3D Scanning
Reverse Engineering
3D Inspection

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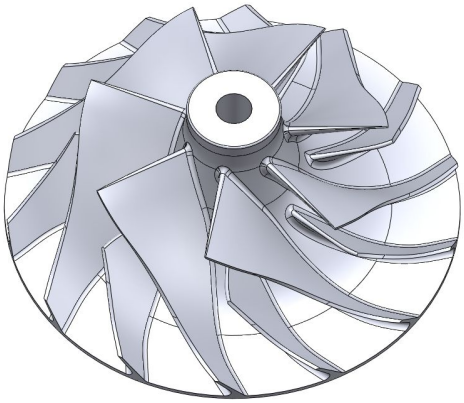
Efficient fans meet efficient machining

Problem

Our customer was in the business of providing high quality CNC processes for large scale manufacturing. When he was tasked with reproducing a very intricate and complicated fan blade, as part of a compressor assembly, he needed to start with a 3D CAD model that reproduced the shape of the part. But beyond simply reproducing the shape of the part, our customer wanted the option to change the geometry to take advantage of some modern machining techniques. With a little adjustment, the parts could be fabricated much faster with better surface finish. Faster parts means lower cost, and everyone loves saving money.

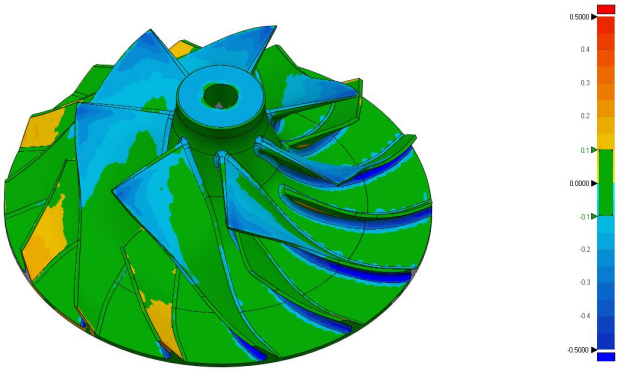
Process

We start with a 3D scan. Fans blades of this sort aren't easy to scan, with crevices and nooks at all angles. We use our automated rotary table, and first position the scanner to capture the top of the blades. We capture 36 scans at 10 degree intervals on the top of the blade, and reposition the scanner to capture the bottoms of the blade. With 36 additional scans, all of the data was then automatically positioned and aligned by the software. The scans were merged into a single 3D body, and now ready for reverse engineering.



We started by constructing the 3D CAD geometry that closest matched the original fan. We followed the top and bottom surfaces of the fan blade using the automated lofting tools available in Geomagic DesignX, which provided a very tight conformance to the original part, but did so in a way that was difficult to machine. We then provided a similar set of surfaces, using the same lofting technique, only this time we set each of the reference curves to a straight line. By making that minor adjustment, it opened up new options in how the part could be machined, and meant that the CNC could cut much more material per pass.

Adjusting the way the surface profiles were defined did change the geometry a small amount. We then compared our original part to the newly constructed CAD model to understand just how much deviation there was, and where. The colors shown on the image to the right highlight the differences between the original and new CAD model. We presented the information to the customer, and they were able to proceed with validating the new design with full awareness of there the changes were, and whether or not they were likely to cause performance issues.



Results

Mechanical parts of this type are always fun to work on. The parts themselves embody all of the beauty and complexity of precision engineering, and highlight just how critical shape can be to optimal performance. We were able to take an existing shape, that performed to a known standard, and reconstruct it in such a way that it could be machined to a better quality finish much faster and at a lower cost than the original. 3D scanning allowed us to capture the most critical aspects of the shape, and employ new tools to improve on the design with the latest CAD technology and CNC machining tools.