International Journal of I.C. Engines and Gas Turbines
ISSN: 2582-290X
Vol. 6: Issue 1
www.journalspub.com

Waterjet Peening Process: A Review

Aniket Shinde*, Nitish Rai, Shaikh Umar, Paramjit Thakur, Shaikh Ahmed
Department of Mechanical Engineering, Saraswati College of Engineering, Navi Mumbai, Maharashtra, India

ABSTRACT

Water jet machining is few of the most adaptive and unconventional type of machining with huge advantage over the conventional type machining. Depth of cut measurement is a vital component in evolution of completely automated Abrasive Waterjet (AWJ) machining system. While cutting Ti-6Al-4V under waterjet, it is important to measure the depth of cut of material at the instant of cutting. This is a major drawback of Water Jet Machining which may overshadow its benefits and increase machining time. Water Jet Machining (WJM) is a non-traditional, mechanical machining process used to easily and evenly cut soft workpieces with high velocity waterjet. The materials used for WJM are steel _SN11 373 prismatic in shape 5. For sample the maximum residual stress generated was -336±5 MPa. Submerged water get is still underutilized and has great scope in future.

Keywords: *abrasive jet machining, machining of Ti alloy, ANN, ANFIS, parameters optimization*

****Corresponding Author***
E-mail: aniket831998@gmail.com

INTRODUCTION

To produce compressive residual stress and to improve mechanical properties of metal peening (a cold working process) is used. In shot peening surface is impacted with shots with a force adequate to generate plastic deformation. The material used for study is Ti-6Al-4V (UNS designation R56400), also sometimes called TC4. Various peening processes modify surface properties of above given material differently. Water Jet Machining and shot peening on enhancing surface hardness of above given material.

LITERATURE SURVEY

Qinjie et al. [1] since shot peening can produce finer grains near surface and produce compressive residual stress it is largely applied. But there is no visible change in the width of plastic strain layer and residual stress layer. Kovaci et al. [2] to enhance properties of surface of materials shot peening is highly known and practical.in this method material with small steel shots by peening for surface hardening. Because of changing surface properties this process could affect electrochemical behavior of material. Kumar et al. [3] Ti-alloys are used in aviation industries such as engine parts air frames etc. The main advantage of using ti-alloy is to compact chemical attack in corrosive and harsh environment as well as fatigue resistance under cyclic condition. To enhance the properties like stress corrosion cracking, forming operations, strength shot peening is generally used which is surface phenomena and generate compressive residual stress which gets enhanced finally and the work is compiled to arise at optimization of parameters to

attain higher residual stress from the point of higher fatigue life. Janabi et al. [4] To improve surface properties in terms of material fatigue and corrosion shot peening is often used. The surface characterization there is up to seven-fold increase in surface roughness compared with untreated stainless-steel surface up to 28.3% compared to untreated surface the coefficient of heat transfer also decreased up to 65 percentage shot peened surface was more adhesive, thicker, rough, and less porous than the untreated stainless-steel surfaces. Sherafatnia et al. [5] Laser shot peening of material hardening is widely used method now a days in various branch of industry specimens were thin plate with holes microstructural surface test were performed around the specimen's holes with different magnification for both specimen as well as certain damage on specimens. 3D images of specimen damages provide insight into its dimension in addition the roughness of non-strengthened specimens were also executed to perform hardness test using Rockwell C method on both the specimen and it shows a difference in the hardness on both samples. Yella et al.[6] laser shot peening has been utilized to modify the characteristics of surface of plates of 6mm thickness laser pulse width employed are 30ps and 7ns and the laser energy was varied in a range of 5 to 90 mj the sacrificial layer utilized greatly influenced the surface characteristic by increasing surface roughness value to 0.4 micrometer. Zhou et al. [7] Niggle fatigue creation behavior in Ti6Al4V dovetail assemblies are analyzed by combining application of theoretical and experimental method the upgradation of niggle regime, niggle wear mechanism and niggle crack initiation behavior is as received and shot peened part are developed and relatively assessed to witness the effect of shot peening on crack initiation, preference is excluded by a logical plan using fracture mechanic concept. Zhu et al. [8] In this report, surface alteration of bulk metallic glass has been studied in an attempt to upgrade the mechanical properties by peening treatment from laser shock. It was evident that the BMG still consists of amorphous structure after treatment by LSP. Wang et al. [9] Micro-structural outcome from XRD investigation qualified the shot peeing influence on micro-strain, domain dislocation density and size in microstructure changes layer in this three-plane diffraction direction. Result showed that shot peeing was an effective cold working method to change micro-structure in region near the surface. Rittel et al. [10] The paper investigates the effect of surface formulation intervention of the dental implant on their potential of mechanical fatigue failure with focus on grit-blasting. The result of this work is that the overall efficiency of dental implant comprises, in addition to the biological considerations, mechanical dependability aspects. Dong et al. [11] For spraying plasma coatings on surfaces grit-blasting is widely used. This paper tells us how grit-blasting can be checked on-line using roughness parameter to explain the surface finish required. The mechanics of grit-blasting are demonstrated with respect to surface roughing. Harris and Beevers.

