"A STUDY ON MACHINE PRODUCTIVITY AND COST BENEFIT ANALYSIS AT MICROTECH POLYMERS"

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The project had been completed successfully by him and it really helps us to improve the productivity of our concern.

During the project duration his commitment towards the project and involvement been outstanding and his attitude were found to be excellent.

On behalf of Microtech polymers we wish him all success for his future assignments.

For Microtech Polymers

Authorised Signature.

ANNEXTURE III

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ABSTRACT

A study on machine productivity and cost benefit analysis of CNC machine which were done on different stages by reducing the time taken for clamping the fixture, reducing the machine's idle time.

Problems which are faced are raised and following by remedies also suggested.

In a machine single fixture is used to clamp the component. Fixture is a device used to hold the component. By using single fixture, loading and unloading time is high. Due to this wastage the whole production system is affected and production schedule cannot be achieved.

Instead of clamping the component individually the whole fixture is to changed for every process. The component is clamped outside the machine. By this component loading and unloading time can be fully eliminated. Here to reduce the wastage of time and cost, new fixture is to be manufactured.

Implementation of new fixture in the existing machine. Studying the productivity and cost effectiveness of the product before and after implementation of new fixture. Studying the efficiency of TMO (team member of operation). To reduce the wastage of time and cost, new fixture is to be manufactured. Instead of changing the component the whole fixture to be changed for every process.

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1.INTRODUCTION

1.1 RESEARCH BACKGROUND

The company MICROTECH POLYMERS was started in the year of 2003.

The company experise in manufacturing moulds, die and plastic components.

Manufacturers of precision plastic parts, moulds & machined components.

It is located near by Ganapathy, Coimbatore.

More than 20 Customers.

ISO 9001:2008 Certified.

QUALITY POLICY

Exceed the customer expectation by continuous up gradation of Technology and systems in a manufacturing process.

MACHINE SPECIFICATION & MANUFACTURING CAPABILITIES

Injection Moulding machines ranging from 30ton machine to 250ton machine 15Machines (Engel, Fanuc, Arburg and etc).

CNC machine (Computer Numerical Control) in VMC high speed (Vertical Machining Centre) 2machines (Makino & Hurco).

Other conventional machines with manual control, 7machines (Lathe, Sparking, M1TR, Radial Drilling & Grinding machines).

RAW MATERIALS USED

For Injection Moulding

Stannyl

Poly urethane

Hostoform ec20tx

Nylon6,66

ABS

POM (Delrin, Celcon)

LNP

Acetal

For CNC Machines

Aluminium (all grades)

Copper

Mild Steel

HDS (Hardened Die Steel)

Cast iron (C45)

P20 (Pre-hardened steel)

PRODUCT DETAILS

PRODUCTS IN AUTOMOBILE ENGG

PA-EVAP

Joint Flange

PA HE Condensor

Rear EVAP J Flange

Trumpet

Regulator Bonnet

PRODUCTS IN TEXTILE ENGG

Actuator

Slider

Cage 5 Pocket

Fly Guide

PRODUCTS IN ELECTRONICS ENGG

Connectors

941 Gear

E-Spacer Note Guide

Crown Pulley

Roll fly shaft

1.2 IDENTIFIED PROBLEM

In the company MicrotechPolymers we have discussed about the productivity of aluminium components is less and target cannot be achieved. So that they have planned for another machine. In that time they plan to improve the productivity in the same system. Then we plan for the effective utilization of the machine.

MACHINE USED

The machine used for production in MTP is CNC (Computer Numerical Control) in this VMC (Vertical Machining Centre).This is a high speed machine. Which table size is x=600mm and y=400mm.Axis travel of X, Y, Z is 600x500x500mm (the specification is machine manufacturers standard).The OEM (original Equipment manufacturer) of the machine is MAKINO Japan.

PALLET CHANGER

In this planning they introduced the pallet changer in the machine. Pallet changer is a mechanical device which is used for CNC machines for continuous production, which has two tables. In these two tables one is in machining and another is idle. During the machining time the idle table raw material is loaded. The same process vice-versa.

Shuttle type side by side pallet changer and work holding:

Integrating shuttle type pallet changers is often difficult when running more than two hydraulic lines. Reason being is there is usually some type of cable track to move the hoses, electrical, and pneumatic lines in and out. This sometimes requires extensive machine modification. Another problem is that in order to get the cable track to move the full length of the machine tool, it must float in mid air. Doing so it is only supported by the cable track construction itself.

