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How a New Product is Developed

I REMEMBER THIS IDEA came during a chilly afternoon in Monterey, California, after the AMEC Surface Enhancement annual committee meeting. I was sitting outside with Holger Polanetsky, Process Engineer of Surface Enhancement Processes at MTU, and we were discussing the issues with repairing parts in-situ. The committee was spending a lot of time and ink looking for ways to write a specification on manual peening.

Shockform has experience with manual peening because the company developed the FlapSpeed® PRO—the only dedicated tool for flapper peening. The FlapSpeed® PRO brought control and repeatability to a manual process that the industry was growing hesitant to use due to the lack of control and visibility. Because FlapSpeed® PRO uses a closed-loop system to control the RPM and a USB key to track all the parameters in real time, the industry welcomed this invention and the use of flapper peening was on the climb again.

While flapper peening was being used on aircraft structures and landing gears, even this new tool was no help to MTU or other engine manufacturers as flapper peening is not officially approved for rotary parts due to the risk of a shot detaching from the flap and lodging itself inside an assembled engine. This is often referred to as FOD (Foreign Object Damage).

Holger started explaining that it would be great to develop a small tool that didn't use shot or flaps, thus avoiding the risk of FOD. Holger knew we had invented, designed and manufactured the FlapSpeed® PRO and we were investing a lot of resources in R&D. He asked me if we could help. We started drafting and discussing the mechanism and approach and soon we had a project and an image quickly drafted on a piece of paper. Holger mentioned that he would be happy with something that could look like an electric toothbrush. This was the beginning of the SPIKER®.

Side Story: The Spiker® was originally called the Mosquito because of the very distinct noise made by the needles. We even had a nice logo made, but the Mosquito name was already registered so we changed the name to SPIKER®.

After a few years of work, including many alterations, different designs, proof of concepts and hundreds of emails, the first prototype was made. Shockform met with MTU's team in Germany and preliminary tests were made at the University of Technology Clausthal by Dr. Lothar Wagner and his team.

Flat specimens were used for Roughness Measurement, Residual Stress Measurement, and Metallographic Examination. A Flap-Bar Bending Test specimen was used for Cyclic Bending Tests. Conventional Peening using CCW14 media and flapper peening using the FlapSpeed® PRO were compared to the performance of the SPIKER®. The SPIKER® used newly designed needles that matched CCW14 .

Tests were performed on Nickel-Based Super Alloy DA718 and Titanium TI-6246. The results were beyond expectations. Both Flapper Peening and the SPIKER® (needle peening) provide better surface roughness on both materials.

The Residual Stress Distribution showed no significant differences between the three techniques. The Compressive Residual Stress performances of the SPIKER® were comparable to both Conventional and Flapper Peening.

Following these tests and encouraged by the results, Shockform continued to work on the development of the SPIKER®. Needles made of full carbide were designed and manufactured to avoid any contamination and a diamond coating was applied to ensure better performance. An intensity between 4A and 14A was reached using these improvements.

The handpiece was slightly modified to be smaller, more flexible and with no sharp edges. A new casing that prevented a broken needle from escaping was incorporated, thus preventing the risk of FOD.

Shockform designed a new connector, combining electricity and air, to make the tool more convenient for the operator. This new connector will allow a quick and easy change of the hand pieces from the round head to a linear head (in line needle) for radius applications.

We are just about to close the loop. The SPIKER® is undergoing tests at MTU in Munich and will be available soon. The specification for a "Computer Controlled Pneumatic Needle Peening, Straightening and Forming" was under review at the AMEC Surface Enhancement meeting last fall.

The only thing missing is for me and Holger to get together and think of new products!

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