IJISET - International Journal of Innovative Science, Engineering & Technology, Vol. 3 Issue 4, April 2016.
www.ijiset.com
ISSN 2348 – 7968

Productivity Enhancement by Using Cellular Manufacturing

R. M. Dhawale s. R. Wagh
[1] M.E. Scholar, (Advance Manufacturing & Mechanical System Design) Mechanical Engineering Department, Shri Sant Gajanan Maharaj College of Engineering, Shegaon, Dist. Buldana 444203, India

[2]. Assistant Professor, Mechanical Engineering Department, Shri Sant Gajanan Maharaj College Of Engineering, Shegaon, Dist. Buldana 444203, India.

Abstract:

The more the operator's cost, the *more advantageous* it will be to have one operator run two or more machines. The more each machine's cost, the *less advantageous* it will be to have one operator run two or more machines.

In many companies I've visited, a manager can point out every penny that goes into what an operator costs (again, wages plus benefits). One company I visited even includes the cost of the parking space the operator uses to park his or her car.

However, when it comes to machine costs, they are not nearly so knowledgeable and diligent. Again, having an accurate value for both operator and machine cost is of paramount importance to making wise operator-utilization decisions. Inflated operator costs and/or devalued machine costs lead to poor operator-utilization decisions. It will appear that using one operator for two or more machines is more cost-effective than it really is.

Key point: Manufacturing Process, Cellular manufacturing, process optimization.

Introduction:

To help maintain a competitive advantage in the global economy, manufacturing companies must continuously strive to increase productivity while reducing the manufacturing cost of their products. This can be tackled in a various ways e.g. reducing inventory cost, increasing machine utilization and reducing the direct labor cost. If productivity can be improved for instance by reducing the labor content of the process, this should help to reduce the manufacturing cost of their products.

Manufacturing technologies have continually gone through gradual but revolutionary changes. These advancements in manufacturing technologies have brought about a metamorphism in the world industrial scene. They include group technology, line balancing, cellular manufacturing, CNC, CAD/CAM, FMS, robotics, rapid prototyping, environmentally sustainable technologies, etc., which have become an integral part of manufacturing.

The first step on the road towards a scientifically sound low cost automation method for a cellular manufacturing line is identifying and quantifying the different manual tasks which could potentially be automated. An adequate evaluation system considering reality, detail, and variation and effort levels has been defined in order to assess the results, suitability for evaluating manual

ISSN 2348 – 7968

work in a cellular manufacturing line, pointing out potentials and limits of the individual approaches. As the final outcome, a ranking of different work measurement concepts for the cellular manufacturing reference line is presented, verifying the applicability of the general approach and serving as a basis for further evaluation of other lines.

One of these lean practices, cellular manufacturing, is based on a group of different processes located in close proximity to manufacture a group of similar products. The primary purpose of cellular manufacturing is to reduce cycle time and inventories to meet market response times.

Some of the other benefits include:

1. Space Reduction
2. Quality Improvement
3. Labor Cost Reduction
4. Improved Machine Utilization.

Input data from industry

DATA	OLD SYSTEM
NUMBER OF MACHINE	**24**
NUMBER OF OPERATOR	**32**
SKILLED OPERATOR	**24**
UNSKILLED OPERATOR	**08**

Number of job in one shift = 2500 Nos.

Basic layout of the system

In current layout all feeding of the machine in operation 1st and 2nd have a manually input of the parts for turning operation.

ISSN 2348 – 7968

Fig.1 old system

New system

For design of new system we consider the following points which are most important to design a new system.

"**Material handling**" involves three sub-criteria based on number of operator and needed area, use of new system and use of old system.

"**Layout characteristics**" are influenced by distance between station, visibility and unity of production line.

"**Cost**" involves investment cost and operating cost.

"**Flexibility**" involves accessibility and maintenance and ability to modify with new product improvement
We add **collet** for feeding the job.