The main fixture work holding problems and considerations with shuttle type of pallet changer are:

Two hydraulics lines maximum, preferably 1 line for single acting fixture

If robot load- preferably double acting clamps for confirmation of actual clamp positions incase of single actuating clamp malfunction. If clamp unclamp cycle is interrupted there may be some low pressure still being held by P.O. check valve.

Hydraulic clamp sequencing must be built into the fixture itself

Preferably P.O. checks on A and B if robot load. Single if no robot load

Very easy to interface electrical components into fixture if needed

1.3 NEED FOR THE STUDY

- To improve the productivity of the machine.
- To improve cost effectiveness of the product in the given time.
- To reduce machine's idle time and operator's idle time.
- Achieving the production schedule on-time and supplying to the satisfaction of customer.

FIXTURE

A fixture is a work-holding or support device used in the manufacturing industry. Which makes a fixture unique is that each one is built to fit a particular part or shape. The main purpose of a fixture is to locate and in some cases hold a workpiece during either a machining operation or some other industrial process. A jig differs from a fixture in that it guides the tool to its correct position in addition to locating and supporting the work piece.

The primary purpose of jigs and fixtures is to:

- Reduce the cost of production
- Maintain consistent quality
- Maximize efficiency
- Enable a variety of parts to be made to correct specifications
- Reduce operator errors

TYPES OF FIXTURES

GENERAL PURPOSE

They are usually relatively inexpensive and can be used to hold a variety and range of sizes of workpieces (examples: Vises, chucks, split collets).

SPECIALPURPOSE

They are designed and built to hold a particular workpiece for a specific operation on a specific machine or process.

1.4 OBJECTIVES AND SCOPE

PRIMARY OBJECTIVE

- Assessing the current productivity of the machine and to give suggestions for increasing the machine productivity.
- To assess the cost-beneficial and increased machine productivity.

SECONDARY OBJECTIVES

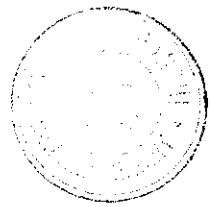
- To identify the impact on human labour on increasing the machine productivity.
- Assessing the cost effectiveness of installing the new fixture system.
- Instead of using two machines, the productivity can be achieved with single machine.
- Reducing the man power in the manufacturing system.

SCOPE OF STUDY

The aim of the project was to study the production process at Microtech Polymers. This study mainly focuses on the improving the productivity of the machine, improve the cost effectiveness of the product and to reduce the machine's idle time. It helps the organization to know about the effective production. With this study it leads to further improvement of the production process and cost analysis.

1.5 DELIVERABLES

The study conducted at the production department of Microtech polymers. Each experimental analysis gives the result among the following category such as Low, moderate and high production. From this the deliverable for the project is found out that the production system to be analyzed and modified for the stability of higher production. Analysis for the TMO to be made whether they are able to sustain with the process or some additional sources to be added.



LITERATURE SURVEY

CHAPTER 2

2.1 REVIEW OF LITERATURE

By comparing the sets of production possibilities of an economy at two or more different points in time, we infer whether there has been a change in the productive potential, that is, whether there is any input-output combination that is feasible at the later date but not feasible at the earlier date or vice versa.... It's interesting, in a world of scarcity, is whether we can obtain the same output with less resources, or a higher output with the same resources. This is where improvement in productivity or technological progress becomes important. The principal reason for our interest in the measurement of productivity is to identify and quantify technological progress.

Using the simplest theoretical example-one input and one output-if input increases, a corresponding output increase is expected (if inputs are not squandered and the system is rational). Figure 2.1 shows this relationship. When technology changes, so does the relationship between input and output. Figure 2.2 demonstrates this change as it affects the example in Figure 2.1.

