

Reduce scrap by repairing turbine blades

A method for repairing aero turbine blades has drastically reduced scrap rates during scheduled engine maintenance. metrology software products ltd (MSP) and Hong Kong Polytechnic University developed and tested a way of fully automating the machine tooling process, thereby improving accuracy.

At the time of this project, maintenance company Hong Kong Aero Engines (HAESL), a joint venture with Rolls-Royce, planned to use the method in its turbine blade refurbishment programme.

Aero-engine turbine blades are subjected to extreme temperatures during operation, resulting in deformation and distortion over time. After a period of around 30,000 hours of air time, engines are entirely overhauled and the blades are taken out and repaired where possible, through metal deposition and machine tooling. "The major problem we identified was that many parts were being machined incorrectly because they were not located on the machine tool at the position they were supposed to be, through errors in fixturing or in built-up tolerances," said Peter Hammond, Technical Director of MSP.

In theory, around half of blades are reclaimable, although at the time of the project the current yield was only around 80 per cent of that half owing to avoidable errors and poor practice, according to MSP. The company claimed it could increase that to a near-100 per cent level. To achieve this, it worked with Hong Kong Polytechnic University and came up with a patented software system, called NC-PerfectPart.

"We probe the turbine and we take those measurements into our software solution, which optimises for position, distortion and material thickness," said Hammond. "Then it computes where the part really is on the machine and transfers this to the tool. The major factor is that we've taken all of the manual steps and interpretation out of the process; we can automate the measuring, the analysis and the uploaded accordance system, therefore we can automate the machining."

At the time of this project there were 16,500 Rolls-Royce engines in service and each engine has around 3,000 blades. On average, half of blades are repairable and, therefore, it is estimated that around 25 million blades will need to be refurbished at some point in the next decade.



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"We are very confident that this new application will greatly increase the repair yields of turbine blades when compared with today's practices and, in doing so, reduce the cost of ownership for our customers, the world's airlines".

Mick Brown

Operations Manager at HAESL