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## Increasing Productivity & Quality of products by Implementations of Automation in manufacturing sectors

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**Abstract:** *There are many productivity and Quality improvement techniques like method study and work measurement, cost reduction, modernization, investment in machine and equipment; re-engineering etc. automation is about speed, accuracy, precision of the process. There are many systems where we can apply automation for better and accurate result. Automation is one of the most effective methodologies for cost cutting by elimination waste as scrap, reducing man power, reducing time, controlling quality, and improving overall performance of any machine, system or process in any industry with the complete assurance of large annual profit margins. This paper talks about concept of automation, tools and technique to be used for improving productivity and Quality of manufacturing products by process of implementation of automation and its advantages.*

**Key words:** *Manufacturing, Automation, PLC, SCADA.*

### INTRODUCTION

In today's Global competition manufacturing Efficiency and Agility is not an option, but it is a strategic requirement. The production cost is increasing rapidly day to day and the labor cost, raw material cost, power cost, etc. are not in our control of manufacturer. Hence to increase the productivity and quality and reduce the production cost one can only have controls on:-

- Manpower cost – by reducing manpower.
- Utility cost – by power saving.
- Quality improvement – Through good control.
- High production – Through state of art machine
- Manufacturing time –by applying new technology

All these can be possible only by implementing automation.

### WHAT IS AUTOMATION?

Monitoring and controlling of any process with the help of advance technologies like computerized control, ladder and logic controls, Robotics, ERP system and incorporating central computer is called Automation [1]. The use of control systems and information technologies to reduce the need for human work in the production of goods and services, save money (on production and materials costs) and making money (in profits) can also defined as automation. Workflow automation uses software to control which eliminating repetitive tasks, gaining efficiency, minimizing errors and reducing costs. No matter what the size of business, be assured that automation will add increased productivity and efficiency.

### Need of Automation

Some of the reasons for need of automation are such as to Achieve more with less, Elimination of human error, Cleaner Technology, Consistency of product, Minimize Energy consumption, Easy diagnosis of fault, Reduction in Resources, Reduction of Peak Loads, Reduction in Effluent, Environment Protection, Improve Safety and Health, Reduce Maintenance (Chemicals, water, energy etc), Reduce manpower, Data collection and consolidation, Effective application for Complex tasks, Trending and Report generation,

Reduce Errors, Increase Speed, Increase Productivity -More automation equals more job capacity, shorter delivery times and optimized business operations, Reduced turnaround and fulfillment times add to overall productivity, Remove the Human Element against market- standard job, Reduce Waste, Expand Capabilities -Automating all parts of the workflow will increase capacity, Improve throughput and Optimize equipment use Workflow automation results in expanded capabilities and increased revenue.

### Objectives of the Study:

- To study the automation.
- To study need of automation.
- To study increasing Productivity & Quality Of products by implementation of automation in manufacturing sectors

### Scope of the Study, Area operation.

Indian Industrial development with the help of make in India project. If Indian industries make world class quality products properly, Indian industrial development made strong, it helps to Government and we can achieve target. Researcher selects 48 industries from Dhule City of Maharashtra State. I have selected for this research domain industrial personnel belong specially belong to production and quality departments of some reputed organizations of Dule district.

### Research Methodology of the Study

The study is based on critical evaluation and analysis of basically Primary Data. The primary sources include industrial personnel.

With the help of the questionnaire, detailed discussions were made with the certain sources of primary data to understand their views, thinking and attitude which would help to give the researchers useful recommendations, if any. The questionnaire is processed with the help of statistical tools like tabulations, grouping, percentages, growth rate, averages, etc. Questionnaire is used mainly to analyze the opinion of the industrial personnel

### Why survey among Industrial personnel's.

Industrial Development is very important in Indian economy and increasing employment .Make in India initiative for development of Indian industrialization at world level so for that it is very important to consider opinion of industrial personnel.

### Research Area

Researchers' selected small scale and Large scale Industries from Dhule city. Researchers selected 40 small scale industries and 08 large scale industries in Jalgaon city. Researcher collects data through Primary and Secondary sources. Researcher distributes questionnaires among the Industrial personnel Plant manager, Production manager, Quality manager & Maintenance manager in each industry.

### Data Analysis

Researcher prepared the questionnaire for Industrial personnel and distributes it among the Industrial personnel Plant manager, Production manager, Purchase manager & Maintenance manager in each industry total 48 industry in which 40 are small scale industries and 08 large scale industries. After receiving the questionnaire researcher analysis the questionnaire and make four groups of Plant manager, Production manager, Quality manager & Maintenance manager.

