

# Optimization of cycle time by using various techniques: A Review

Ajinkya Patil<sup>1</sup>, R.C.Bedasgaonkar<sup>2</sup>

<sup>1</sup>M.Tech, Department of Mechanical-Production, KITCOEK, Kolhapur, Maharashtra, India

<sup>2</sup>Assistant Professor, Department of Mechanical Engineering, KITCOEK, Kolhapur, Maharashtra, India

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**Abstract** - As industrialization has taken a great place in our world and also the competitiveness among industry is increasing day by day, so every industry is in a way of manufacturing products of high quality at low cost with a priority of delivering product to customers in stipulated time span. Every industry uses a system to manufacture the product. Therefore, industry needs a manufacturing system which is capable to produce the high quality product in the minimum cycle time. This can be achieved by keeping the manufacturing system productivity high. Hence Productivity measurement is essential to measure the performance of the manufacturing system. In this present work we are developing the methodology to measure the productivity of cycle time reduction. Therefore, we are proposing a calculation for production cycle time by optimizing productive components of cylinder block component. Further the productivity is considered as one of the significant factor for performance measurement of manufacturing systems. The result shows that the proposed model can be useful in future studies target towards cycle time reduction in cylinder block manufacturing industries.

**Key Words:** Optimizing productive, Cycle Time, Automation.

## 1. INTRODUCTION

The demand placed by customers about mainly two things one is lead time and another one is price. Eliminating waste gives an advantage in both, and provides an opportunity for greater profits. There are three primary ways to eliminate waste:

- i. Establish machine performance capabilities before it begin making parts.
- ii. In process inspection.
- iii. Automate non value-added tasks such as tool setting and work piece set-up.

Reduced cycle time can translate into increased customer satisfaction. Quick response companies can launch new products earlier, enter new markets faster, and meet changing demand. They can also offer their customers lower costs because quick response companies have streamlined processes with low inventory and less obsolete stock. If we automate machine set-up and machining processes, then it will reduce inspection costs. Also it helps to reduce machine downtime and create shorter lead times.

Time-consuming set-up activities on CNC machines are

- i. Measurement of tool geometry.
- ii. Identifying and updating machine work offsets.
- iii. Cutting a second part.
- iv. Adjusting rough and finish tools to specification.
- v. Inspecting first-off parts to verify setup adjusting work offsets.
- vi. Repeating inspection of altered process parameters.

Focusing on cycle time is a very effective way to eliminate waste and increase profits. Cycle time includes set-up time, parts movement time, inspection time, and rework time. It is well understood that the goods are created at lower costs. A good machine tool system concentrates on cycle time by eliminating the non-value-added activities. Fig. 1 illustrates a common example of the systematic impact of long cycle times.

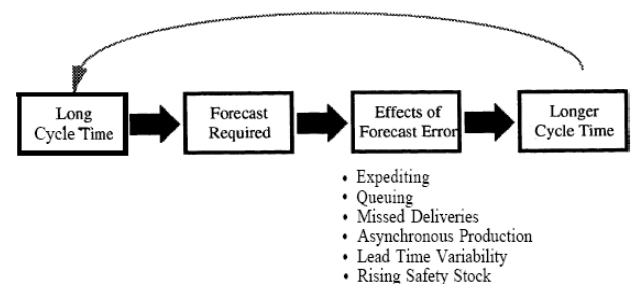


Fig. 1 - Systematic impact of long cycle time

The mathematical expression for calculating cycle time is as follows,

$$\text{Cycle Time} = \frac{\sum (\text{Setup Time} + \text{Machining Time})}{\text{No. of final components Produced}}$$

By minimizing the non-value-added activity (e.g. inspection, set-up, adjustments, tool breakage, etc.) we can maximize productivity and profits. Depicts five steps required to improve the capability of your machines. Five Steps for improvement of machine capability are

- i. Determine the accuracy as per need.
- ii. Establish a baseline.
- iii. Identify and rank the sources of error.
- iv. Eliminate or calibrate the errors.
- v. Establish a new baseline

Fig. 2 provide a predictive maintenance process. It mainly includes following steps such as:

- a. Maintains and improves the capabilities of the machine.
- b. Eliminates judgment calls on which machine to use.
- c. Eliminates bottleneck.
- d. Transforms operational expenditures into investments in process.
- e. Increases machine up-time.
- f. Eliminates unnecessary movement of parts.
- g. Provides traceable documentation of the machine and process capabilities.

