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Cycle Time Reduction in Manufacturing Processes

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Abstract: Manufacturing Organisations faces a problem in reduction of cost and efficiency challenges in their manufacturing operations. To stand up in today's Globalisation world, Manufacturers need to find ways to reduce production time and cost in order to improve operating performance and Product quality. Manufacturing time based challenge is an organised way of focusing on reduction of total throughput time in manufacturing firm. Reduction time has a cascading influence on value and worth. As cycle times are reduced, output increases equally. If reduction in cycle time is fifty percent and work in process inventory is twice turns causes output to increase from twenty to seventy percent. As output increases, resources capacity is freed. Two major effects takes place: expenses turn down, and the manufacturing firm becomes capable of producing considerably more output with fewer assets: a successful arrangement.

Keywords: Cycle time, Sleeve, Grooving, Slot cutting, Hydraulic fixture

I. INTRODUCTION

The shift from conventional mass production to batch production has accelerated in recent years. In response to continuously varying customer requirements, products are being manufactured in small batches, each with custom features. The trend is pervasive in both commercial and defence markets and has severe implications to the operations of a manufacturing enterprise. The diverse product mix being manufactured in a common facility greatly complicates both production planning and scheduling. Additional pressures on these functions are imposed by severe on-time delivery and minimal cycle time requirements placed upon manufacturers by the competitive market. More cycle time due to mentioned operation requires additional manpower. To correct the reworks and increase the manufacturing process, analysis is done on all the causes and suitable solutions has been suggested to reduce the cycle time. This type of suggestion is one of the quality improvements in manufacturing process and to increase the production economy of the industry. This paper deals with the reduction of the cycle time in manufacturing process by using hydraulic fixtures in place of manual fixtures. This would decrease the cycle time and considerably more outputs can be gained.

II. CYCLE TIME

The time required at each station for the performance of the work is known as cycle time. Cycle time is normally larger than the cycle time. the cycle time at a station is the time interval between the completion or the starting of the work on successive items and therefore includes both productive and non productive work as well as any idle time.

Cycle time = service time + idle time

Cycle time = $\frac{\text{useful production time per day}}{\text{Output per day}}$

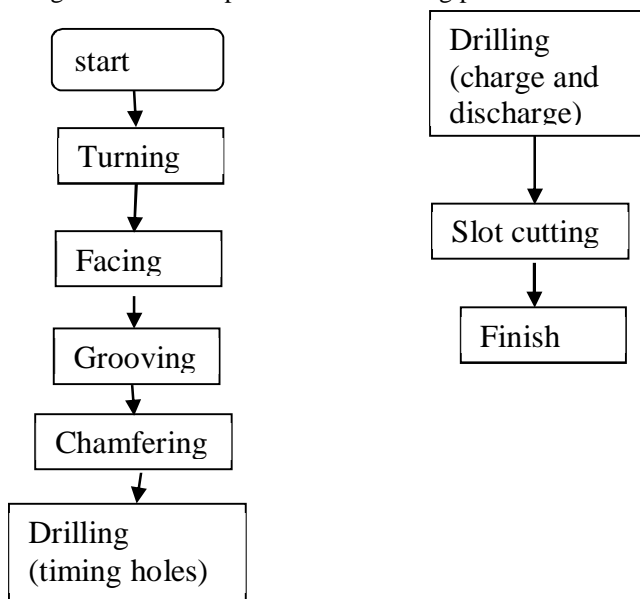
1) *Product:* Output per day



2) *Sleeves:* Sleeves can also be used to restore a particular bore size if a cylinder has to be bored out to repair a cracked or otherwise damaged engine.

A. Working Principle

The process flow diagram shows the process of machining process in VMC machine as shown in fig.-1.