Table 1 Information of Questionnaire

Sr. No.	Type of Industries	Plant manager	Production manager	Purchase manager	Maintenance manager	Total
1	Small scale	40	40	40	40	160
2	Large scale	08	08	08	08	32
	Total	48	48	48	48	192

From above There are 192 questionnaire received from group two type of industries small scale and large scale industries , after analysis, researcher select 100 % respondents i.e. 192 for study.

### Testing of Hypothesis:

To study increasing Productivity & Quality Of products by implementation of automation in manufacturing sectors.

$H_0$  (Null Hypothesis) There is no increasing Productivity & Quality Of products by implementation of automation in manufacturing sectors.

$H_1$  (Alternative Hypothesis) There is increasing Productivity & Quality Of products by implementation of automation in manufacturing sectors.

Chi-square formula for testing hypothesis is as follow:

$$X^2 = \sum_i \sum_j (O_{ij} - E_{ij})^2 / E_{ij}$$

While applying the Formula. Following two tables were prepared.

Table 2 Testing of Hypothesis

Sr.No.	Name of Respondent	YES	NO	TOTAL
1	Plant Manager	37	11	48
2	Production Manager	33	15	48
3	Quality Manager	31	17	48
4	Maintenance Manager	27	21	48
	TOTAL	128	64	192

Table 3 Testing of Hypothesis

O <sub>ij</sub>	E <sub>ij</sub>	O <sub>ij</sub> -E <sub>ij</sub>	(O <sub>ij</sub> - E <sub>ij</sub> ) <sup>2</sup>	(O <sub>ij</sub> - E <sub>ij</sub> ) <sup>2</sup> / E <sub>ij</sub>
37	32	5	25	0.78
33	32	1	1	0.03
31	32	-1	1	0.03
27	32	-5	25	0.78
11	16	-5	25	1.56
15	16	-1	1	0.06
17	16	1	1	0.06
21	16	5	25	1.56
			Total	4.86

Thus From the above we have calculated value of X<sup>2</sup> is 4.86

Now, Critical Value of X<sup>2</sup> Statistic for (m-1) (n-1) is denoted by X<sup>2</sup><sub>(m-1)(n-1)</sub>

Where (m-1) (n-1) are degree of freedom i.e. (4-1) (2-1) = 3

The table value at 5 % I.o.s. is 7.815

Thus, the observed value X<sup>2</sup><sub>0</sub> > X<sup>2</sup><sub>3;0.05</sub>

Hence, reject H<sub>0</sub>, and accept H<sub>1</sub>

Therefore, there is increasing Productivity & Quality Of products by implementation of automation in manufacturing sectors.

### METHODOLOGY FOR IMPLEMENTATION AUTOMATION

- It is very important to identify the needed and the feasibility of the system to be automated.
- The production cost, the complicity of the machines, the utility requirement of the machines, quality parameters of the products are most important factors to consider while planning for Automation.
- Select the system which has Flexibility, Ease of Programming, Adaptability to change, Expandability, Enhance ability of function, Ruggedness in system, Service back up.
- Performance factor for automation are Response Time, Reliability, Maintainability, Availability and Capability etc. .

### TOOLS FOR AUTOMATION

- PLC - A programmable logic controller, PLC, or programmable controller is a digital computer used for automation of typically industrial electromechanical processes, such as control of machinery on factory assembly lines, amusement rides, or light fixtures.
- SENSORS - A sensor is a transducer that converts a physical stimulus from one form into a more useful form to measure the stimulus.
- ACTUATORS - Hardware devices that convert a controller command signal into a change in a physical parameter.
- DRIVES - Whenever something must be moved, a motor is usually at the source of most automated equipment. There are many types of AC and DC motors.
- SCADA - SCADA (supervisory control and data acquisition) is a system that operates with coded signals over communication channels so as to provide control of remote equipment (using typically one communication channel per remote station.

### EFFECT ON PRODUCTIVITY AND QUALITY

- Increasing production by avoiding manual delays.

- Improving productivity by achieving the optimum efficiency of the machine.
- Avoiding reprocessing and improving the productivity.
- Automation improves the power saving possibilities and hence the cost of product goes down.
- By avoiding manual error it improves the quality of product and hence productivity.
- Automation can give useful data of the machines which increases the possibility of analyzing the cause of low or poor productivity.

## CONCLUSIONS

From the above discussion, it can be concluded that, from study of process which is used in automation, the required results of improving productivity can be achieved in limited or very less resources in return. With a proper implementation of automation process stated above, problems can be efficiently classified in corresponding area and those techniques can be applied one by one to get long lasting results along with improved productivity as well as profit margin.

In addition to manufacturing sector, many tools and techniques of automation can be applied to various other industries and educational institutions to improve efficiency and productivity.

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