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USE OF NON-TRADITIONAL MACHINING IN THE TEXTILE INDUSTRY

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A B S T R A C T

The process of unconventional machining is widely used to produce detailed, complex and accurate forms in materials such as titanium, stainless steel, high power temperature resistant alloys. It is used to remove materials using devices that are harder than the content itself. In the modern manufacturing system, to enhance the productivity of textile industries extensively using nontraditional machining system. Laser beam machining is one of them. The present paper is an attempt to review the usage of nontraditional machining especially laser beam machining.

1. INTRODUCTION

A laser is a visual device that discharges rational light (electromagnetic radiation). Laser is an acronym for light amplification by stimulated emission of radiation. Laser discharge light in narrow, low separation beam, with a narrow wavelength range. Cutting fabric with a laser produces “sealed” seams without wearing them out. Nonlinear consistency allows the laser to be focused to a very small spot (0.25mm) this allows applications like laser cutting. Cutting takes place by burning, melting and vaporization Angelova et al., 2017. Fabrics can be laser imprinted to produce unique effects. The power output of the laser can be controlled depending upon the intended end-use. Design made on the computer it is read by a computer that uses the information to automatically guide a laser makes all the required cuts, producing an exact physical replica of the design.

1.1 Unconventional machining process

The following are some important requirements for developing non-traditional machining processes.

- Ability to fabricate the hard material.
- Potentiality of making difficult parts.
- There is a need for better completion and less tolerance.
- The material of the job piece is heat sensitive, and temperature can convert the inner properties of the job material.
- The workpiece is very thin and stretchable to clamp.

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2. NON-TRADITIONAL MACHINING IN THE TEXTILE INDUSTRY

Nontraditional manufacturing using the system are in high production speed as compared to the traditional process. There is also the possibility of the technical system are less utilization per kg of yarn produced. The elimination of large delivery packages for some processes reduces the need for labour. Development of non-traditional yarn manufacturing haring some of the processes makes easy to process like rotor air-jet and laser are the nontraditional systems which have been a commercial success. The recent development in three system

2.1 Laser cutting

Fashion designers in the 19th century introduced Laser cutting in clothing manufacturing for the quick process and the fast production due to the need in the system. So, the laser enters the garment industry. By the use of laser, it is used to cut the textile into the required pattern shapes. In synthetic fabricates laser cutting produces well-finished edges.

Figure 1. Laser cutting machine

By using the laser process, it reduces the difficulty of drying build by the conventional carver. Laser cutting is used to cut leather because of the accuracy of the sharp cut element and the laser process is used to make the new and uncommon design to produce the function of appears design and jewellery style. The laser comes in the garment industry makes the work simple and reduce the stress of the manpower. By using the laser cutting it prevents the burn and take off the debris and smoke along-with the cutting surface and also different types of pieces the cloth manufacture everywhere in the world had taken the upper hand of laser application in all multi-fibre protocol authorities to make their by-products more competitive. A short time ago the use of the laser industry is enlarging designer necessity, 3D body scanning denim loading and engraving leather.

The main reasons for use of lasers in cloth industries may be due to a reduction in price easing and anti-counter jetting. In several times, the sealing of the cut patterns are the edges and repair the cloth parts is to present wear out, where laser plays the major role.

Laser cutting in the textile industry has been growing in popularity over the last two decades or so. As in the case of garment manufacturing facilities, there is an emphasis on multiple cuts layer there is a possibility of cutting widespread. The technology of laser scanning uses single or multiple thin & sharp stripe layers to compute element size. To laser cut fabric a designer first creates a pattern. Many patterns are created using CAD or computer-aided design software Nanjundeswaraswamy (2021). This machine might connect to another software system caused by CAM. The design is created in the CAD and transferred to the laser machine by lane system for the cutting. Lasers are used on many kinds of fabrics including silk, nylon, polyester, cotton and leather.

2.2 The feature of laser applications

- It is used for high care in trimming contours.
- Working speed is at a high level.
- Less waste, no chips.
- Wear-free technique, contactless
- It is light–free and clean.
- The level of quality is good & no mechanical wear.
- Fixation of materials is not required because of force-free development.
- With the help of computer integrated design process is simple.
- Laser engraving, laser cutting blended in a single step.

