

BRAKE PIONEER IN TRANSFORMATION

Surface Transforms, a leader in carbon ceramic composite technology, is changing from an R&D company into a commercial manufacturing organisation. By **William Kimberley**

SURFACE TRANSFORMS is one of the UK's leading manufacturers of 'next-generation' carbon fibre reinforced ceramic composite materials (CRFCs).

They are designed to replace traditional carbon-carbon products on aircraft by offering improved product lifetime, so increasing the number of landings that can be performed between maintenance schedules. Its products can be found on rocket propulsion systems and as a replacement for conventional technical ceramics for use in body and vehicle armour. They can also be found on high-performance cars.

Formed in 1992, Surface Transforms

originated out of the Advanced Materials group of ICI when four former employees bought the intellectual property rights to the materials technology. Initially, and for quite a lengthy period of time afterwards, it served as a research and development company. Initial projects were funded programmes that looked at various applications including aerospace and railway carriage braking.

The company even started to become involved in Formula One. However, the timing was unfortunate because it initiated the project just at the time when the FIA was in the process of banning carbon ceramics on grand prix cars. Surface Transforms duly

refocused its efforts on fitting its brakes to high-performance road cars.

As a result, its System ST brakes can now be found on the Koenigsegg supercar – as an option on the CCX, which was launched at last year's Geneva Show, and on the CCGT launched at this year's show. They are also on the Ascari A10 and a new supercar from Weber Sportcars. Altogether, System ST is now fitted to more than 15 different car platforms.

Surface Transforms is also working in partnership with StopTech, a California-based leader in balanced brake upgrades for production cars and production-based ▶



LEFT Surface Transforms SystemST brakes perform to the highest levels, having been developed for over seven years in Formula One, the Indy Racing League and on aircraft. The rotors are ultra lightweight (some 70% lighter than cast iron) and have incredible stopping power. The company believes they offer the best performance, integrity and wear advantages on the market

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racecars, to promote the adoption of carbon ceramic brakes on high-performance cars in the US market. An annual supply contract has not yet been signed yet both companies forecast that in the aftermarket between 50 and 100 car sets will be required in the next 12 months. StopTech has placed the first production order and will soon be offering the System ST ceramic brake disc on selected vehicles.

CARBON CERAMIC TRAILBLAZERS

"Carbon ceramic brake technology was really brought to the market by three cars that were launched, utilising the technology at a similar time – the Ferrari Enzo, Porsche Carrera GT and the Mercedes-Benz McLaren SLR – and Surface Transforms had the appropriate technology," says Antoni Sznerch, Surface Transforms' business development director.

Unlike carbon-carbon brakes, carbon ceramics do not need to be hot to work. They work optimally from cold, while offering significant weight saving over

Transforms converts into ceramic brakes and discs using its patented technology.

"By developing our discs and pads from our pad partner, we provide a balanced and high-performance complete friction couple," says Sznerch. "We use what could be called a traditional nought/90 fibre orientation. However, our raw material is carbon fibre precursor which has 30 percent elongation in the fibre before it will break, whereas carbon fibre only has 2 percent. This 30 percent elongation allows us to needle the fibres together so that we not only have the nought/90 orientation but also have the fibre in the 'z' direction through the material bundle and that is what binds the fibres together.

"It would be physically impossible to do this with traditional carbon and can only be done at the precursor stage. We convert the precursor to carbon fibre then we crack methane and convert the carbon to carbon-carbon.

"The final stage of manufacture is to convert the carbon-carbon to carbon silicon carbide. The carbon that we crack from

for the materials that we develop.

"The company philosophy and strategy is two-fold. Firstly, we are building a business in the manufacture and supply of carbon ceramic brake rotors for automotive applications. Secondly, as we don't see ourselves as a large volume manufacturer of automotive brake discs, we are looking for licensed manufacturers for the long-term. Aircraft brakes, currently, in the main are carbon-carbon – metal brakes are now less common on new aircraft – and we are looking to license our technology to carbon-carbon manufacturers.

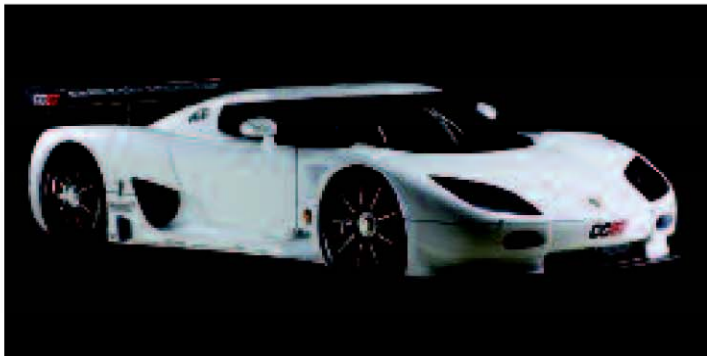
"This has a good strategic fit because our siliconisation process can be added onto the tail-end of their existing process. A licensed automotive manufacturer will be a little bit different because it would need a more complete manufacturing package. However, we have intellectual property rights for the main core of three critical processes, starting with how the raw material is put together, how it is carbonised, and the siliconisation process."

The company's research capabilities were recognized by the UK government with the announcement in March that it had won a grant worth more than a million pounds sterling. It will be the lead company and project co-ordinator in a collaborative research and development programme to develop new technology and products allowing innovative recycling of carbon waste.

CASH FLOW BOOST

The levels of waste carbon fibre are increasing rapidly on a global scale as a result of increasing carbon fibre material usage in the design of civil engineering industrial structures, aircraft and cars. The project is designed to have an improved economic and environmental impact on the use of friction materials in transport through the innovative recycling of waste carbon and its conversion into more cost-effective carbon friction products. This could have very positive financial and environmental benefits especially for the car industry.

"This is another material endorsement of the company's technology and it will have a significant impact on its financial performance and cash flow," says Sznerch. "We are building a long-term, profitable business in the licensing of proprietary carbon ceramic composite technology with an initial focus on automotive and aircraft brake applications." ■



LEFT The CCGT, Koenigsegg's new racecar that is based on the production CC model range, features Surface Transforms's ceramic discs

traditional iron rotors. They also have negligible wear in normal use.

"The fundamental difference between the brake discs that are fitted to these three cars and Surface Transforms' technology is that they are manufactured using discontinuous carbon fibre where our discs are made of continuous carbon fibre," says Sznerch. "This means that our mechanical integrity should be superior because the strength of carbon lies in the direction and length of the fibre."

Surface Transforms manufactures and supplies 3D multi-directional carbon fibre and oxidized PAN (polyacrylonitrile) preforms to suit a variety of engineering applications. Carbon fibre preforms are mats of interwoven multi-directional carbon fibres and are the basic materials that Surface

methane infills around the fibre that is then converted to silicon carbide. In this way we end up with a carbon silicon carbide disc with good mechanical integrity.

"Because we machine our discs to shape, as opposed to shaping them in a mould, we have great flexibility in the design and dimensions of the disc."

Surface Transforms recommends a brake pad which has been developed and offered on a bespoke basis by Pagid, a leading pad manufacturer. Its STR2-organic pads are acceptable for most conditions of use.

"We are now going through the phase of transforming an R&D company into a more commercial manufacturing one," says Sznerch. "We are a materials technology company looking for commercial applications