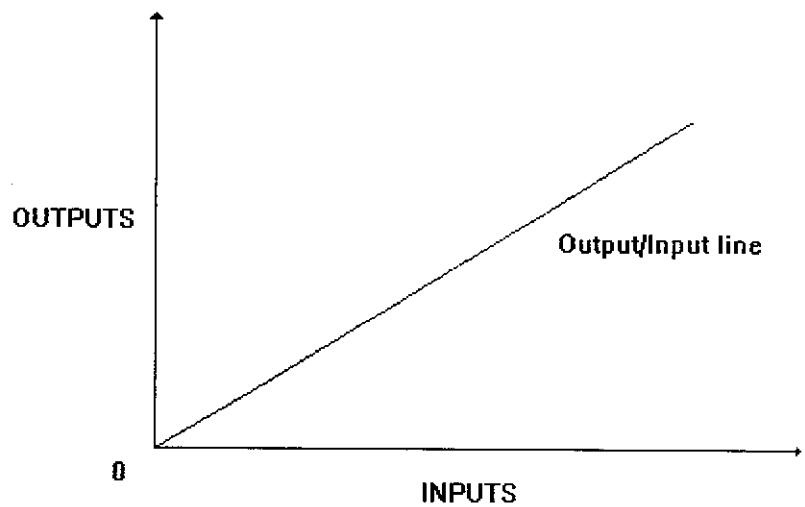


Figure 2.1 One Input and One Output.

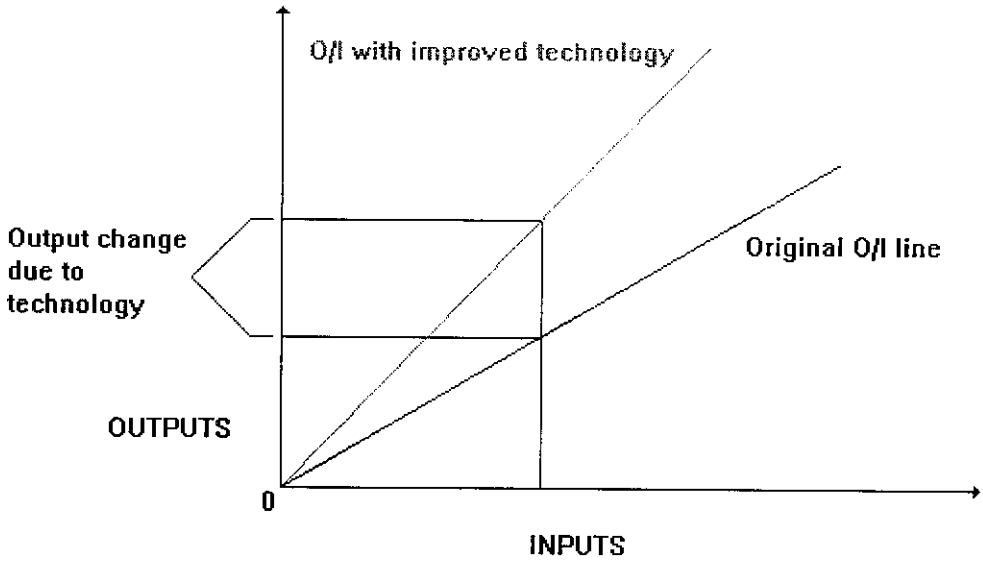


Figure 2.2 O/I With Improved Technology.

The output/input lines shown on these graphs depict the maximum output achievable for a given level of input. It labels this the "production possibility frontier." For any amount of input, this line shows the level of output the economy must produce to be considered efficient.

These examples may seem to imply that a change in productivity is easily quantified-but it is not so simple. The function that determines the production possibility frontier is normally unknown, and even experts do not always know all factors that affect it. Figure 2.3 shows an example: more than one line "explains" the increased productivity. In comparing Figure 2.2 with Figure2. 3 an alternative explanation for the change in output can be seen. Technology improvement is not necessarily the cause because the shift in production, from point A to point B, also shows on the third (curved) O/I line. The change from Ob to Oa may be the result of new technology, increased inputs, or both. And this is a simplified example, with only one input and one output; complex relationships are much harder to analyze.

