Flexible Manufacturing System in Manufacture of Precision Engineering Components - Key Issues in Implementation

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ABSTRACT

Flexible manufacturing System's concept, design and implementation vary considerably and depend mainly on application and the environment under which these are required to operate. This paper brings out an integrated approach adopted for finalising concept, selection and implementation of flexible manufacturing system for manufacture of precision engineering components, restructuring of support infrastructure, services and tackling the environmental factors for its successful implementation.

FLEXIBLE MANUFACTURING SYSTEMS

FMS can be defined as the approach where the automation system is not dedicated throughout its life to the manufacture of a limited range of products, but has the versatility and adaptability to tackle both existing and future product needs.

Another definition gives ultimate goal for FMS systems as CONTINUOUS - ZERO STOCK - BATCH MANUFACTURE.

PROBLEM AREAS IN EXISTING MANUFACTURING SYSTEMS

A detailed study of existing manufacturing system of a plant manufacturing precision engineering components, mainly for Defence, brought out following problem areas leading to low plant utilisation and high rejections.

a. Frequent and shifting bottlenecks in production due to a few types of complex components requiring several operations on several machines, thereby, disrupting production schedules in case of delay at any stage and machine breakdowns.

b. Rejection of components of each stage/machine setting resulting in high rejection of components requiring multiple machines and processes.

c. In view of stringent quality requirements, there was a need to inspect parts after each operation, thereby need for a large inspection department to cope up with inspection of products.

d. High inprocess inventory in a bid to smoothen the production process.
e. Long lead time for manufacture of new complex components in view of elaborate tooling, gauge, fixtures and multiple machine settings.

f. Large inventories of tools, gauges and fixtures requiring continuous maintenance and replacement putting excess strain on inhouse tool-room.

g. Low moral amongst employees engaged mainly in handling crisis situations instead of actual planning and control.

FEASIBILITY STUDY

A feasibility study carried out to identify possible alternative solutions for this plant indicated a preference for flexible manufacturing systems as against conventional mass production technology being adopted by this plant in the past. This view was further supported by the following developments.

a. As a result of technology innovations world wide, it has become possible to build flexibility in manufacturing systems and thus deliver a large variety of products in smaller quantities almost as efficiently as few types of products in large quantities.

b. Increase in number of competitors of this organisation, forcing it to respond quickly to the requirements of the customers for a large variety of products in small quantities, which it could afford to ignore till recently.

c. Increase in operating costs.

d. Need to reduce development time for new products to keep competitors from catching up on high-tech products.

e. Need to create flexible manufacturing facilities which would be adaptable to new product lines in shortest possible time and with negligible additional investment.

CRITERIA FOR SELECTION OF AREAS FOR INTRODUCING FLEXIBLE MANUFACTURING SYSTEMS:

After several rounds of discussions with the plant executives, the following criteria were adopted for selection of areas for introducing flexible manufacturing technology.

a. New complex components requiring large number of tools, gauges, fixtures and setting on a number of production machines using conventional mass production technology.

b. Complex components requiring several operations on several machines.