# A Theoretical Description on Importance of Machining, Scheduling & Layout Planning in Industries

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## Abstract

Machining creates a wide diversity of objects used on a daily and is one of the most significant techniques used in the machining industry. Things such as tools and equipment are shaped with a high-level of accuracy via quality precision machining that utilizes sophisticated software such as CAM (computer aided manufacturing) or CAD (computer aided design) to interpret blueprint designs. A number of materials, including steel, copper, graphite, titanium and plastics, to name a few, can be cut with optimal precision. To organize and complete your projects in a timely, quality and financially responsible manner, you need to schedule projects carefully. Effective project scheduling plays a crucial role in ensuring project success. To keep projects on track, set realistic time frames, assign resources appropriately and manage quality to decrease product errors. This typically results in reduced costs and increased customer satisfaction. Important factors include financial, documentation, management and quality assurance.

**Keywords: Machining, Scheduling, Layout Planning**

## I. SCHEDULING

Process planning and scheduling are two most important tasks in a manufacturing system. These tasks strongly influence profitability of manufacturing a product, resource utilisation and product delivery time. Process planning is the systematic determination of methods by which a product is to be manufactured economically and competitively. The primary goal of process planning function is to generate process plans, which specifies raw material/components needed to produce a product as well as processes and operations necessary to transform raw materials into the final product. Thus, outcome of process planning is the information required for manufacturing processes, including identification of machines, tools and fixtures. Scheduling assigns a specific task to a specific machine in order to satisfy a given performance measure. It is bound by process sequencing instructions that the process plan dictate and by the time-phased availability of production resources. Thus, both process planning and scheduling involve assignment of resources and are highly interrelated. Conventionally, process planning and scheduling are carried out in two distinct, sequential phases, where scheduling is done separately, after the process planning. This approach is based on the concept of subdividing the tasks into smaller and separated duties to satisfy the requirements of sub optimisation and suitable for mass production. However, today's manufacturing environment is quite different from traditional one. It is characterised by decreasing lead time, exacting standards of quality, larger part variety and competitive costs.

## II. MACHINING

The machining of super alloys, ceramics, glass etc. to their final dimension by conventional methods is extremely tough, laborious, time consuming, and generally not possible. Advanced machining processes have emerged to beat these difficulties. Tight tolerance and dimension with acceptable surface are sometime only attainable at great cost. There are few machining methods available that ensure high efficiency and accuracy, but special machining methods to accomplish these are required to accomplish this.

The ultrasonic machining is one of the viable processes for the precision machining of these materials because of its unique characteristics. Due to high investment and operating costs, there is an economic need to operate the ultrasonic machine as efficiently as possible in order to obtain the invested pay back. The success purely depends on the selection of machining process parameters. Proper selection of process parameters plays a significant role in ensuring the product quality, reducing the

machining cost, increasing productivity. Ultrasonic machining is a non-traditional machining process within which abrasives contained in slurry are driven against the work surface by a tool oscillating normal to the work surface at low amplitude (25-100 microns) and high frequency (15-30 kHz).

It is preferably used to machine hard and brittle materials having hardness greater than 40 HRC with good accuracy and reasonable surface finish. Generally the tool is pressed downward with a feed force, F between the tool and work piece. The machining zone is flooded with hard abrasive particles within the water based slurry. The abrasive particles, as they indent on the work material, the material get removed if the work material is preferably brittle. Figure 1 shows the basic elements of an USM setup. During indentation, due to Hertzian contact stresses, cracks would develop just below the contact site, then as indentation progresses the cracks would propagate due to increase in stress and ultimately lead to brittle fracture of the work material under each individual interaction site between the abrasive grits and the work piece.

The tool material should be such that indentation by the abrasive grits does not lead to brittle failure. Thus the tools are made of tough, strong and ductile materials like steel, stainless steel and different ductile metallic alloys. In addition, abrasive should be made harder.

## III. LAYOUT PLANNING

Facility Layout is the configuration of Departments, Work centers, and Equipment, whose design involves particular emphasis on movement of work, customers and materials through the system. Layout planning is planning that involves decisions about the physical arrangement of Economic Activity Centers needed by a facility's various processes . The main objectives of facility layout planning involve: Reduce operating costs; Minimize Material handling costs; Utilize Space efficiently; Utilize Labor efficiently; Eliminate Bottlenecks; Facilitate Communication and interaction between workers, between workers and their supervisors, or between workers and customers; Reduce manufacturing Cycle Time and customer service time; Eliminate wasted or Redundant Movement, etc. Evaluation is the most important stage for any problem. It should be carried out very carefully, and the method of evaluation depends upon the type of problem. For a single problem, Selection of layout alternative using factor evaluation there may be more than one method available, for evaluation of the layout the available methods are given below: • Factor analysis or also called Weight factor comparison method. • List the advantages and disadvantages • Ranking based on selected consideration. • Tally of gain and losses expected. • Rating of alternatives verses objectives

Koopmans and Beckmann defined the facility layout problem as a common industrial problem in which the objective is to configure facilities, so as to minimize the cost of transporting materials between them. Author considered that the facility layout problem consists in finding a non-overlapping planar orthogonal arrangement of „n‟ rectangular facilities within a given rectangular plan site so as to minimize the distance based measure. Azadivar and Wang defined that the facility layout problem as the determination of the relative locations for, and allocation of, the available space among a given number of facilities. Lee and Lee reported that the facility layout problem consists in arranging „n‟ unequal-area facilities of different sizes within a given total space, which can be bounded to the length or width of site area in a way to minimize the total material handling cost and slack area cost. Shayan and Chittilappilly defined the facility layout problem as an optimization problem that tries to make layouts more efficient by taking into account various interactions between facilities and material handling systems while designing layouts. According to Muther, Moore and Apple the main objectives are reached through the attainment of some facts like: Reduce risk to health and improve safety of employees, Improve morale and worker satisfaction, Increase output, Decrease production delays, Proper floor space utilization, Reduce material handling, Better utilization of Machines, Manpower, and Services, etc

## IV. CONCLUSIONS

A number of materials, including steel, copper, graphite, titanium and plastics, to name a few, can be cut with optimal precision. Machining creates a wide diversity of objects used on a daily and is one of the most significant techniques used in the machining industry. Process planning is the systematic determination of methods by which a product is to be manufactured economically and competitively. The primary goal of process planning function is to generate process plans, which specifies raw material/components needed to produce a product as well as processes and operations necessary to transform raw materials into the final product. The main objectives of facility layout planning involve: Reduce operating costs; Minimize Material handling costs; Utilize Space efficiently; Utilize Labor efficiently; Eliminate Bottlenecks.

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