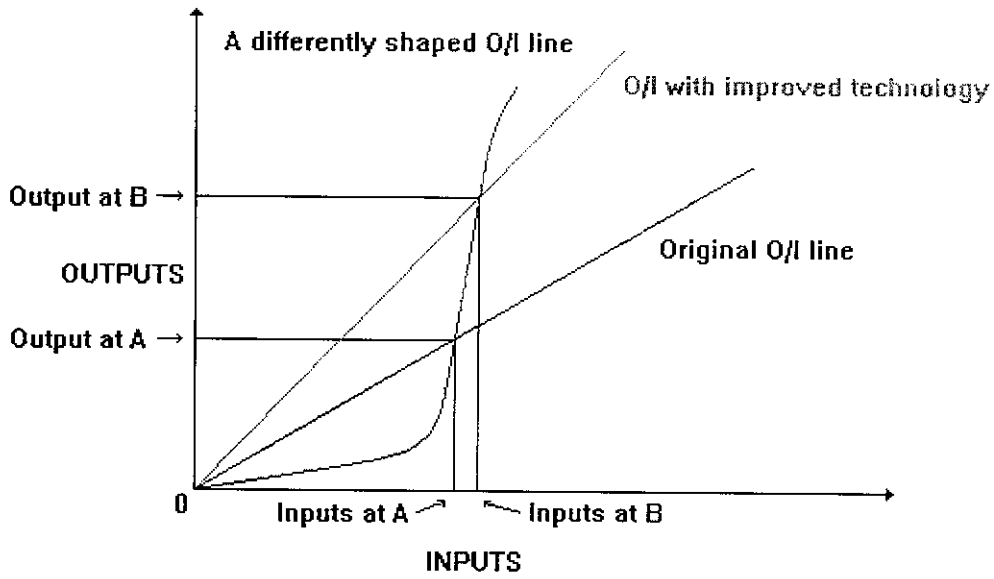
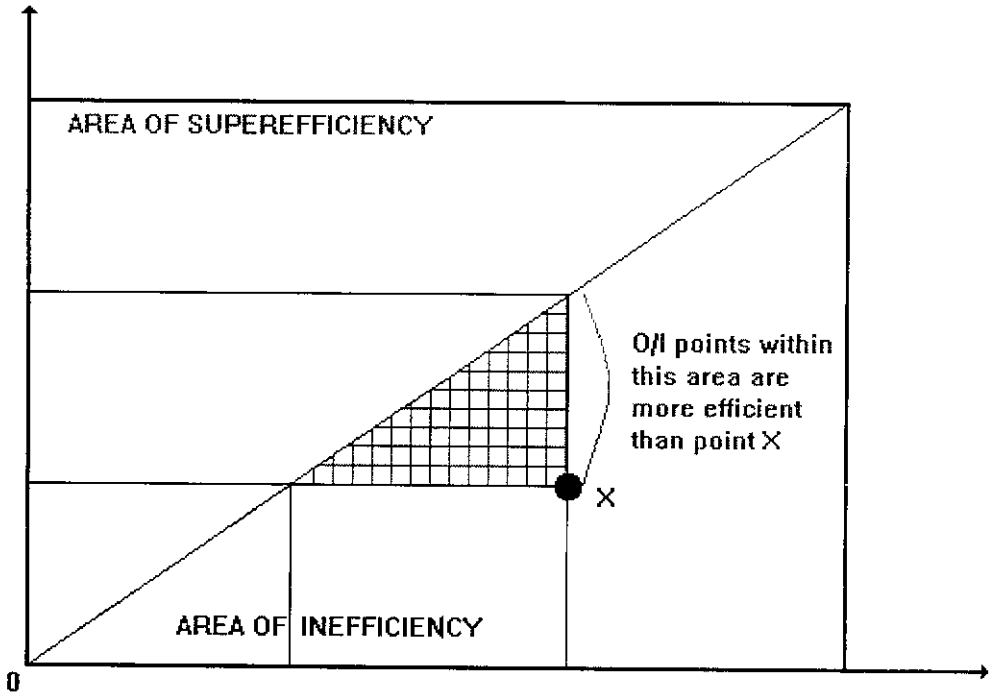


Figure2. 3. An Alternative Example.

It mentions seven such difficulties with this economic analysis. The three most relevant to measuring productivity are inefficiency, input quality changes, and nonconstant returns.

INNEFFICIENCY

Figure 2.4 shows another simple O/I line. The area under the line represents all the points of inefficient input utilization. The line indicates the points of maximum output for the given input.



OUTPUT/INPUT Graph Demonstrating Inefficiency

Figure2. 4. O/I Graph Showing Inefficiency.

INPUT/OUTPUT CHANGES

Output may drop into inefficiency if input quality is lowered. This is not necessarily true inefficiency, however. When input quality degrades, the lines must be redrawn accordingly. Only then can one tell whether output efficiency has declined.

PRODUCTIVITY AND KNOWLEDGE WORK

There is a distinct difference in the productivity of an organization and the productivity of a single work unit of that organization. It indicate this difference by use of their third objective-to establish measures that reflect an organization's degree of success in meeting its established goals. The goals for each level of the organization should differ to represent the contribution that specific level expects to make toward overall organizational goals. Therefore, each level's productivity evaluation should be different, reflecting its unique goals.

