



Vapormatt

White paper

Wet shot peening turbine and fan blades

Wet shot peening improves fatigue performance, wear resistance, corrosion resistance and overall durability.

Jet engine turbine and fan blades need to be strong so they can cope with the extreme operating conditions created by high temperatures, pressures, and rotation speeds. Blades need to withstand these stresses without deforming or failing.

With the structural integrity of turbine and fan blades being crucial for the safe operation of aircraft, stronger blades also maintain their aerodynamic shape under high loads, leading to better engine efficiency. They also require less frequent replacement and maintenance, reducing the downtime and operational costs for airlines.

The lifespan of a turbine blade can be extended more than a 1000% by shot peening.

Peening by wet blasting involves projecting small hard spherical particles of media onto the surface of a component and is a highly effective way of improving fatigue strength.

By bombarding a turbine or fan blade with a peening media the substrate of the blade is subjected to compressive stresses, countering the tensile stresses experienced during operation, such as thermal cycling and centrifugal forces. The process reduces blade susceptibility to fatigue and stress corrosion cracking, enhancing the overall fatigue life and durability of the blade.

The impact of the high-velocity beads during wet shot peening also causes plastic deformation of the surface layer. This deformation leads to work hardening, increasing the hardness and wear resistance of the surface. As a result, the blades are better able to withstand erosion, abrasion, and foreign object damage, which are common challenges faced during operation in harsh environments.

Typically peening is used on components that are irregular in shape and that may be subject to twisting and bending stresses. Users of the wet peening process on components typically require an almen intensity of 5-20N, depending on the component being peened these have recorded significantly increased product life and quality across a range of industries.

There are several other benefits our customers have experienced when wet shot peening aerospace engine parts when compared with their legacy dry shot peening machines.

- **Superior finishes:** As with all wet blast applications the flow of media over the fan and turbine blades ensures a smoother, more consistent, and higher quality finish when compared with dry shot peening.
- **Elimination of contamination via better blast medias:** A wet peening machine works best with ceramic, glass bead or stainless steel shot medias as specified by AMS2431. The benefit is that any risks of non-ferrous contamination is removed from the process.
- **Controllability:** With wet shot peening the highest levels of process control are available. The integrated HMI and several monitoring parameters give the option to change multiple variables that meet and often surpass the requirements of AMS2432. With live reports and automatic adjustments available wet blasting machines have become a preferred choice for numerous aerospace companies.
- **Reduced media consumption:** Users of our wet shot peening machines have found that overall spend on peening blast media is drastically reduced. The cushioning effect of water and our patented filtration systems mean good media is recycled and stays in the system for much longer.
- **Dust free and safe peening:** Wet shot peening machines require no additional ATEX certifications and safety measures that are otherwise required when dry shot peening potentially explosive materials such as titanium. The wet blast process avoids this as the media and dust produced by the process is contained within the water, making it far safer. The major advantage of dust is the safety element. Dust can be managed with extraction units but these are bulky and expensive.
- **No pre cleaning:** Wet shot peening means parts can be put into the wet blast machine uncleaned and still covered with oil, grease, and other contaminants. The wet blast process results all surface contaminants during peening before being quickly filtered away. In contrast, dry shot peening involves cleaning the components and drying them before processing can begin.

Wet shot peening meets or helps meet the requirements of several aerospace specifications, including:

Document Number	Document Title	Manufacturer
AMS 2432	Shot peening, computer controlled	Multiple OEMs
POP 392-AR	Wet glass bead peening to PWA 36906	Pratt and Whitney
RPS 428	Controlled blasting and peening for fatigue resistance	Rolls-Royce
P11TF8	Metallic shot peening	GE
DMP28	Surface compressive stressing	SNECMA / Safran
32-09-01	Glass bead peening of light alloy parts	Safran

Conclusion

If you are an aerospace MRO or OEM operation looking to increase operational efficiency, reduce waste, and deliver peened turbine and fan blades with a higher quality surface finish, wet blasting is the only solution.

With Vapormatt wet blasting technology, you can benefit from accurate and repeatable cleaning, peening and surface preparation in a single efficient process.



Vapormatt Leopard Cub and Sabre wet blasting machine, ideal for wet shot peening turbine and fine blades



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