

# ***PARAMETRIC STUDY OF LASER ENGRAVING PROCESS USING TAGUCHI METHOD UTILIZING FIBER LASER SYSTEM FOR AISI 304 STAINLESS STEEL***

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**Abstract.** Laser engraving process is non-conventional machining process used for engraving of almost each material which cannot be mark by conventional machining processes. Laser engraving process is done by heat up mechanism which vaporize the material surface. With the use of laser engraving machine the engraving is possible by utilizing different input parameter as spot diameter, laser power, laser frequency, different wave length, engraving speed, number of passes etc. Output parameter is potentially material removal rate, surface finish and indentation. Parameters with multiple responses characteristic is optimized based on the Taguchi method analysis. Three input parameter (frequency, engraving speed and number of passes) were investigated its effect on surface roughness as it output parameter.

## **1. Introduction**

Laser process is one of the most widespread technical inventions of the last century. Laser is the acronym of Light Amplification by Stimulated Emission of Radiation. It is both subject of intense study from scientists and engineers to further expand the field of application and develop new and better laser system. The non-contact nature of the process allows wide variety of materials such as plastics, wood, metal and ceramics to be used as work piece that furthers the usefulness of the process. The principle of operation is based on ablation wherein the interaction between material and the laser beam, which comes from a laser system and passes through a focusing lens (convex lens), leads to the vaporization and melting of work material. It is also a good example of how a fundamental theoretical concept can rest for decades until it is rediscovered for a technical application. As a result, the material is removed from the work piece in layers via ablation mechanism.

Literature review provides the scope for the present study. Literature review plays important role to get information about the dissertation work It works as guide to run this analysis. Literature review includes different study on laser engraving processes for better surface finish with different laser by using parametric analysis, and effect of laser power, different wave length, pulse frequency, beam speed and other so many parameters also effect of surface finish, material removal rate and indentation of engraving.

Laakso et al. (2009) reported that fiber laser allows independent tuning different laser parameters and the marking process can be optimized for producing colors with better quality and visual appearance. Has discussed Color marking of stainless steels as a process is known for some time but still it has not been used widely in the industry.