2.2 RESEARCH GAP

According to the Literature review's there are number of analysis has been conducted by the researchers all over the world regarding increasing the machine productivity and cost benefit analysis in many organization. Some researchers had studied the impact of quality of work done by the TMO's in the organization. Some other researchers had concentrated on evaluating the production process by increasing profit to the organization.

This study is conducted to know the maximum productivity and cost-benefit analysis. The gap observed is to reduce the machine's idle time and achieving the production schedule on time. This is considered as a research gap and the researcher tends to fill this gap by means of this study.

METHODOLOGY

Chapter 3

3.1 TYPE OF PROJECT

Experimental Research technique was adopted in this project. Implementation of new fixture in the existing machine. Studying the productivity and cost effectiveness of the product before and after implementation of new fixture. Studying the efficiency of the TMO (team member of operation).

- To reduce the wastage of time and cost, new fixture is to be manufactured.
- Instead of changing the component the whole fixture is to be changed for every process.
- By this component loading, Clamping, unloading & unclamping time can be fully eliminated.

A simple mathematical formula for productivity is the ratio of output to inputs. Hence we can increase productivity by keeping inputs fixed and increasing output, keeping output fixed and decreasing inputs, or increasing output and decreasing inputs simultaneously. This simple formula, however, can be misleading, as not all of the important factors that affect productivity are easily quantified. There are closely-linked technical, social, psychological, and cultural dimensions to productivity.

3.2 ANALYSIS OF PRODUCTIVITY IMPROVEMENT

1) Establish what needs to be improved and why;

2) Establish an appropriate productivity measure and a corresponding measuring system;

3) Assess the current level of productivity and set stretch productivity goals;

4) Identify key factors impacting on the productivity measure;

5) Form and train a multi-functional productivity improvement team;

6) Conduct a critical multi-dimensional analysis of each impacting factor focusing primarily on the underlying processes;

7) Establish new policy and procedures in keeping with recommendations for improvement;

8) The recommendations to all stakeholders within the organization and conduct training sessions on the new procedures where appropriate; finally,

9) Establish a system for the monitoring and review of the new procedures

FIXTURE USED TO CLAMP THE COMPONENT

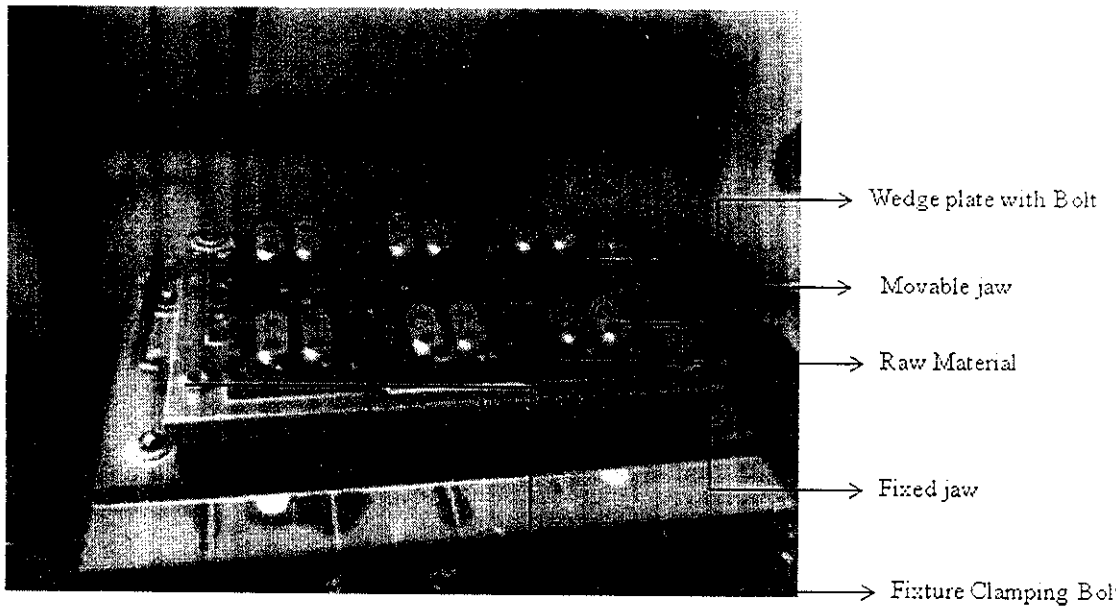


Fig 3.1

The above fig shows the fixture which is used to clamp the component. The Fixture is initially mounted in the machine table using base plate and bolts. The fixture which has the movable and fixed jaws to clamp the component. Wedge plate is used to tighten the component.

