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Laser Surface Texture for Improvement of Modular Design

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Abstract: Laser surface textures can have various geometries and dimensions. These can be placed on a portion or the entire product. This can be change the contact between the surfaces. To reduce or increase the tensile, compressive and angular loads. In some surfaces it is recommended that a portion is used based on the dimensions of the product. The geometries can use the entire dimensions. This chosen using the load change that occurs when many surfaces contact in the product. The load change can be instantaneous or occur gradually. This produces a much greater corrosion when in contact between the surfaces. The surface texture layers can be used on particular or both surfaces. The interparticle distance are much greater that each size. The benefits include changing properties. The surfaces are liquefied in the direction of the load. This improves the contact area between the particles. This can be modular or on the entire surface. The laser produces a high solidification rate of particle. This contributes to the performance of the product. To resist corrosion of the surface. This depends on the liquification and modular design. Surface textures are a continuous geometrical path. These are usually designed as contact heights and widths. These have a distance that is equal to the processing time or duration of the laser and the dimensions of the product. The geometrical path has a distance in the horizontal and vertical directions. Lasers have the benefit that these can process with high efficiency geometries. In the research products were processed with various shapes and dimensions.

Keywords: Laser Process, Surface Texture, Modular Design

1. Introduction

The load capacity is chosen using the geometry and surface texture design. The greater this is the increase in dimensions that can be used [1]. The lower this capacity the decrease geometries are required for the laser process [2]. This can contribute to corrosion and loads of the product. Laser process is an accurate method when there is greater specification [3]. This ensures the contact surfaces and design have the required capacity in use [4]. To produce an increase in loads and higher corrosion. This is important to surface texture design using the method of laser processes [5]. This precisely chooses the distribution of loads [6]. To produces a product that can be frequently used [7].

Products can vary in dimensions that depend on its use. In situations were there are much greater dimensions [8]. The tensile, compressive and angular load can vary instantaneously [9]. To produce a lesser residual capacity of the product.

In some products used in high production processes [10]. The geometry can produce a lower change in capacity and require infrequent use [11]. This is used for dimensions much less than lower production processes [12]. These are beneficial in choosing the surface textures use for the product [13]. To ensure lower corrosion and greater capacity of the geometry. Lasers can ensure the product has improved properties and uses. To develop these various load capacities. The surface textures is produced on a portion or the entire dimension of the product. This can be in either direction that requires the research.

To design the surface textures the laser settings are used. These ensure the properties can be chosen for the design of the product [14]. The tensile, compressive and angular properties can be changed using the process. This can be increased or decreased that depends on the dimensions of the product. This can either occur instantaneously or gradually for the products duration of use [15].

These are much greater than each path. This is setup using the laser design. To precisely develop the surface. This can use to choose the tensile, compressive and angular load capacities. These laser processes alters the geometry by

motion in the vertical and horizontal directions. Therefore, the laser moves in various paths with a duration for each direction.

To understand directionality to produce either a horizontal or vertical on the designs. Surface textures depend on the waveform but the direction of the setup for motion of laser beam. This ensures usability of the product are not reduced when in use.

The laser consist of a waveform that has a variable duration. This is produced in the vertical and horizontal directions at a particular processing rate. This is used to distribute the surface texture on the geometry. This suggested geometry has to be placed equally in the various directions.

This is to ensure when the laser process is performed for the entire dimensions. In most situations the horizontal direction for much lower distance than the vertical path. This is to reduce the angular load that can greatly decrease the residual capacity of the product. This produces loss of contact between the surfaces of the geometry. This would produces load displacement in use. This is because loading in the horizontal directions would increase the products angular displacement. This has the most contribution to the load distance. These should be reduce to improve the usability of the product by suppliers and producers. This can be used for design specification. To reduce the frequent alterations to a portion or the entire product. The processing rate consists of horizontal and vertical directions, distance and durations.

$$\text{Horizontal Processing Rate, } H_p=D_h\div t. \quad (1)$$

$$\text{Vertical Processing Rate, } V_p=D_v\div t. \quad (2)$$

The duration is constant in the process. Therefore, these can be equated to design the product.

$$t=D_h\div H_p.,.\ t=D_v\div V_p. \quad (3)$$

$$D_h\div H_p=D_v\div V_p. \quad (4)$$

This can used to specify the surface heights and widths on the product. The laser process a design that of precise surface texture geometries. In most situations the surface height is optimized and equal to the surface width and coefficient.

$$H_{pk}=e_{vl}\div d. \quad (5)$$

This ensures the highest tensile and compressive loads of the product. To produce a distributed surface between the geometrical dimensions. These are included in the equation.

$$D_h=H_{pk}. \quad (6)$$

$$D_v=e_{vl}. \quad (7)$$

$$D_v=2H_{pk}. \quad (8)$$

The processing rate of the laser occurs in a particular direction. This is usually in the vertical path of the beam of the process.

$$V_p=P. \quad (9)$$

This is the processing rate used by the laser on the geometry. To ensure the product is designed to optimal dimensions.

$$D_hV_p=D_vH_p. \quad (10)$$

$$P=D_vH_p\div D_h. \quad (11)$$

$$P=dH_{pk}H_p\div H_{pk}. \quad (12)$$

$$P=dH_p. \quad (13)$$

Therefore the motion the motion of laser processing rate is set to equal the coefficient and geometry processing rate. The designer can use this to specify the horizontal and vertical processes. This uses the setup of the design of the laser.