ISSN 2348 – 7968

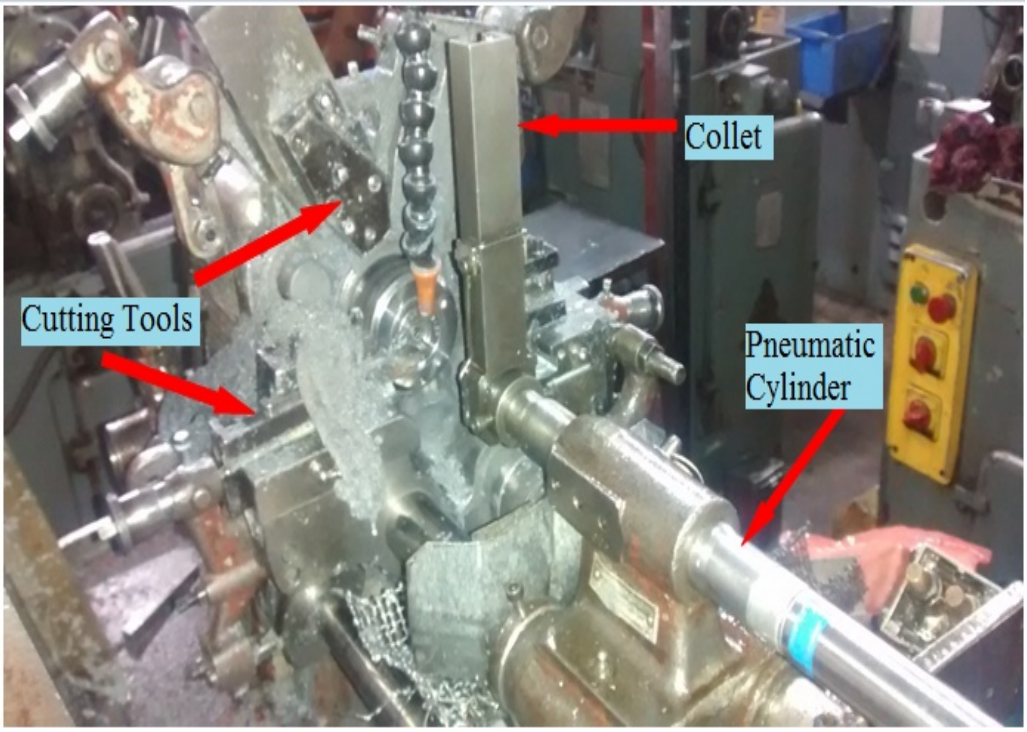

Fig.2 New system

RESULTS AND DISCUSSION

After implementation of new process it is required to evaluate total production and its cost. Available data for machining is taken for comparison with automated process. Total production cost before automation and after automation is calculated which is used for calculating total saving cost. Based on production expenditure different pie charts are plotted.

Cost distribution of old process

Cost details of 24 machines for one month are shown in table 7.1. Here the most contributing parameter is labor costing which is 75% of total production expenditure. So, project mainly focus to optimize labor cost.

Table.1 Old Process Cost Distribution

Sr. No.	Parameter	Unit Cost (Rs)	Unit	Total Cost (Rs)
1	Skilled Operator	12000	24	288000
2	Machine Maintenance	950	24	22800
3	Tool Break Down	840	36	30240
4	Electricity	8.25	2150	17740