Over this only required process are made and to set as finished component. The fixture base plate is made of aluminium material to reduce the weight of the fixture.the weight of the fixture plate is 25kg (measured).

3.3 FINISHED COMPONENT EVAP

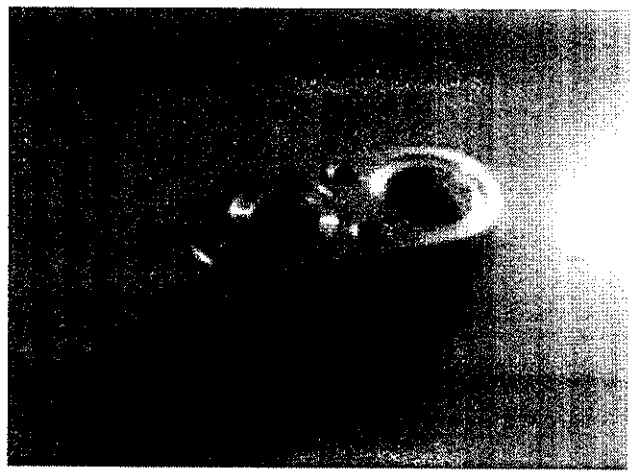


Fig 3.2

The study on machine productivity and cost benefit analysis done for the above fig 2.The raw material for the component is aluminium. For which processing time is shown below

PROCESS	TIME
Cenre Drill	45 sec
5.1 Drill	2 mins
10mm Drill	45 sec
Φ12.3/Φ19.1 Form Tool	1min
Φ16.1/Φ21.1 Form Tool	1min
M6*1P Tap	2 min 30sec
Facing	30 sec
Total Time	8 mins

PROCESSING TIME Table 3.1

3.4 CLAMPING SYSTEM

In this fixture system clamping is done for each component individually. But it takes more time for clamping. Instead of clamping the component the whole fixture is clamped and unclamped. For changing the fixtures frequently the another fixture is manufactured.

3.5 NEW FIXTURE

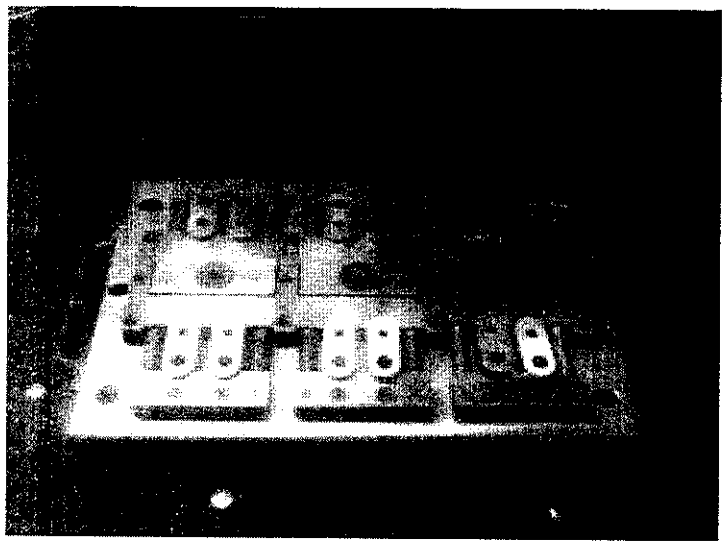


Fig 3.3

In fig 3 shows the newly manufactured fixture.This fixture is manufactured as per the specification of the old fixture.

DATA ANALYSIS AND INTERPRETATION

CHAPTER 4

4. DATA ANALYSIS

PROBLEM IDENTIFICATION

- In a machine single fixture is used to clamp the component.
- Fixture is the device which is used to hold the component.
- By using the single fixture loading & unloading time is wasted.
- Due to this wastage the whole production system is affected and production schedule cannot be achieved

4.1 TIME ANALYSIS OF EXISTING FIXTURE SYSTEM

Experimental Analysis:

PROCESS	**TIME**
Loading	2 mins
Clamping	2 mins
Processing	8 mins
Unclamping	1min 30sec
Unloading	1min 30sec
Cleaning	1 min
Total Time	**16 mins**

Table 4.1

4.2 TIME ANALYSIS OF NEW FIXTURE SYSTEM

Experimental Analysis:

PROCESS	**TIME**
Fixture Loading	1 min
Loading	0 min
Clamping	0 min
Processing	8 mins
Unclamping	0 min
Unloading	0 min
Cleaning	0 min
Fixture Unloading	1 min
Total Time	**10 mins**

Table 4.2

Trial is taken for 25sets the repeatability achieved for time.

