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INVESTIGATION OF MACHINING PARAMETERS IN THE DESIGN OF CNC TECHNOLOGIES

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ДОСЛІДЖЕННЯ ПАРАМЕТРІВ ОБРОБЛЕННЯ ПРИ ПРОЕКТУВАННІ ЧПК ТЕХНОЛОГІЙ

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Today CNC technology has major contribution in industries. CNC (Computer Numerical Controlled) machines are main platform in the contribution of good quality products in industries. Basically CNC machines are automated operating machines which are based on code letters, numbers and special characters.

The development of computer aided design and manufacturing system is evolving to the phase of integrated manufacturing systems, which is oriented towards the need of 21st century. Efforts are made to maintain and improve the vitality of manufacturing system. Keeping it as center stone of all economic activities and ensuring that manufacturing remains an attractive industrial area. Optimization of corporate activities in computer integrated manufacturing (CIM) and CAPP in one of the greatest targets of the system. Since it has been believed that only those industries capable of effective manufacturing would withstand international and global competition.

In the modern machining the challenge is mainly focused on quality in terms of surface finishing. Surface texture is concerned with geometric irregularities. The quality of surface is most significant for any product. The surface roughness is main affecting thing such as for contact causing surface friction, wearing, holding the lubricant etc. There are many factors which affect the surface roughness (SR) and material removal rate (MRR), i.e. tool (material, nose radius, geometry, tool vibration), work piece (hardness, mechanical properties), cutting condition (speed, feed, depth)etc. New products have been generally designed to be produced on three axis CNC machining centers from cubical billets. It is not sufficient to device a feasible procedure for manufacture of desired component. The procedure must be economically justified. Cutting conditions may be established which give satisfactory results.

The process of metal cutting or machining of metal work-piece is influenced greatly by the relative velocity between the work-piece and the edge of the cutting tool. The relative movement in the machining operations is produced by the combination of rotary and translator movement either of the work-piece or of the cutting tool or both.

Traditionally design methods are too complex and difficult to use. A large number of experimental works has been done when the process parameters are increased with their levels. To solve this problem Taguchi method is used with a design of orthogonal arrays to

study the all parameters. Taguchi Method is developed by Dr. Genichi Taguchi, a Japanese quality management consultant. It is an efficient tool for the design of high quality manufacturing system. The main advantage of this method to reduce the experimental time and find out significant factor. Taguchi robust design method is a most powerful tool for the design of a high quality system. He considered three steps in a process's and product's development: system design, parameter design, and tolerance design. In system design, the engineer uses scientific and engineering principles to determine the fundamental configuration. In the parameter design step, the specific values for system parameters are determined. Tolerance design is used to determine the best tolerances for the parameters. Taguchi's orthogonal array provides the set of experimental data (less number of experimental runs) and Taguchi's S/N ratio is the logarithmic function of desired output. The objective of using S/N ratio as a performance measurement is to develop products and processes insensitive to noise factors. The steps suggested by Taguchi shown in fig. 1.

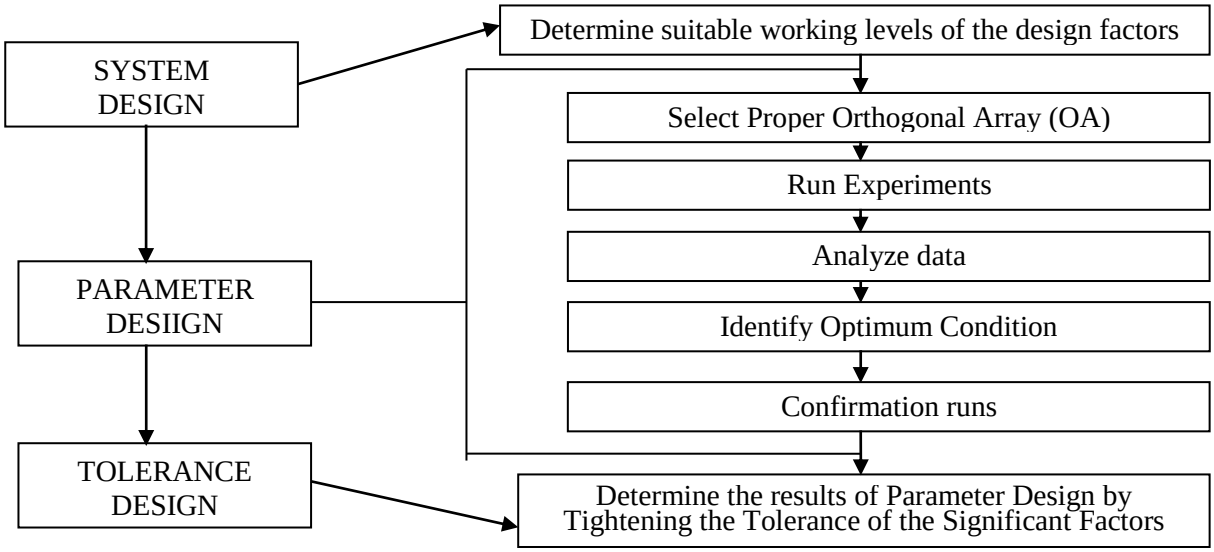

Figure 1 - Flow chart of Taguchi's method

Surface roughness is defined as a group of irregular waves in the surface, measured in micrometers. It is produced by the fluctuations of short wavelengths characterized by asperities (local maxima) and valleys (local minima) of varying amplitudes and spacing. Surface roughness is defined by various characteristics of the surface profile such as center-line average R. peak-to-valley height Hand average roughness depth, but these have limitations. The randomness of the profile is no measured by any of these parameters. The randomness of the surface profile causes the roughness value to vary under the given cutting conditions and is caused by the random nature of the mechanism of formation of the built-up edge, side flow and tool wears. There are various methods used for the roughness measurement such as stylus profilometry, light sectioning and taper sectioning methods, scanning electron microscopy and transmission electron microscopy etc.

From the above discussion we found that most of the researchers had taken input parameters (speed, feed, depth of cut) and in some cases other parameters such as nose radius, environment etc. and facing output parameters SR, MRR. From the literature review it is found that for surface roughness the most significant parameters are speed, feed and nose radius and least significant parameter is DOC and for MRR the most significant parameters are DOC, feed and speed and least significant parameter is nose radius. Now these days these parameters play a very vital role for the machining and utilized in the industries.