5	Material Handling	6000	4	24000
			Total Expenditure	382780

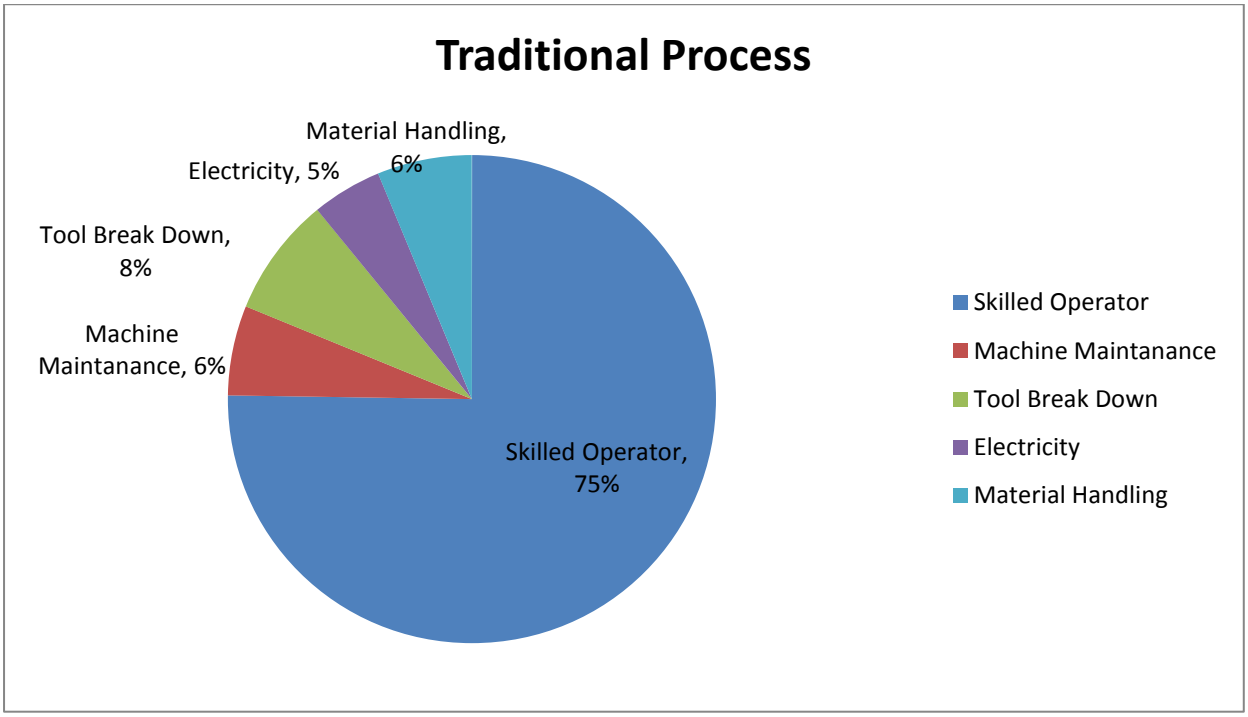

Fig.3 Pie Chart - I

Cost distribution of revised process

Cost details of 24 machines for one month after automation are shown in table 7.2. After implementing automation system labor cost is 18% of total production expenditure. So, project is able to achieve 56% reduction in labor cost.

Table.2 Revised Process Cost Distribution

Sr. No.	Parameter	Unit Cost (Rs)	Unit	Total Cost (Rs)
1	Skilled Operator	12000	06	72000
2	Machine Maintenance	950	24	22800
3	Tool Break Down	840	21	17640
4	Electricity	8.25	2830	23350
5	Material Handling	6000	4	24000
			Total Expenditure	159790

