

Single-Piece Flow Shot Peening Systems

Pratt & Whitney recently began operating a new, state-of-the-art turbine module center in East Hartford, CT. The focus of the turbine module center is to produce precision turbine components through the use of totally updated lean manufacturing processes and equipment.



One of four turbine blade root peening machines installed at Pratt & Whitney's Turbine Module Center.

In the past, most turbine engine manufacturers produced large batches of parts using huge machines with large amounts of work in process (WIP). For an engine OEM, this meant that they had a lot of money tied up in their inventory of super-alloy components at various stages of the manufacturing process. By implementing a cell-oriented, lean manufacturing process they could eliminate much of the inventory float that normally occurred, thereby reducing costs. In addition, each machine required its own operator for processes such as grinding, EDM and shot peening. Today, turbine blades are produced on demand in cells where one operator may supervise five or six machines at once. To make this possible, Pratt & Whitney worked with machine manufacturers to totally re-design the way their machines were used and operated.

Progressive Technologies has installed four new turbine blade root shot peening machines at Pratt's turbine module center in East Hartford. Each machine is part of a unique cell designed around single-piece flow production methods. The root peening machines are only 0.9m wide and are located right next to the preceding and following operations.

(!) In the Spot Light

Progressive Technologies designs and builds standard and custom automated process machinery for aerospace, automotive, heavy equipment and general industry applications. They specialize in systems for grit blasting, shot peening, high pressure waterjet stripping and thermal spray coating including air plasma, HVOF and their new 100HE™ high enthalpy plasma.

No Manual Masking Required

A prime goal of this peening program was to eliminate the time consuming task of manually taping each blade root prior to shot peening. To meet this challenge, Progressive worked with ACME Masking Company to develop a two-piece urethane mask to work in an automated clamp mechanism. This system enables the operator to easily load and unload the blades from the base mask and then clamp the root with a second mask to seal the base of the root. An air purge is provided to pressurize the blade during peening, and the system will fault out if the purge pressure drops below setpoint. This air purge helps prevent media from entering the interior of the blade and signals if there is a bad seal or an incorrect blade/mask combination.

Closed-loop Media Flow Control

The turbine blades are peened to an Almen Intensity of 6 - 9 A using conditioned cut wire shot. Magna-Valves are used to provide closed-loop control of shot flow to each nozzle. A two-axis gun mover enables the nozzles to peen a zone 75mm x 75mm which accommodates all of the turbine



blade part numbers processed at this facility. To help ensure that all peening specifications are satisfied, key-reset timers are used to keep track of time between four-hour intensity checks and also between forty-hour media sieve analyses.

Progressive has earned the reputation for building world-class CNC systems, however many people are not aware of the broad range of machine capabilities the US manufacturer offers such

Gun rack oscillates in 2 axes to provide coverage over the 75mm x 75mm peening zone. A simulative Almen fixture is shown.

as these single-piece blade root peening machines. By leveraging their expertise with large custom systems the American company has made small to medium size process machines extremely affordable without sacrificing quality or performance.

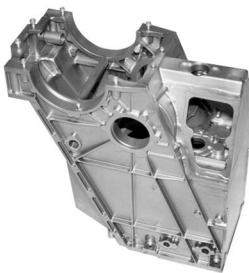
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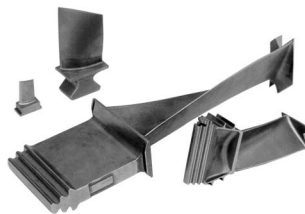


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