



## PRESS RELEASE

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*SURFACE PROCESSING IN MOTORSPORT*

### PRECISION FINISHING FOR PEAK PERFORMANCE

The entire race team have given their all to create the ultimate vehicle. The best components, in-depth specialist knowledge and an outstanding driver, but it is never enough. All that counts is the title. Every team strives to get that little bit extra. But where does this come from? How can the decisive boost in performance be achieved?



Sponsored by OTEC – The car built by KA-Racing

Surface processing on the individual components plays a central role. This is because the friction between the components can be fatal for the engine and gearbox. Driving the gear wheels and maintaining speed generate enormous heat on the component surfaces. This can affect performance and ultimately lead to part failure. At

best, this means the race is over for the driver and race team. At worst, a mechanical failure can cause an accident. OTEC mass finishing processes help improve component properties.

Although conventional procedures improve the surfaces of camshafts and engine parts from a visual perspective, a certain degree of roughness remains. The components are often noticeably uneven or the contact ratios are too low. This type of surface processing also does nothing to significantly improve the components' service life or the engine performance.

By contrast, the stream finishing process from OTEC achieves incredible results. As an expert in mass finishing machines and process technology, OTEC offers the right solutions for component surface processing in motorsport. The company's latest

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technology enables surface values of Ra 0.02  $\mu\text{m}$  and Rpk values below 0.1  $\mu\text{m}$ , with consistent, reproducible quality and all in a fraction of the time it would take using traditional methods. OTEC develops an individual process according to the specified performance goals. Surfaces can be polished quickly through a combination of carefully blended abrasives, the right immersion angle and the corresponding process time. Good Rvk and Rpk values reduce wear on the friction parts and create a low friction value right from the start. The outstanding smoothness across the entire surface, even on the tooth base, ensures reduced notching and gear failure. Alongside gear wheels, OTEC machinery can process other typical motorsport components such as clutch shafts, camshafts, drive shafts, racks, pinions, pistons, shifting dogs and brake disc chambers.



Gear wheel before (left) and after (right) processing

The process not only achieves perfectly polished surfaces, but also improves the components' appearance. But what does it mean for performance? Tests show a significant performance increase of 5% after OTEC processing. Processing can also reduce heat generation by up to 10%. A further advantage is the extended part service life. Lower friction means reduced wear. This lower wear also reduces metal ablation, which helps keep the oil clean. Processing can reduce friction by up to 30%, leading to greater efficiency and lower energy consumption. The savings from this performance boost, along with the increased service life, more than outweigh the higher cost of the OTEC mass finishing process compared to conventional procedures. The OTEC process reduces time and costs for maintaining and repairing motorsport components,

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whilst reducing noise generation in gear wheels by up to 3 dB. Race teams around the world benefit from the significant performance increases made possible by OTEC processing.



Camshaft from a racing car before (left) and after (right) OTEC processing

One of the teams who have successfully used OTEC surface processing is KA-Racing e.V., a student group from the Karlsruhe Institute of Technology (KIT) consisting of around 80 students from various subject areas. Every year, the team designs and builds two racing cars: one with a conventional combustion engine and the other with electric drive. With these vehicles, the students take on other universities in Formula Student, an international design competition for universities around the world. Sponsors such as OTEC Präzisionsfinish GmbH allow the students to develop and produce their vehicles almost entirely themselves.

The team develops virtually all components themselves, including the gear units for their electric vehicles. These consist of two-stage planetary gears, in which both the planetary and sun wheels are processed using OTEC machinery. This procedure uses a stream finishing machine with pulse drive. The precisely defined and fast-repeating motion intervals between the workpiece and media enable an incredibly intense and precisely controllable grinding effect. Walnut shell is used as an abrasive, and is mixed with oil to help protect the components against corrosion. This post-processing is a decisive factor for the success of KA-Racing. The enormous stresses and forces exerted on the gears make the gear wheel surfaces particularly important. Processing with OTEC machinery increases efficiency in the first gear stage by 0.1% to 99.5%. In the second stage, efficiency increases further from 98.9% to 99.1%. One convenient

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side effect is the increased material strength, caused by the internal compressive stresses that result from the mass finishing process. Last year, the students from Karlsruhe were crowned the best Formula Student Electric team in the world, thanks in part to the use of OTEC surface processing machinery.



Shift drum after OTEC processing

### **The company**

OTEC GmbH provides precision technology for achieving perfect surfaces. OTEC machines are used for deburring, grinding, smoothing and polishing, with the aim of improving surface quality on tools and products. With a network of over 60 distributors worldwide, OTEC is there for international customers from a wide range of sectors. Customers benefit from OTEC's in-depth technical expertise when it comes to developing the perfect interplay of machine and abrasive.

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