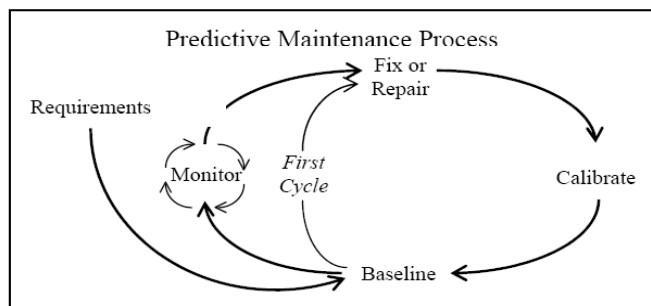


Fig. 2- Predictive maintenance process [1]

## 2. Literature Review

Rawat. [1] Discussed the key considerations for defining an effective productivity measurement. It also explores the relationship between quality and productivity. They have studied the parameter optimization or the present work include the development of model for the measurement of productivity for the manufacturing system. System composed functioning independently in parallel, reliability will be higher than reliability of each component.

Brkić [2] In this survey, it has been shown that a modified method of work sampling, with time components grouped by factor analysis, is applicable not only in the domain of capacity utilization observations, but also in investigating PC in a metalworking industry with small-sized series, using small alterations.

Proposals for further investigation include the application and control of this method in other types of production, such as assembly processes and processes in the textile industry. Further analysis should be also oriented to the issue of transport time, as well as further division of time components of other stoppages, to isolate the most significant ones.

R Muvunzia [3] the aim of the paper was to present a model for predicting the cycle time in a hot stamping process. An equation for the cooling time of the blank was developed and validated using finite element analysis simulation. The next phase of this research will involve

conducting physical experiments to validate the results from the simulation.

Mrugalska [4] Lean production successfully challenged the mass production practices to the production systems focused on good quality products aimed at customers' satisfaction, where everything that does not add value is concerned to be waste and reduces Cycle Time. It can be the answer to a great flexibility of production systems and processes realizing complex products and supply chains. In order to achieve it, it is advisable to introduce IT integration of the production level with the planning level, customers and suppliers by CPS. In the presented paper the review of literature about lean production and Industry was presented to show the possibility of linking the approaches for minimizing overall time.

Shagluf [5] The goal of the original approach demonstrated in this work is to reduce manufacturing cycle time to the maximum, taking into account serial production characterized by discontinuity and the considerable amount of current assets needed for financing the production process. This methodology is based on designed models that, on one hand, respect current technical-technological and manufacturing documentation and, on the other, real production constraints.

The results related to the identification of downtime causes and losses measurement are of importance not only for the cycle scheduling, but also for optimal production planning.

K.Wavhal [6] the cycle time of any machining operation is of great significance for any manufacturing industry. The cycle time is affected by various parameters such as machining conditions, human involvement, bottlenecks in process, idle time etc. To reduce the cycle time, it is necessary that all these parameters must be within optimum limits. Various PPC techniques, automation of machines, systematic sequencing of jobs and many other methods can be applied to manufacturing process for optimization of cycle time which in turns responsible for improve productivity and efficiency of industry.

Toly Chen [7] Enhancing the competitiveness and sustainability has been pursued by every semiconductor manufacturer. A key to this is the production cycle time. Shortening the production cycle time improves the responsiveness to customer demands, and leads to significant profits from yield improvement and cost reduction. However, in the past, cycle time reduction is usually unplanned owing to the lack of a systematic and quantitative procedure. To tackle this problem, a systematic procedure was established in this study for planning cycle time reduction actions to enhance the competitiveness and sustainability of a semiconductor manufacturer. First, some controllable factors that are influential to the job cycle time are identified.

Subsequently, the relationship between the controllable factors and the job cycle time is fitted with a BPN. Based on this relationship, actions to shorten the job cycle time can be planned. The feasibility and effectiveness of an action have to be assessed before it is taken in the practice.

### 2.1 Findings from Literature Review:

After studying the above literature, we have found that,

- i. Optimization of manufacturing cycle time
- ii. The cycle time is affected by various parameters such as machining conditions, human involvement, bottlenecks in process, idle time etc.
- iii. Lean production manufacturing to show the possibility of linking the approaches for minimizing overall time
- iv. Improves the responsiveness to customer demands, and leads to significant profits from yield improvement and cost reduction
- vi. To reduce the cycle time, it is necessary that all these parameters such that machining conditions, human involvement, bottlenecks in process, idle time etc. must be within optimum limits

### 3. CONCLUSIONS

In this study, the effect of process parameters on the response variables was investigated experimentally in cylinder block manufacturing industry.

- i. Identified of norms at Cylinder Block Manufacturing machine shop
- ii. Calculation of various major parameters to achieve best production cycle time
- iii. Evaluated actual time vs. estimated time study
- iv. Analysis of past and present system

### 4. FUTURE SCOPE

Essential need to integrate the various methodologies and approaches used in the cylinder block manufacturing industry. Implementing the procedure of optimizing cycle time to the kind of manufacturing production line can increase number of output of products.

### 5. ACKNOWLEDGEMENT

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