

Peening

Robotic Shot Peening Machines for Turbine Blades

Mec Shot manufactured, supplied, erected & commissioned a robotic shot peening machine to one of a renowned customer for shot peening of fir tree flanks of steam turbine blades. The peening cabinet was designed & manufactured in tubular construction, internally rubber lined for protecting against erosion for indoor use allowing peening of one blade of equivalent dimension, maintaining an appropriate envelop around the parts for peening device movement.



Turbine blade

The door mounted turn table on main door, for easy loading and unloading of the blades and drive by a servomotor of 1.1.KW rating with a variable speed. The turntable interpolate with the 6 axis of industrial robot. The speed of the turntable could be chosen on the operator screen in the central control panel. The rotary table was interfaced with Fanuc servo motor and drive controller for rotary table & 6 Axis robot with controller unit

Shot peening a mechanical methodology to enhance the fatigue life of

various components in the Industries. An automatic operating system where all the required parameters remain constant is an important factor for shot peening of steam turbine blades. Steam turbine blades are forged out of high temperature, fatigue and creep resistant alloy steel of different grades having tensile strength up to 1050 N/mm² and hardness about 350 HB30. The automated shot peening process enables the repeatability and cost effectiveness. The robotic single nozzle automatic shot peening system was used for controlled shot peening in fir tree flanks of steam turbine blades to induce residual compressive stresses. Portion of the airfoil or transition radius of the airfoil to the base plate was masked not shot peened.

Different sizes of the blades are shot peened by automatic process as follows:

Length of blade:	500-1500mm
Width of root:	150-400mm
Thickness of root:	30-120mm
Surface roughness:	> Rz 22 pm
Compressive stress:	300 Mpa upto a depth of 0.25 mm

The peening intensity range using cast steel shot S390/S280 is 0.30 to 0.35 at



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Almen A with coverage of 125% to 200%. The system is also suitable for using conditioned cut wire shots also. The machine is suitable for accommodating the minimum and maximum size of blades and is able to shot peen least 25 blades of maximum size in a shift of 8 hours.

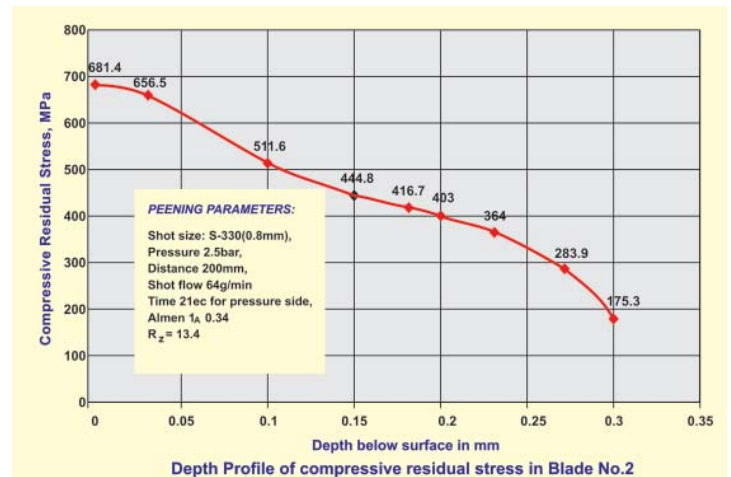
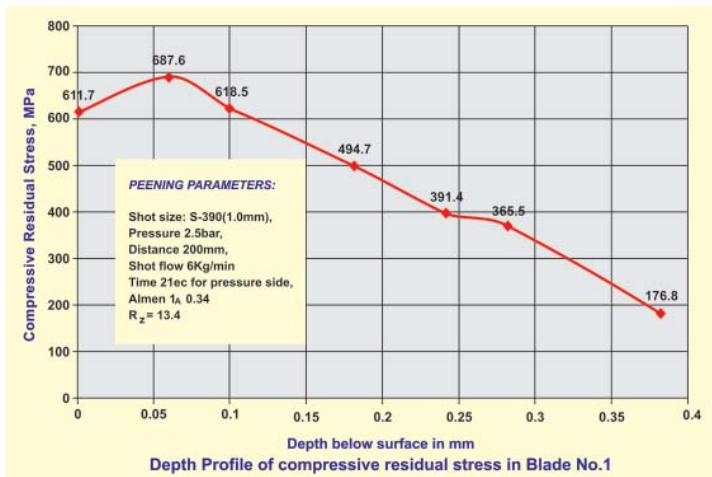
The residual stress measured on two blades with different sizes of shot

The nozzle manipulation performed with 6 axis industrial robot. Robot area



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was protected with special jacket to prevent damage during peening operation. The positioning repeatability of robot +/- 0.08 mm. The system equipped with a two-deck vibratory screen separator to efficiently size and separate spent media after passing through the reclaim system.

The shot peening system was equipped with a dedicated recovery, recycling,

classification, storage and shot peening system. Close loop air pressure regulator for regulating air pressure through PLC & Magna Valve was supplied for controlling variable flow rate through PLC. To protect the Magna Valve against excessive wear, there was a Pinch Valve above the Magna Valve. The shot flow controller was with digital display.



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