1) Analysis

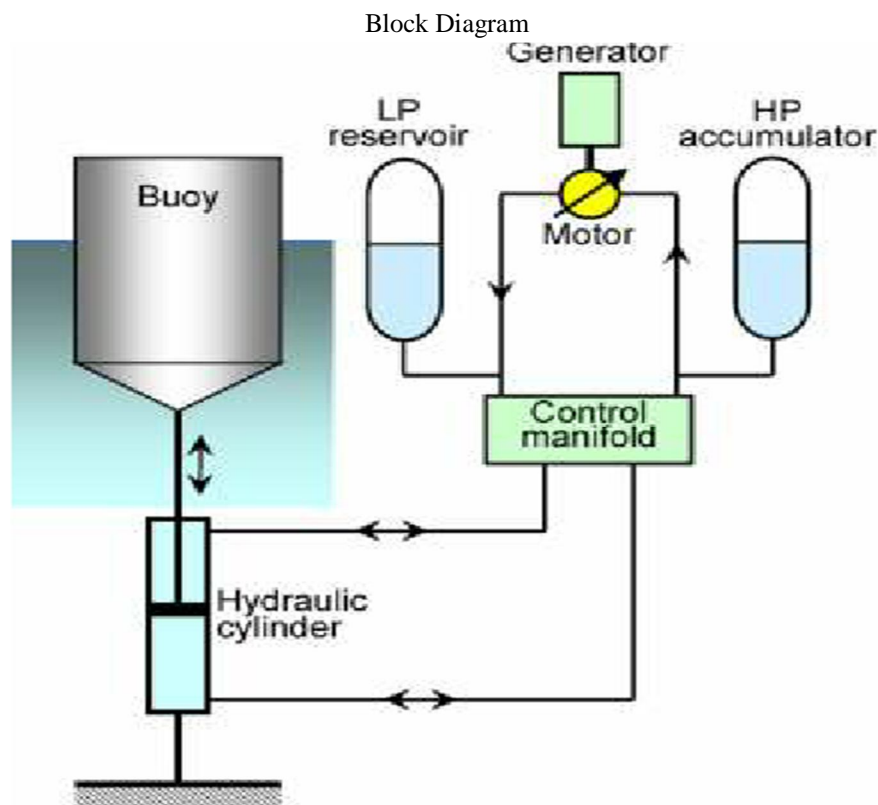
- a) Analysing the manufacturing process of the sleeve blank in the VMC machine we measured total time taken to manufacture a unit piece
- b) The total time taken is 375 sec in which most of the time is consumed by setting the work piece in the fixture. So we have planned to change the manual fixture into hydraulic fixture.

B. Observation

S.NO	OPERATION	TIME TAKEN IN MANUAL FIXTURE IN SECONDS	TIME TAKEN IN HYDRAULIC FIXTURE IN SECONDS
1	FITTING	60	10
2	TURNING	30	30
3	FACING	10	10
4	GROOVING	30	30
5	CHAMFERING	15	15
6	REMOVING	60	10
7	FITTING	60	10
8	TIMING HOLE DRILL	10	10
9	DRILL	20	20
10	SLOT CUTTING	20	20
11	REMOVING	60	10
	TOTAL TIME	375	175

C. Hydraulic Fixture

A clamping system that uses high pressure liquid to power clamps and hold a work piece in place. Hydraulically clamped fixtures have many advantages over manually clamped fixtures. Hydraulic clamping enables manufacturers to put more intelligence into the fixture by eliminating human error and reduces time taken.



D. Advantages

- 1) Hydraulic clamping offers consistent clamping of the part in each cycle
- 2) Time taken for tightening and loosening by operator is reduced
- 3) Possibility of distortion is greatly reduced
- 4) It can do multiple clampings at a time
- 5) It improves load/unload time

III. RESULT AND DISCUSSION

The above observation shows that the cycle in machining process reduces gradually when hydraulic fixture has been used in the replacement of manual fixture. It also shows us that the consistent clamping could be done by using hydraulic fixture.

IV. CONCLUSIONS

In this paper we have discussed the problem caused due to manual fixtures. A detailed analysis has been done so that cycle time could be reduced for machining processes by implementing hydraulic fixtures.

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