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REVIEW ON SHOT PEENING OF NON FERROUS ALLOY

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Abstract -Shot peening is a surface level important process for improving the mechanical properties of ferrous and non-ferrous. In this paper presents a review on process parameters and mechanical properties of Non-ferrous metals. Non-ferrous metals is result increasing use in automotive parts such as axles helical gears, fillets transmission shafts etc. Effect of shot peening on mechanical properties is studied to collect data from several papers. Form the paper reviewed, shot peening improves the mechanical properties of nonferrous alloy.

*Keywords – **shotpeening, tensile, fatigue, impact, hardness**.*

I. INTRODUCTION

Shot peening is the cold working process which are used to increase the residual stress of the component. In shot peening, large no. of small metallic balls were forced to strike the surface of the component ti high velocity. When the metallic ball shitting the surface, some impact energy is created in the surface. Due to this,there will be a plastic deformation occurs on the surface which tends to change the residual stress of the material. This causes the change in mechanical properties of the materials. Shot peening process is shown in Figure 1.

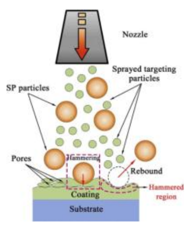

Fig.1.shot peening process

II. LITERATURE SURVEY

Juan Gonzalez et.al (2017) et al. have investigated Al 6063 alloy under different shot peening treatments. They found that SSP shot peening process improves the fatigue behaviour more than 15% compared to all other processes. Vaibhav Pandey et.al (2017) has studied causes of USSP on corrosion properties of Al 7075. They concluded that there is an enhance in the surface roughness and residual stress with an enhance in shot peening timing. It lowers the corrosion resistance and promotes increase other properties such as nanostructure, low plastic deformation, less micro-strain. Kovaciet al. (2018) studied the effect of shot peening of low-alloy steel for different process parameters. The plastic deformation, surface roughness, residual stress increases with increase in intensities of shot peening and maximum values obtained at 24A. It also improves the corrosion resistance of the material. Barry et al. (2008) studied the fatigue behaviour of cast A8 magnesium alloy. Their study shows that there is an improves in fatigue strength up to 5 times, depending on the applied stress and 30% increase the endurance limit of the material. Ruidong et al. have investigated the corrosion behaviour of the FSW joint of 7075 aluminium alloy after shot peening treatment.This study reveals that it improves the corrosion resistance on the welded surface due to shot peening treatment. Liu et al. (2017) has investigated the fatigue performance of shot-peened Ti-6Al-4V alloy under surface polishing treatment. They concluded that fatigue life gradually increases with an increase in shot peening intensity. Sara Bagherifard et al. (2017) studied the effect of severe shot peening on the properties of AZ31 magnesium alloy. SSP increases surface roughness up to 150%, microhardness up to 133%, and surface wettability up to 20%. In this study, concluded shot peening was found to decrease corrosion resistance the samples. Omar Hatamlehet al.(2007) have studied the residual stress in FSW of 7075-T7351 aluminium under the laser and shot peening. They concluded that laser shot peening results in a significant decrease in the tensile residual stress at the surface of the specimen. Ruixia Zhang et al. (2016)Have investigated the mechanical properties of AZ31B magnesium alloy before and after LSP. Their result concluded that large improvement in the properties such as hardness increases from 57 HV to 69 HV and yield strength from 128 MPa to