ISSN 2348 – 7968

6	Total Saving Amount	-	-	222990

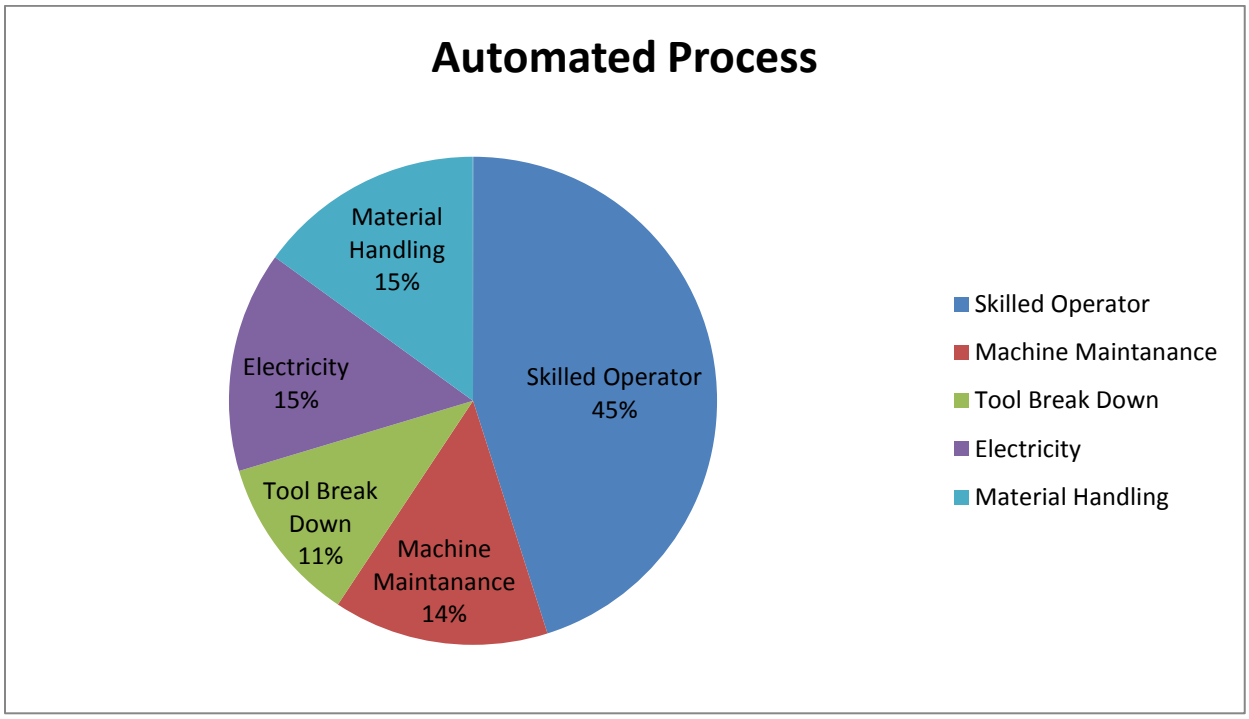

Fig.4 Pie Chart– II

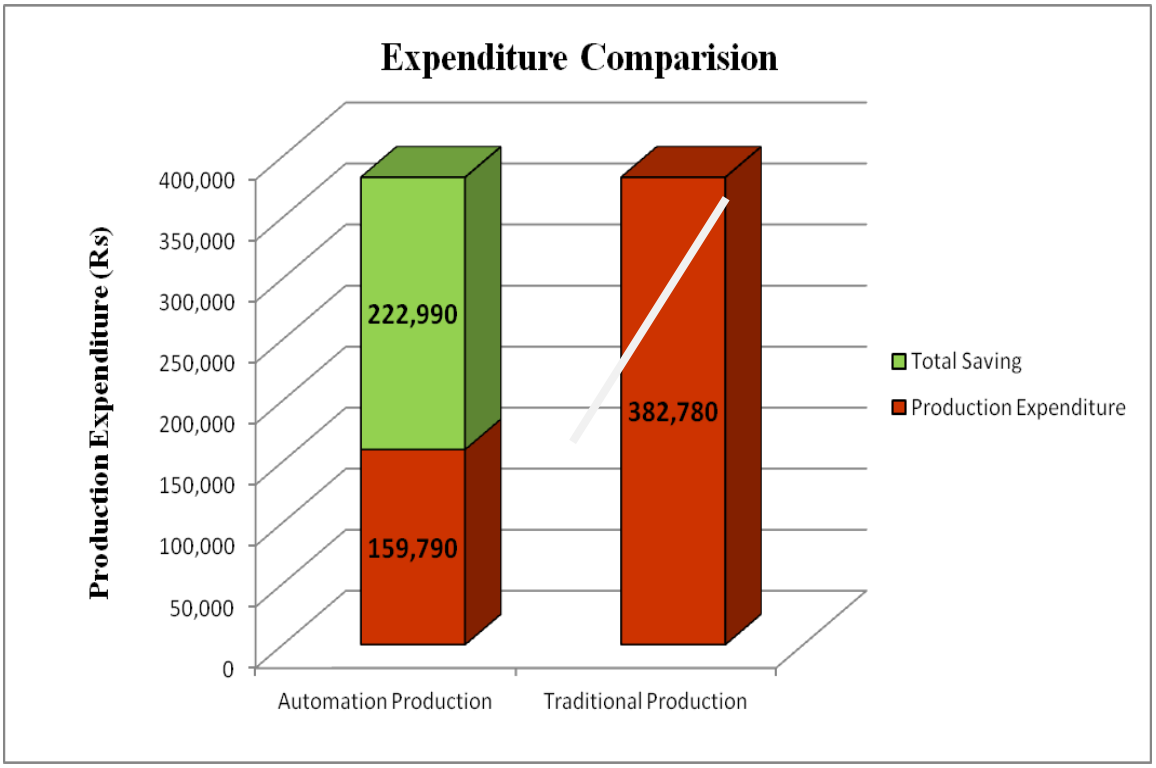

Fig.5 Expenditure review

Reviewing fig.5 it is clear that effective cost saving of 58% is achieved by implementing the project.

Conclusion:

The basic foundation for a scientifically sound method for automating a cellular manufacturing and line balancing on a low cost basis is laid as consequences of this project. The cost factor depends upon the number of the skilled worker and the number of unskilled workers. The decrease in time factor has a greater effect on cost factor for all of the variables analyzed.

The manual feeding of workpiece was replaced by automatic system, as a result the idle time of machine is reduced which led in productivity improvement. Implementing process automation system has a better accuracy and precision over the traditional system enhanced product quality. Partial effect of tool breakdown and part rejection which was at peak position in conventional system is minimized through this automation.

Finally the design of a new shop floor layout the production process flow is arranged in a systematic way which has reduced the product cycle time. Cellular manufacturing has become a key process to accomplish the stated objectives of this project.

References:

