CAM Software Slashes Turbocharger Development Time

In order to achieve competitive gain in the automotive marketplace, one of the world's most famous suppliers of turbocharging systems is exploiting the advanced capabilities of MAX-PAC™ CAM software from US company Concepts NREC. Using modules such as MAX-5™ and MAX-AB™, this leading tier-one supplier says it can go from design to first prototype of complex turbocharger compressor wheels in much shorter times, accelerating time-to-market.

Based on decades of experience at the forefront of turbocharger development and production, the company's high technology plants manufacture the latest turbochargers, high-performance turbocharging systems with variable turbine geometry, and multistage regulated turbochargers. Through ongoing development, the company's engineers continuously seek new improvements in fuel consumption, performance, and emission values.

Milled impeller wheels, as opposed to cast wheels, are among the notable recent developments in manufacturing methods. Milled wheels not only optimize the performance, but also the durability and reliability of its turbocharging systems.

"We were using another CAM software suite, but it offered limited scope," a user says. "We wanted to implement a change and discovered that one or two other companies had recently switched from the CAM software we were using to MAX-PAC. As a result, we invited Concepts NREC to come in and present."

Once the decision to purchase MAX-PAC had been made, the benefits were realized almost immediately. "It was already apparent that MAX-PAC would be superior in functionality and capability, but

we also discovered that programming times were around 50% shorter. Over the years, we have harnessed the benefits of MAX-PAC such that the time taken from receipt of data from the Aerodynamics Department to first prototype has been significantly reduced. With time-to-market such a vital business differentiator in the automotive industry, this has proved invaluable."
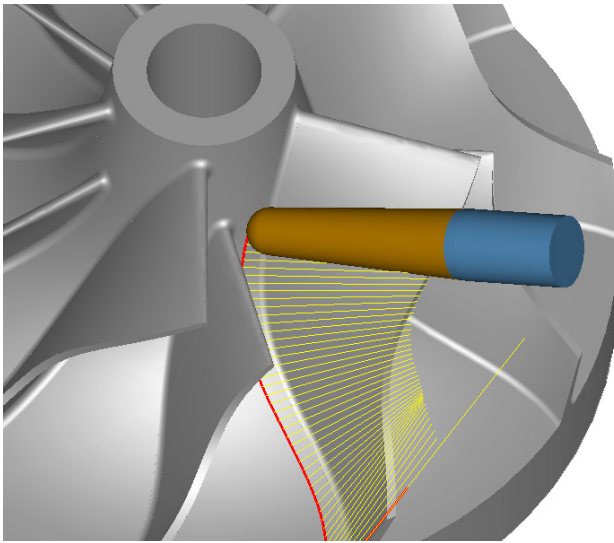
Using MA-5's patented algorithm, the company's engineers can realize cost savings using ruled-surface designs and production with a flank milling process in which the entire

Photos are development parts for passenger-car compressor wheels.

blade surface can be finished in one pass using the side of the cutter. Compared with other CAM systems, MAX-5 is typically capable of generating flank milling toolpaths with 80-90% error reduction. The alternative of point milling requires many finish passes to leave a suitably small cusp height between consecutive passes.

MAX-5 Screen Shot

"We use MAX-5 to define the toolpaths for all of our milled wheels at prototype and preliminary programming stages in preparation for series production. Ultimately this is critical, as it impacts directly on the manufacturing cost of the products. While quality will always be the top priority, it is important to minimise cycle times, because in volume production, we can make more than 100,000 parts. In 2012, the organization added MAX-AB to its MAX-PAC suite, which is particularly useful when generating cutter paths for five-axis, full point contact milling of turbomachinery parts with arbitrary (free-form) blade surfaces. MAX-AB is especially suited to CFD-influenced blade shapes that can be difficult or impossible to cut with other more generic CAM systems. The module includes strategies for roughing, plunge milling, hub finish, point-milled blade finish, leading edge, fillet finish, and tip milling.

Another use the company finds for MAX-PAC technology is the creation of master tooling for cast wheels.

"Here we need even higher surface finish quality, as

the tool might be used to produce around 250,000 wheels. As a result, cycle times for tooling are higher, typically eight hours in cut, but this is necessary to achieve the required quality levels."

In conclusion, this client is exceptionally pleased with its MAX-PAC CAM software and the advantages it offers, stating that MAX-5 has become "the industry standard for milling this kind of part".

Incidentally, the Aerodynamics Department at the company's facility also exploits Concepts NREC technology. For tasks such as detailed design, radial compressor design, 3D flow analysis and FEA for 3D stress analysis, engineers deploy AxCent®, COMPAL®, Pushbutton CFD® and Pushbutton FEA™ CAE software modules.

All-in-all, this is a Concepts NREC showcase plant able to demonstrate the full raft of benefits that come from investment in the latest and most advanced software technologies.

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