CONCLUSION

From reviewing the above research papers, we conclude that Submerged WJM is better and has not been extensively used.

REFERENCES

[1] Lin Q, Liu H, Zhu C, Parker RG. Investigation on the effect of shot peening coverage on the surface integrity. Applied Surface Science. 2019.

[2] Kovaci H., Aslan M. The result of surface plastic deformation generated by shot peening on corrosion behaviour of low alloy steel. Int J

Adv Manuf Technol. 1999;15:238–243.

[3] Kumar RK, Sampath Kumaran P, Seetharamu S, Kumar SA, Pramod T, Naveen GJ. Investigation of Shot Peening Effect on Titanium Alloy Affecting Surface Residual Stress and Roughness for Aerospace Applications. Procedia Structural Integrity. 2019 Jan 1;14:134–41.

[4] Al-Janabi A, Malayeri MR, Badran OO. Performance of shot peened surfaces subject to crystallization fouling. International Journal of Thermal Sciences. 2017 Jan 1;111:379–89.

[5] K. Sherafatina. Due to initial surface treatment effect on shot peening residual stress. Ind Eng Chem Res. 2007;5152–5158.

[6] Yang Q, Zhou W, Zhong Y, Zhang X, Fu X, Chen G, Li Z. Effect of shot-peening on the fretting wear and crack initiation behavior of Ti-6Al-4V dovetail joint specimens. International Journal of Fatigue. 2018 Feb 1;107:83–95.

[7] Petronić S, Čolić K, Đorđević B, Mišković Ž, Katnić Đ, Vučetić F. Comparative Exemination of the Strengthened and Non-Strengthened NIMONIC Specimens with Laser Shot Peening Method. Procedia Structural Integrity. 2018 Jan 1;13:2255–60.

[8] Kulkarni PG, Sahasrabudhe AD. Investigations on mother wavelet selection for health assessment of lathe bearings. The International Journal of Advanced Manufacturing Technology. 2017 Jun 1;90(9–12):3317–31.

[9] E. Avcu, Y. Avcu, F. Bastan et.al. Tailoring the surface characteristics of electrophoterically deposited chitosan-based bioactive glass composite coatings on titanium implants via grit blasting. Progress in organic coatings. 2018.

[10] Yella P, Venkateswarlu P, Buddu RK, Vidyasagar DV, Rao KB, Kiran PP, Rajulapati KV. Laser shock peening studies on SS316LN plate with various sacrificial layers. Applied Surface Science. 2018 Mar 30;435:271–80.

[11] Avcu E, Avcu YY, Baştan FE, Rehman MA, Üstel F, Boccaccini AR. Tailoring the surface characteristics of electrophoretically deposited chitosan-based bioactive glass composite coatings on titanium implants via grit blasting. Progress in Organic Coatings. 2018 Oct 1;123:362–73.

Cite this Article: Aniket Shinde, Nitish Rai, Shaikh Umar, Paramjit Thakur, Shaikh Ahmed. Waterjet Peening Process: A Review. *International Journal of I.C. Engines and Gas Turbines*. 2020; 6(1): 12–14p.