152 MPa.Meo et al. (2016) has analysed the residual stress under shot peening by finite element analysis. They concluded that the capability of shot peening decreased tensile residual stress produced by welding and increase the fatigue life of the welded joints. Sano et al. (2012) has investigated the fatigue life of FSW of A6061-T6 aluminium under laser peening without coating. For unwelded specimen, the fatigue strength improves from 110 MPa to 170 MPa at 10^7cycles. For welded specimen, it increases from 90 MPa to 120MPa. The fatigue life is higher than the un-welded specimen as compared with laser peened FSW specimen. Chuan Xu et al. (2017) have investigated mechanical properties of Mg/Ti weldments under high-energy shot peening. The high- energy shot peening had increased tensile strength to 24.5% as compared with the un-peened specimen. Vielma et al. (2014) has investigated the fatigue life of quenched and tempered medium-carbon alloy steel under different shot peening intensities. Their studied shows that all treatments produce increment in fatigue life as compared with the untreated specimen.The highest values obtained at 10A which produce 45% to 50% of tensile strength under alternating loads. Zheng Xuan et al. (2017) has studied about surface roughness of Al2024 alloy under shot peening process by using the Finite Element Method. They concluded that the initial stage of shot peening increases surface roughness rapidly and becomes slow when the coverage reaches 100%. Fouad et al. (2011) has studied wear properties of AZ31 magnesium samples and compare shot peened specimen with untreated samples. There is no change when the pressure is low and at high pressure, wear rate decreased as compared. Fouad et al. (2011) has investigated about fatigue behaviour of AZ31 magnesium alloy under surface treatment (EP & BB) by conducting rotating beam and bending fatigue test. Their result shows that the fatigue life of BB samples was higher than the EP samples. Cancan Liu et al. (2018) has investigated the corrosion behaviour of AZ31 bending strength of cylindrical pipe of AZ31 magnesium alloy. In this study, a tensile, compressive and bending test conducted. Their result shows that there is a significant improvement in the properties. Ying-Kang Wei et al. (2017) has investigated the corrosion behaviour of nickel coating AZ31B Magnesium alloy which undergoes in- situ shot peening. They concluded that the shot peened samples exhibit good corrosion resistance than the untreated samples. Table 1 shows the summarize results of various shot peening process.

III. CONCLUSION

The conclusion has been made through the review of different papers which as follows, Shot peening processes extensively improves fatigue life of the material based on the shot intensity and and to the surface polishing treatments. This wills helpto increase corrosion resistance and there by the rate of corrosion will decreases. It improves the surface hardness with the increase in shot intensity and surface coverage. Italsoimpliesanimprovementin otherpropertiessuch astensile strength,wearrate, surface wettability etc depending upon the treatment.

Table 1 Summary of shot peening results of non ferrous metals from various papers

References	Material	Process	Result
Juan Gonzalez (2017)	Al6063 alloy	Shot peening	Shot peening improvesfatigue up to 15%.
Vaibhav Pandey (2017)	Al7075 alloy	Ultrasonic shot peening	It increases surface properties withincrease in shot peening timing.
Barry (2008)	A8 Mg alloy	Shot peening	The fatigue strength increases up to five times based on applied stress and 30% in endurance limit.
Z.G Liu (2017)	Ti-6Al-4V alloy	Shot peening & Surface polishing treatment	The fatigue life increases with the increase in shot intensity.

Sara Bagherifard (2017)	AZ31B Mg alloy	Severe shot peening	This process increases surface roughness, micro hardness, and surface wettability of the material.
Omar Hatamleh (2007)	7075-T7351 Aluminium alloy	Laser and conventional shot peening	Both process decreases the tensile residual stress
Ruixia Zhang (2017)	AZ31B Mg alloy	Laser shot peening	This process implies significant improvement in hardness and yield strength.
Meo (2003)	Weldments	Shot peening	This process decreases the tensile residual stress and it improves fatigue strength.
Sano (2012)	A6061-T6 Aluminium alloy	FSW & laser shot peening	Shot peening improves the fatigue life of treated specimen than the untreated specimen.
Chuan Xu (2017)	Mg/Ti weldments	High energy shot peening	It increases tensile strength to 24.5% as compared with untreated samples.
Omar Hatamleh (2007)	7075-T7351 Aluminium alloy	Laser and conventional shot peening	Both process decreases the tensile residual stress.
Ruixia Zhang (2016)	AZ31B Mg alloy	Laser shot peening	This process implies significant improvement in hardness and yield strength.
Meo (2003)	Weldments	Shot peening	This process decreases the tensile residual stress and it improves fatigue strength.
Sano (2012)	A6061-T6 Aluminium alloy	FSW & laser shot peening	Shot peening improves the fatigue life of treated specimen than the untreated specimen.
Vielma (2014)	Carbon alloy steel.	Shot peening	This process increases the fatigue and tensile strength of max. 45% to 50%.
Zheng Xuan (2017)	Al2024 alloy	Shot peening	Surface roughness improves rapidly at initial stage and increases slowly when full coverage of the surface.
Daoxia Wu (2017)	Ti1023 alloy	Shot peened by cast steel & ceramic shots.	Cast steel shot produce high roughness and plastic deformation than ceramic shots.

Izumi Fukuda (2013)	AZ31B Mg alloy	Shot peening	Shot peening improves the properties significantly.
Fouad (2011)	AZ31B Mg alloy	Shot peening	Wear rate was decreased at high shot peening intensity.
Ying-Kang Wei (2017)	AZ31B Mg alloy	Shot peening	It provides good corrosion resistence.

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