2.3 Depth of cut

The total depth of cut is gauged by the total thickness of all the mounting beard. Cloth layers are successfully cut by the laser. the maximum depth of cut is 8.96mm. The constant cutting RPM is at 120mm/s.

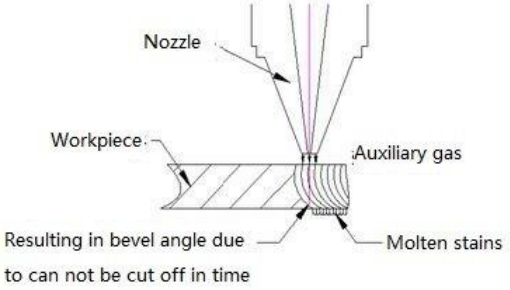

Figure 2. Fibre cutting Laser

Fibre cutting lasers (figure 2) permit controlled heat entry which is an option for fine cutting. Peak performance of laser maximum cut depth up to 10mm. The laser beam can be focused on a very small diameter for high precision minimum cut width of up to 15μm (0.0006 in). smallest possible cut width dependent on beam characteristics and material strength. Cutting fine contour precision and dynamics of the cutting machine are important. Heat affected zone along with the cut very small (up to 2μm). Deformation of the parts to be processed can be avoided. High energy depth in the focus point of the laser beam causes the material to melt and evaporate. Active or neutral process gas oxygen, nitrogen, or argon melted material is blown out. Laser cutting is fast compared to automatic multiple-ply knife cutters with the speed of 30-40m/min as compared to that of 5-12m/min.

3. THE USAGE OF LASER IMPRINT OVER TRADITIONAL METHODS

Some of the methods that can imprint stuff but lasers have improved to become more dependable, well organised, worth while procedure in business (figures 3, 4).

Figure 3. 3D body scanning by laser scanner

Denim

Garment

Buttons

Leather

Embroidery

Figure 4. Laser engraving items

3.1 Contactless procedure

The major use of laser printing is that it's a contactless procedure. It means the laser beam is not touching the medium naturally, and it is enforced to instead commit to heat to accomplish the outcomes.

3.2 It will work at a radius of the boundary

Usually, laser marking a procedure which imprint is same as to that target here is to eliminate a part of the stuff being function. As laser system and fibre laser in specific after so much manage a vary of depth can be accomplished to match uses Nayak and Padhye (2016).

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3.3 It's highly efficient

laser imprinting is an extremely well-organised procedure. it is easy to change allying medium and a scale of drop benefaction it's customer more close result. which is frequently more under compare to those advanced by more conventional processes (Prasad & Chakraborty, 2018).

3.4 A focus on quality

They should more concentrate on their quality. Searching procedure these two are well organised and passes the required outcome can be durable. But imprinting with a laser more than reach this target Youssef and El-Hofy (2020). After several portions will have both of them engraving and marking on them and a single imprinting setup will finish two of the methods.

3.5 The defended procedure

In here they concentrate on their protection too, both for the workers and the customers by returning technical methods that often use dangerous chemicals, it stops labourer having to a work in these situations. The utilization of lasers in concurrence with the computer means that they can be controlled from a distance (Singh et al., 2018).

4. APPLICATIONS

A laser engraving machine can engrave and de creation on the surface layer of any material making the products look high grade.

Laser automation is giving inputs in garments, finishing which can build different surfaces without any wet processing, this method is very precise and it can work with good repetition and reproductive capacity.
Some metal detection machines use laser beams to determine if there is any needle in the last finished cloth.

In some stitching machines, the laser beam is involved for preprogrammed and exact positioning and to make a crack in the textile.

Laser treatment way is used for long-lasting antibacterial effects on cotton textile using silver non-particles.

5. CONCLUSION

In the modern manufacturing system, extensively non-traditional manufacturing processes are used than traditional manufacturing systems to meet the global demand and quality, Garment industry is not exceptional, the majority of the garment industries were shifted from traditional manufacturing to non-traditional systems by using sophisticated modern machines such as laser beam machine, for cutting, marking and for engraving etc.

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