2. Laser Surface Method

To process the surface of the product. The geometry was placed in the path of the laser. The duration was set to be equal to the processing time of the product. This was chosen using the frequency and dimensions.

$$\text{Duration=Processing time} \div \text{Frequency.} \quad (14)$$

This was chosen to process the entire dimensions. This equation can be used to produce surface texture on a portion of the product. This equation was written but can be varied for research.

$$\text{Duration=Processing time} \div 2\ \text{Frequency.} \quad (15)$$

This produced the surface texture for a portion of the products dimensions. The laser beam diameter was set to 0.2mm on the product. The process was performed on the geometry.

The surface texture directionality can be a contributer to its design. This lacks research to develop methods when many contacts are involved in the design. The laser is capable of producing in the angular direction. This product has a resultant contribution of both vertical and horizontal directions. The research is to develop on methods of load displacement of various geometries. To ensure the product is capable of resistance to tensile, compressive and angular loads.

Surface textures are produced in the paths of the direction of the laser beam. This can develop a precise geometrical direction on the products. This changes in the tensile, compressive and angular directions when load displacement occurs in the product. These can resist and prevent deterioration of the geometries used.

To produce each of the load directions. The product is placed in the path of the laser. This is to develop the geometry in the vertical, horizontal and angular directions. The result can specify the required use of the product.

This is the products capability to resist loads in various directions. This can be either the vertical or horizontal and both for angular surface texture path. This develops an optimal method of design. These products should produce

various changes to the load and displacement in design. The result of the research should choose the use for the geometry of the entire product. This is to prevent degradation when there is load. The product when processed has a residual capacity. This changes the load displacement of the geometry. This is important to ensure that the properties such as corrosion resistance.

The angular geometrical path is the load resultant of the capacity in the tensile and compressive directions. This is performed by placing in the angle of 45 degrees to the various directions.

Load production: The capacity can vary based on the dimensions of the product. When the geometry is much greater than the surface textures use. This can reduce the residual density of the product. The result can produce much greater load displacement. The surface textures for greater dimensions can produce corrosion. In production most products consist of contact between various geometries. This can be laser processed together for a product. The surface texture can be produced and the geometries are setup. This can be used for various dimensions of products.

This can contribute to the use, performance and reduce preventative changes of the products. These ensure the design has the requires load capacity properties. The laser can ensure decrease of elements that produce corrosion of the product. To design the geometry path. This has to be placed and settings used. The laser then moves in the direction of the path. The duration of the laser is a portion of the time of the frequency of the waveform.

$$\text{Geometry distance, } D=Lt. \tag{16}$$

The symbol l is the processing rate of the laser beam. The duration in the equation is t of the motion. This is used to product. This can be written as lz in the angular direction, lu in horizontal direction and lv in the vertical direction. The laser process moves in each of these directions. This can result in different surface texture angles, heights and widths on products. These are the same on the geometrical path. This can be calculated in the equation.

$$\text{Surface texture height}=D\div t. \tag{17}$$

$$\text{Surface texture width}=D\div 3.14t. \tag{18}$$

$$\text{Surface texture angle}=D^2\div 3.14t^2\div 2. \tag{19}$$

These are used to describe the performance of the entire geometry. The surface textures ensure load capacity for the various tensile, compressive and rotational directions.

The laser had a beam diameter, frequency and duration. This was setup to produce the surface textures on the geometries. The laser processing rate and processing rate of the product was used. This was used to produce the geometry to the dimensions. The d is the ratio of surface height to width on the product. This was set to 30, 45, 60 degrees for the process. This can be written 3.14÷6, 3.14÷4, 3.14÷3 to develop the surface textures on the product. The laser was set to the coefficient, d to calculate using the processing rate of 30, 45, 60mmpersecond. This was used to derive the laser processing rate. The geometries for used had similar dimensions. This ensures a design specification could be obtained for the laser.

3. Results and Discussion

The laser process resulted in surface textures on similar geometries. This product had processed a portion and entire dimension. The resultant capacity was in the tensile, compressive directions.