Comparative Time Analysis for Fixture System

- By this analysis nearly 6 mins saved for every process.
- Per day 6 hrs saved. (calculation of time 20hrs per day is assumed)
- Production schedule can be achieved & depending for additional m/c not required.

4.3 IN EXISTING SYSTEM

For 1hr = 45 components manufactured (Initially for 1set 16min is assumed from the experimental analysis table)

For single component manufacturing time = 1 min 30 sec

Per day = per hr production * No. of hrs

= 45 * 20 (No.hrs production per day 20 assumed)

Per Day = 900 no's

Per Month = per day * Total no of days in month

= 900 * 26 (Avg. no of days/month 26 assumed)

Production = 23,400 no's/month

Per year = per month * total no. of months/year

= 23,400 * 12 (total no. of month /year = 12)

Per Year = 2,80,800no's/ year

The Cost of each component is fixed Rs.7.50 based on the machining time and process.

Total production cost = 2,80,800 * 7.50

Total production cost = **Rs.21,06,000**

4.4 IN NEW SYSTEM

For 1hr = 60 components manufactured (Initially for 1set 10mins is assumed from the experimental analysis table)

For single component manufacturing time = 1 min

Per day = per hr production * No. of hrs

= 60 * 20 (No.hrs production per day 20 assumed)

Per Day = 1200 no's

Per Month = per day * Total no of days in month

= 1200 * 26 (Avg. no of days/month 26 assumed)

Production = 31,200 no's/month

Per year = per month * total no. of months/year

= 31,200 * 12 (total no. of month /year = 12)

Per Year = 3,74,400 no's/ year

The Cost of each component is fixed Rs.7.50 based on the machining time and process.

Total production cost = 3, 74,400 * 7.50

Total production cost = **Rs.28, 08,000**

4.5 ANALYSIS

In Existing system total no. of components produced = 2,80,800no's /year

In new system total no. of components produced = 3, 74,400 no's/ year

Total no. of components = **93,600** no's/year produced excess.

Total production cost in existing system = **Rs.21, 06,000**

Total production cost in new system = **Rs.28, 08,000**

By implementing the new fixture system sum of Rs.7, **02,000**/year is saved.

INVESTMENT

One time investment of Rs.1.50Lakhs is required for manufacturing the new fixture system.

4.6 ADDED ADVANTAGES

- Power consumption is reduced instead of using two machines a single machine is used.
- Reducing the man power in the manufacturing system.
- Overall Equipment Effectiveness increases.
- Achieving the production target easily.
- Reduction in tools cost, maintenance cost.

4.7 LIMITATIONS

- Stress on TMO.
- Availability of the power supply for increased machine productivity.
- Life span of the machine.

4.8 EXPECTED DELIVERABLES

- Increasing the productivity of the machine.
- Cost cutting.
- Time saving.
- Using the human resources effectively.
- Reduction in number of machines used for production.

CONCLUSIONS

5.CONCLUSION

5.1 SUMMARY OF FINDINGS

Productivity measures are key indicators of economic performance and there is strong interest in comparing them internationally

Productivity is created in the real process, productivity gains are distributed in the income distribution process and these two processes constitute the production process. The production process and its sub-processes, the real process and income distribution process occur simultaneously, and only the production process is identifiable and measurable by the traditional accounting practices. The real process and income distribution process can be identified and measured by extra calculation, and this is needed to be analyzed separately in order to understand the logic of production performance.

5.2 CONCLUSION

Thus from the study on machine productivity and cost-benefit analysis at Microtech polymers it is evident that there is cost effectiveness in production process and the production time is reduced.Therefore more output is gained from the process.

ABBREVATIONS

CNC	:	Computer Numerical Control
VMC	:	Vertical Machining Centre
OEM	:	Original Equipment Manufecturer
MTP	:	MicroTech Polymers
TMO	:	Team Member of Operation
i/p	:	Input
o/p	:	Output

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