that are lighter, easier to carry and more elegant than their predecessors, and manufacturers must find new ways to reduce weight and dimensions while enhancing features and functionality. Facing fierce global competition, rapid technology changes and demanding customers, manufacturers such as Lenovo Group Limited, a Chinese computer hardware and electronics company, often look to high-performance materials as part of their ever-thinner design strategy.

When Lenovo began designing its IdeaPad U-series notebooks, the company had a goal of slimming down the keyboard assembly from 5.2 mm to just 3.2 mm in thickness; an overall profile reduction of 30 percent. Achieving such a large reduction required thinner walls for the keyboard frame and a significantly thinner metal back plate.

SLIMMING THE PROFILE WITHOUT COMPROMISING STRENGTH

Lenovo had been using a combination of acrylonitrile-butadiene-styrene (ABS) resin and aluminum for keyboard assemblies in earlier notebooks. However, due to the new design featuring thinner walls and backplate, the company required a stronger, stiffer solution that could deliver the required performance in pressure tests that simulated typing.

Lenovo turned to SABIC, a longstanding collaborator, for a new approach. In addition to the main goal of a thinner profile for the IdeaPad keyboard design, the company wanted to ensure the solution would continue to support its environmental policy, which emphasizes minimizing the use of materials and lowering overall impact.

Dr. Hao Ning, Lenovo material designer, Mechanical Engineering Development Team, IdeaPad Product Group (IPG) R&D, said, "We created a great design for this stylish new notebook and believed it would be a beautiful and highly competitive addition to the laptop market. However, to achieve our vision, we needed the right resin given our elevated requirements and an experienced material supplier to collaborate with us on this important project."

SABIC CYCOLOY RESIN DELIVERS HIGHER PERFORMANCE IN THIN-WALL DESIGN

When Lenovo approached the SABIC team in China for assistance with an innovative solution to support the needs of this new application, the original equipment manufacturer (OEM) had several requirements. The material not only had to pass the pressure test in a thin-wall configuration, it also had to provide excellent aesthetics and high flow for easy processing, and make a contribution to the overall sustainability of the IdeaPad device.

The SABIC team recommended mineral-filled CYCOLOY thermoplastic resin, a blend of polycarbonate (PC) that delivers high impact strength and high modulus (6GPa), as well as excellent flow, easy processing and low warpage for thin-wall injection molding. This versatile material is also colorable and paintable and can deliver different types of surface finishes required by customer design specifications.

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"We selected SABIC's CYCOLOY resin not only for its excellent performance but also because SABIC was able to provide highly experienced technical support throughout every step of the project," said Dr. Hao Ning.

The SABIC team worked closely with key Lenovo teams, including research and development. SABIC engineers provided technical support for tooling design and molding trials, and the local China sales team supported rapid delivery of material to the molder at the early production stage.

LOWER KEYBOARD PROFILE AND REDUCED ENVIRONMENTAL IMPACT

Because CYCOLOY resin offered nearly triple the strength of the previous material, the thinner keyboard frame, with walls only 1.6 mm thick (compared to the previous 2.2 mm walls), passed the pressure test.

Equally important, the high performance of CYCOLOY resin allowed Lenovo to replace the aluminum back plate with stainless steel, and at a much thinner gauge (0.2 mm vs. 0.6 mm). In fact, Lenovo is considering eliminating the back plate altogether in future designs. Together, these improvements allowed Lenovo to achieve its goal of a 30 percent reduction in the profile of the keyboard assembly for its IdeaPad U310 model.

This new, slimmer configuration was well received in the market. *LAPTOP Magazine* wrote, "The Lenovo IdeaPad U310 is one of the best-looking Ultrabooks yet and backs its beauty up with a comfortable keyboard and snappy performance."

Both the material changes and thickness reductions also contribute to Lenovo's sustainability goals. In this case, the upgrade to CYCOLOY resin from the ABS resin enabled Lenovo to replace aluminum, whose production carries a high energy cost and high level of CO_2 emissions (~12 kg CO_2eq per kg of aluminum in primary production), with steel, which has a lower energy cost and lower CO_2 emissions (~2 kg CO_2eq per kg of unalloyed steel in primary production). The superior stiffness and strength of CYCOLOY resin also enabled the use of a significantly thinner back plate that requires less metal and contributes to the light weight of the laptop (only 1.7 kg). Similarly, the use of thinner walls reduces the amount of plastic needed for each keyboard frame.

"SABIC uses life cycle assessment (LCA) tools following international ISO standard guidelines to estimate the environmental impact of its products. Based on cradle to gate LCA analysis, the energy and carbon footprint of the keyboard assembly was reduced by more than 30 percent as a result of using CYCOLOY resin," said Sreepadaraj Karanam, SABIC Sustainability Technical and LCA leader. "This is a good example of how our solutions can have a positive, ripple effect across a design, resulting in an application that is sustainable overall. The higher performance of CYCOLOY resin was instrumental in the success of this new design."

Based on the excellent outcome of this project, Lenovo expanded the keyboard assembly design to its IdeaPad U410 model, which features painted CYCOLOY resin.

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