The surface texture on a portion of the product had the least corrosion. This ensures the frequent use. The surface texture on the entire dimension had the most corrosion of product. The laser process produced varying tensile, compressive and angular properties. The process that had surface texture on a portion resulted in the lowest tensile and compressive loads. This produced the greatest angular capacity. This ensures the product can be used frequently in production.

The surface texture produced on the entire dimension had the greatest tensile and compressive loads. This resulted in the least angular capacity. To produce a higher corrosion of the surfaces in contact between the products.

The process had produced varying surface texture widths and heights. This was using the laser processing rate and the geometry processing rate.

The surface texture height and width for coefficient of 30 degrees. This resulted in the least tensile and compressive loads. To produce a highly distributed but low angular distance.

The surface texture height and width for 45 degrees. This produced optimal properties. The tensile and compressive loads were equal in this design. This produced a high angular capacity. To prevent load displacement without intervention by the user.

The surface texture height and width for a coefficient of 60 degrees was produced on the geometry. This had the highest tensile and compressive loads. The product was in place but a greater duration resulted in load displacement of the geometry. This can be used for products that are frequently altered for improvements of the product.

4. Conclusion

The laser was accurate and precise to develop for each the surface textures on the geometries. The product that had surface textures on a portion of the product. This can be used for geometries that have greater dimensions. This is chosen since the load produces an increase in the tensile and compressive directions. Therefore requires the process to produce fewer surface textures on the product.

The geometry had surface textures on the entire dimensions. This can be used for lower dimensions of the products. The laser process was efficient in developing the geometries. This can be varied frequently by suppliers and producers. The research can be used to develop methods of

the process. To be used for increased and decreased precise geometries. This ensures the tensile, compressive and angular properties.

This produced a precise and accurate design of the geometry and the surface textures of the product. The product condensed to optimal values when the surface texture height was equal to the surface texture width of the geometry. This ensures the resultant loads was distributed in all directions without load displacement occurrence in the products use. This can be used to specify the laser and products motion for a variable processing rate. To design the laser.

Laser was efficient and accurate in choosing the load capacity and corrosion resistance. These geometries can be used. This include for vertical directions geometries that are low in dimensions. These require frequent changes and usability. The geometries in the horizontal directions are used for much greater dimensions in its production. The surface textures in the angular directions has optimal properties. This include that the changes and usability for much greater duration. This has the most corrosion resistance.

References

[1] Campbell, F. (2010) Understanding the Basics, ProQuest Ebook Central: A S M International.

[2] Suchy, L. (2018) 'Influence of Hub Parameters on Joining Forces and Torque Transmission Output of Plastically-Joined Shaft-Hub-Connections with a Knurled Contact Surface', Machines, 6, (16).

[3] RS PRO (2017) Datasheet: RS Pro 50mm Plain Steel Parallel Dowel Pin, 10mm Diameter RS Stock No: 270-726. Available at: www.rspro.com.

[4] Stamekovic, D., Jovanovic, S. and Milosevic, M. (2001) 'Investigation of the press fit joints by tribology aspect', Facta Universitatis: Mech. Eng., 1, (8), pp. 1057-1064.

[5] RS PRO (2017) Datasheet DIN 9021 washer A2, M10 7976254. Available at: www.rspro.com.

[6] Cognard, J., Devaux, H. and Sohier, L. (2010) 'Numerical analysis and optimization of cylindrical adhesive joints under tensile loads', International Journal of Adhesion & Adhesives, 30, pp. 706–719.

[7] Troughton, J. (2008) Handbook of Plastics Joining: A Practical Guide, Institute of Welding International.

[8] J. Davim, Laser in Manufacturing, John Wiley & Sons, Incorporated, 2013.

[9] Tada, N. (2017)"Evaluation of Thin Copper Wire and Lead-Free Solder Joint Strength by Pullout Tests and Wire Surface Observation," Crystals, 7, 255.

[10] Huyuk, H. (2014) 'Analysis of elastic-plastic interference-fit joints', Procedia Engineering, 81, pp. 2030–2035.

[11] Wang, H. (2018), 'A model to calculate the laser absorption property of actual surface', International Journal of Heat and Mass Transfer, 118, pp. 562–569.

[12] Oshida, Y. (2013) 11, Surface Modifications, In Bioscience and Bioengineering of Titanium Materials Second Edition, Oxford: Elsevier, pp. 341-456.

[13] Duley, W. (1976), 'CO2 Lasers: Effects and Applications' Academic Press, Inc. London.

[14] Donghua, Dai. et al. (2018), 'Influence of scan strategy and molten pool configuration on microstructures and tensile properties of selective laser melting additive manufactured aluminum based parts', Optics and Laser Technology, 99, (2018) 91-100.

[15] Stamekovic, D., Jovanovic, S. and Milosevic, M. (2001), 'Investigation of the press fit joints by tribology aspect', Facta Universitatis: Mechanical Engineering, 1, (8).