1. Cellular Manufacturing Layout DesignSelection: A Case Study of Electronic Manufacturing Service Plant. Nittaya Ngampak and BusabaPhruksaph
2. Trap Design for Vibratory Bowl Feeder Robert-Paul Berretty,Ken Goldberg Mark H. Overmars,A. Frank van der Stappen.
3. Design and implementation of cellular manufacturing In a job shop environmeLiana maríaalvarezlópez
4. Optimization methods in process plan KerkešovákristínaUniversity of žilina, faculty of mechanical engineering Department of measurement and automation, 010 26, slovak republic.
5. Shutong Xie, “Models and Optimization Techniques of Machining Parameters in Turning Operations” ISSN : 0975-5462 Vol. No. 3 March 2011.
6. Ram Kumar,” Productivity Improvement by Load Balancing of Machines”, Volume : 2 | Issue : 3 | Mar 2013 • ISSN No 2277 – 8179
7. Shahram Ariafar,” An improved algorithm for layout design in cellular manufacturing systems” Journal of Manufacturing Systems 28 (2009) 132139

ISSN 2348 – 7968

Authors:

1. R. M. DHAWALE., M.E. Scholar, (Advance Manufacturing & Mechanical System Design) Mechanical Engineering Department, Shri Sant Gajanan Maharaj College Of Engineering, Shegaon, Dist. Buldana 444203, India

2. S. R. WAGH. ASSISTANT PROFESSOR, Mechanical Engineering Department, Shri Sant Gajanan Maharaj College Of Engineering, Shegaon, Dist. Buldana 444203, India.