



# Faster with coatings.

## Formula Student



Silverstone, Hockenheim, Spielberg. Roaring engines, fast cars, hot asphalt. The nerves of drivers in the paddock are strung taut as the last fine tuning is carried out on their cars. What's at stake are points – and honour. Because, even if it sounds and feels like Formula 1, the prize money at the Formula Student is the experience of putting theoretical knowledge from the lecture hall into practice. And having a blast doing it. Oerlikon Balzers and Oerlikon Metco are at the track too.

At the beginning of the 80s, the Society of Automotive Engineers in the USA founded the Formula SAE, a university competition. Just shy of two decades later, the idea arrived in Europe as the Formula Student. Today, nine competitions are driven in different countries throughout the world and the number of participating racing teams is rising steadily.

The participating student teams conceive, design, and construct a formula racing car over the course of one year with which they compete against each other in various events before a jury of specialists from motor-sport and the automotive industry. The winner, however, is not the team with the fastest car, but the one which attains the highest point score in a series of disciplines. In static (engineering design, cost analysis and business plan presentation) and dynamic disciplines (acceleration and long-distance tests, autocross, figure 8s and energy efficiency), a maximum of 1'000 points is possible. "That's why our team doesn't just have engineers, but also students studying business administration or marketing. The task that has been posed is to build a prototype for a fictional small series of cars, and that means we need more than just technology. We also need a business plan and must attract investors for our idea," comments Francesco Salerno, spokesperson for the racing team from the University of Stuttgart, Germany (Rennteam Uni Stuttgart), explaining the Formula Student concept.

### **SUMEBore scores thanks to reduced friction**

The world ranking currently lists over 500 SAE and Formula Student teams. The University of Stuttgart team is among the top ten and at the end of May was even able to take first place in the Formula SAE in Michigan, thereby claiming the victory in the unofficial world championship. Peter Ernst, Head of SUMEBore Technology at Oerlikon Metco, is especially pleased at this: "For several years now, we have sponsored the racing team from the University of Stuttgart with our SUMEBore technology, so of course we cheer them on during every competition."

The SUMEBore coatings on the cylinder bore surfaces in the engine's interior reduce friction and thus increase engine power. At the same time, they reduce oil and fuel consumption as well as wear and increase the corrosion resistance. "Thanks to SUMEBore, we achieve a lower specific consumption over nearly the entire engine speed range. That's very important for us because for the 'Efficiency' discipline, the consumption is calculated for the 22 kilometre distance race of the endurance competition and the team with the lowest consumption wins 100 of the possible 1'000 points. Low consumption is also of special importance for us because with our four-cylinder engine, we naturally have a higher consumption level than teams with a one-cylinder engine," explains Francesco Salerno.

### **In racing, commercial vehicles, passenger cars and motorcycles**

The systems for the application of the SUMEBore coatings are based on atmospheric plasma spraying (APS). The coating is carried out by means of a plasma torch which is rotated using the RotaPlasma system. "It basically works like this: The coating powder is introduced into a hot plasma. The powder particles melt forming droplets which are applied uniformly to the inside of the cylinder by means of the rotational movement of the plasma torch and the acceleration of the plasma gas, thus creating the coating," explains Peter Ernst, summarizing the highly complex process. SUMEBore has not only been used for years in racing: HGV manufacturer, Scania, relies on the SUMEBore technology for virtually all of their engines; the Volkswagen Group uses it, for example, in their EA211 four-cylinder engine which is manufactured in large numbers every year; SUMEBore is also used in the new Porsche 918 Spyder.

### Friction concept with BALINIT DLC

The Coburg Automobile Team, or CAT, from the Coburg University of Applied Sciences, Germany, also depends on SUMEBore. “We asked ourselves the question, What kind of performance could we get from a series engine? In our case, that’s a Yamaha R6 which has been a faithful part of our team for years. We have developed a friction/performance concept and in Oerlikon Metco, we have found our sponsoring partner. But we were sure of one thing: that our engine offered even more potential. Then Oerlikon Balzers gave us the opportunity to coat individual components with BALINIT DLC STAR,” says Thomas Schnurr, power train team leader for CAT, looking back at the beginning of the season.

Sascha Hessel, Head of Precision Components at Oerlikon Balzers, Germany, explains: “We support several German university teams with our coatings. For CAT, we coated the piston pins, bucket tappets and camshaft of the new car with BALINIT DLC STAR. We get regular feedback from the team as to how the system is developing. That represents valuable data for us.”



### Lower consumption + lower weight = more points

BALINIT DLC STAR, a modified diamond-like carbon coating, exhibits outstanding tribological performance and is employed by automobile manufacturers for the components in diesel injection systems and the engine parts which are subjected to the greatest loading. A ductile (elastic) metal-based coating of chromium nitride provides the necessary hardness and with its high load capacity, it supports the superimposed tribological carbon coating.

“We expected our friction/performance concept to generally provide more power and less consumption, which represents an important aspect in the ‘Endurance’ discipline: With lower consumption, less weight needs to be taken along and that means more points for us. We were then also able to validate significant benefits resulting from our friction/performance concept in terms of fuel consumption, oil consumption and engine running,” summarizes Thomas Schnurr.

### Outstanding results achieved

After a brilliant season, both teams have good reason to be satisfied: The Stuttgart racing team was able to win four of five races, which put them at the top of the ranking after all of the races in Europe were completed. The Coburg Automobile Team was also able to finish the season with one win at the Formula SAE event in Italy, putting them in sixth place in the overall ranking.

## About Oerlikon Surface Solutions

The Surface Solutions Segment of the Oerlikon Group includes the two brands Oerlikon Balzers and Oerlikon Metco.

**Oerlikon Balzers** is one of the world's leading suppliers of surface technologies that significantly improve the performance and durability of precision components as well as tools for the metal and plastics processing industries. Extremely thin and exceptionally hard coatings, marketed under the BALINIT and BALIQ brand names, reduce friction and wear. The BALITHERM brand opens up a broad range of heat treatment services, whereas BALTONE comprises coatings that are available in a full range of elegant colours, perfectly suited for decorative applications. Under the technology brand ePD, the company develops integrated services and solutions for the metallization of plastic parts with chrome effects. Worldwide, more than 1'100 coating systems are in operation at Oerlikon Balzers facilities and its customers. Equipment engineering and assembly of Balzers' systems are processed in Liechtenstein and in Bergisch Gladbach (Germany).

**Oerlikon Metco** enhances surfaces with coating solutions and equipment. Customers benefit from a uniquely broad range of surface technologies, coating solutions, equipment, materials, services, and specialized machining services and components. The innovative solutions improve performance and increase efficiency and reliability. As innovation leader, Oerlikon Metco is forging new paths with materials for additive manufacturing (AM). Oerlikon Metco serves industries such as power generation, aviation, automotive, and other specialized markets.

The **Surface Solutions Segment** operates a dynamically growing network of currently more than 145 facilities with over 140 coating centres in 37 countries in Europe, the Americas, Asia and Australia, employing more than 6'000 people. The Surface Solutions Segment is part of the Switzerland-based Oerlikon Group (SIX: OERL).

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