

Earning the Yellow Jersey Made Easy



Photo: Peter Witek

High-tech and craftsmanship made in Germany: Why a bicycle manufacturer near Lake Constance relies on ROHACELL® for its wheel rims to help it sprint into the top-ranking in the world of professional cycling. A case in point: Team MILRAM at the Tour de France 2009.

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Ten stages across flat country, seven across mountain highlands, one across rough hilly terrain, and two individual and team time trials. Total distance: around 3,500 kilometers; duration: three weeks. With even the spectators of the Tour de France required to possess a certain amount of stamina and capacity for endurance, this, the world's most prominent cycling event, is a grueling test for the riders. Talent, training, and top physical condition on competition days are key prerequisites for making it across the finish lines. Another is excellent equipment. Carbon fiber reinforced polymer (CFRP), or simply carbon, is the premium material of choice these days. CarbonSports, a Friedrichshafen-based bicycle manufacturer, uses this material to make one of the best racing wheels in the world. To help it achieve even better rankings in cycling's top league, the high-tech craftsmen at CarbonSports use a material produced in Darmstadt—ROHACELL® rigid foam made by Evonik Industries—in the core rim section of their lightweight wheels.



Craftsmanship and a high-tech material from Germany: Since 1995, Friedrichshafen-based CarbonSports has been manufacturing its Lightweight-brand cycling wheels with a marked passion for precision. Up to this day, every wheel has been built according to the original process developed by the toolmakers Rudolf Dierl und Heinz Obermayer. Thanks to the material properties of carbon, the flyweight bicycle wheels weigh in at less than 1,000 grams, are aerodynamic, and feature extreme rigidity. For the last four years, the Lake Constance bicycle manufacturer has been banking on Evonik's ROHACELL®, a material it uses for its rim cores. ROHACELL® is extremely rigid and solid, yet minimally dense, making it an ideal material for manufacturing robust, lightweight parts. The polymethacrylimide rigid foam was invented in Darmstadt in 1970, and is still produced there. The bottom picture shows rim cores machined from ROHACELL®.

Photos: Frank Jeniche

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Around two centimeters wide, more than half a meter high, jet-black and fitted with a conspicuously large outer ring, the wheel, at first glance, looks anything but “lightweight.” That first impression is immediately dispelled, however, when you lift the wheel up. This carbon wheel weighs less than 1,000 grams, and really is lightweight—making it a highly prized piece of equipment among professional cyclists. In fact, quite a number of the athletes competing in this year’s Tour de France will be taking advantage of the wheels from Friedrichshafen. Erhard Wissler, the managing director of CarbonSports, confidently explains, “As they race to clinch victory, they will be doing so on our wheels. And we are working on making our Lightweights even lighter.”

The lightweight wheel brand with top performance points
Lightweights made in Friedrichshafen are in greater demand than ever, with delivery currently taking around nine weeks. The company makes approximately 10,000 wheels a year—all of them handmade. “Our brand of wheel offers the best performance,” says Wissler, explaining why Lightweight is a leader in the top field. This top-performance quality is achieved thanks to the material properties of carbon, which is aerodynamic and highly rigid. Carbon is stronger and more rigid than, for example, aluminum. As a result, none of the physical energy generated by the rider to propel the bike forward is lost in deformation of the wheels. Instead, that energy is efficiently transmitted onto the road.

A carbon wheel rim with a special foam core

The wheels consist of a full-carbon rim with a special foam core: ROHACELL®, a rigid polymethacrylimide foam. Because it is not just extremely strong and rigid, but also has exceptionally low density, ROHACELL® is an ideal material in components that need to be both lightweight and robust. In combination with the CFRP outer casing, this produces a high-strength, rigid construction that is nonetheless exceptionally lightweight.

“ROHACELL® is particularly heat-deflective and creep resistant,” explains Dr. Alexander Roth, head of New Technologies ROHACELL® at Evonik in Darmstadt, “and it can be permanently combined with conventional polymers (by applying heat and pressure) to create extremely resilient compound materials.” Erhard



A brand that stands for low rolling resistance and top performance: The carbon material for the Lightweight-brand wheels is stronger and more rigid than, for example, aluminum. This means that the bicyclist's mechanical energy is not lost through wheel distortion, but is efficiently transferred, as it were, to the road. This is a plus for the sole German cycling team participating in the UCI's ProTour cycling competition, as well as for the cyclists in the Tour de France 2009. Here captain Linus Gerdemann and sprinting hopeful Gerald Ciolek together with their MILRAM team.
Photo: Peter Witek

Wissler adds that, "This enables us to achieve optimal fusion of the CFRP top coatings during the production process as well as good supporting for these coatings once they are exposed to the stress of competitive racing. We have been using ROHACELL® in our overall design since 2005." The rigid foam has been manufactured in Darmstadt since it was first invented in 1970.

High hopes pinned on Team MILRAM at the 2009 Tour de France

Even pros under contract with other sponsors rely on wheels made by the Friedrichshafen manufacturer (one of the components of which is supplied by Evonik) to achieve better times on one or other of the mountain stages. „They are willing to accept the sometimes considerable contractual penalties this involves in return for greater speed," Wissler points out with an amused smile. Team MILRAM, captained by Linus Gerdemann (winner of the 2009 Tour of Bavaria) and including in its ranks sprinting hopeful Gerald Ciolek (winner of one of the stages of this year's Tour de Suisse), has officially gone into the race (often referred to as the "Tour of Suffering") on Lightweight wheels, and therefore has no legal consequences to fear, of course. CarbonSports is the sponsor of the only German team taking part in the UCI (cycling's world federation) ProTour series of events. Frequently cited by CarbonSports as "the epitome of innovation—handmade in Germany", these premium wheels will thus be used not only in a few choice races, but will be used by the pros on Team MILRAM in all their contests.



The symbiotic merger of high technology and craftsmanship
The know-how involved and the actual processes executed in the production halls in Friedrichshafen is kept strictly secret, with only the 35 staff members privy to those production secrets. Eight working hours go into each wheel. And that has its price. While the standard-version wheel set costs just under 3,000 euro, a version with lighter hubs and a lighter mounting costs a thousand euro extra. "The trick, ultimately, is to connect the wheel rim with the spokes, and to make the whole thing using carbon," Wissler explains somewhat succinctly. In order to bring more know-how into the company, Wissler even cooperates with universities. He says that, until 2006, his was the only company which mastered this technology. It was only in 2006 that a rival from a neighboring European country copied the process and launched a "similar product" on the market.

In a move calculated to help it meet the high level of existing demand more quickly, the company recently relocated to a new site situated near the airport in Friedrichshafen. A new company building (4,000 square meters in size) was erected there a few months ago at a cost of €4.5 million. This is where the carbon blanks are now manufactured, with final assembly and shipping carried out in Rottenburg near Stuttgart. Wheel production operations were expanded to a staff of 60 employees (or 45 families, as Wissler likes to emphasize). The majority of customers who buy Lightweight wheels are ambitious cyclists. "They invest in good material in order to enhance their own performance. Just like we do with ROHACELL®," says Wissler.