CHAPTER 1
INTRODUCTION

Majority of industrial applications [1] of machining are in metals. Although the metal cutting process has resisted theoretical analysis because of its complexity, the application of these processes in the industrial world is widespread. Machining processes are performed on a wide variety of machine tools.

Metal cutting processes can be viewed as consisting of independent input variables, dependent variables, and independent-dependent interactions or relationships. The engineer or machine tool operator has direct control over the input variables and can specify or select them when setting up the machining process.

Turning is a machining process for generating external surfaces of revolution by the action of a cutting tool on a rotating work piece, usually in a lathe. Turning is the major operation in a machining sequence discussing in this research work.

A lathe is a machine tool which rotates the work piece on its axis to perform various operations such as cutting, knurling, drilling, thread cutting etc. with tools that are applied to the work piece to create an object which has symmetry about an axis of rotation. Lathes are used in woodturning, metalworking, metal spinning, Thermal spraying, parts reclamation, and glass-working.

Aluminium alloys can be machined rapidly and economically. Because of their complex metallurgical structure, their machining characteristics are superior to those of pure aluminium. The micro-constituents present in aluminium alloys have important effects on machining characteristics.
The literature survey indicates that, in machinability studies investigations, statistical design of experiments are used quite extensively. Statistical design of experiments refers to the process of planning the experiment so that the appropriate data can be analysed by statistical methods, resulting in valid and objective conclusions. Design and methods such as factorial design, response surface methodology (RSM) and Taguchi methods are now widely used in place of one-factor-at-a-time experimental approach which is time consuming and exorbitant in cost.

In the literature survey it appears that enough systematic research work has not been carried out regarding machinability of aluminium alloys such as Al6061T6 and Al7075 in different machine environments in dry condition.

In the present investigation it has been carried out systematically to study the effects of all cutting parameters such as feed, cutting speed, depth of cut, tool nose radius and rake angle on machinability factors during turning on aluminium alloys such as Al6061T6 and Al7075 in dry condition. Different machine environments used in the present investigations are medium duty lathe, CNC LT16 XI lathe and MTABXL turner lathe, in dry environment. Experiments are carried out according to design of experiments approach using Taguchi method. L8 orthogonal array is used for medium duty lathe for machining of Al6061T6 and Al7075. L31 orthogonal array is used for CNC LT16 XI lathe for machining of Al6061T6. L31 orthogonal array is used for MTABXL turner lathe for machining of Al7075.

Using MINITAB software the mathematical models are developed relating the machinability factors with cutting parameters for different machine environments to predict machinability factors within the scope of the investigation.