

# Role of Ergonomics to Improve Productivity in Textile Industries

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**Abstract**—It is distinct trait of our civilization ,human being rarely works without help of machine or equipments .It is also observed that the machine can run long without intervention of human being . Work is done either by man or machine. Productivity is commercial term directly associated with 5 M's machine, man, material, money and management. In this project emphasis has been paid to improve the small scale industries i.e. textile industries. Ergonomics has taken as subsystem under which fatigue and safety is analyzed .Wrong postures gives different kind of problems muscular, ophthalmological and orthopedical, cause reduction in productivity. With the provision of correct body posture and using different productivity models application of ergonomics reduces the absentia ,truancy of workers . productivity can be improved in small scale industries like textile industries. In this way we can improve the GDP of our country by providing attention towards ergonomics (OHS).

**Key Words-** Ergos, Nomos,OHS,DC.GDP

## I. INTRODUCTION

The word ergonomics is derived from two Greek words ergos means work nomos means law. This word was introduced in 1949 by a group of British scientists who were concerned with the efficient use of complex military equipment during the Second World War. We can say it is human engineering this word is used in country like USA but in European countries this is called Ergonomics. Ergonomics is multidisciplinary area of study. Various disciplines have influence on human factors.

1. Engineering: Design and work system suitable for workers.
2. Physiology: Study of man and its working environment
3. Anatomy: Study of body dimensions and relations for work design.
4. Psychology: Study of adaptive behavior and skills of people.
5. Industrial Hygiene: occupational hazards and workers health.

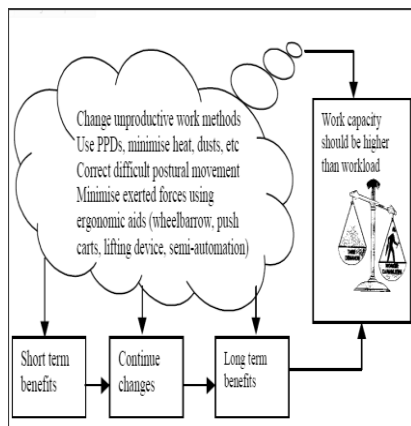
These are following areas where we can study about human engineering or ergonomics:

- i. Anthropometry and bio mechanics.
- ii. Control of physical work environment.
- iii. Design of man –machine system.
- iv. Accidents fatigue and safety
- v. Work place design.

Occupational health and safety (OHS) primarily seeks to maintain the working ability of the labor force as well as to identify, assess and prevent hazards within the working environment. Ergonomics, on the other hand, combines all of these issues to improve workers' efficiency and well being and maintain industrial production through the design of an improved workplace. OHS and ergonomic applications therefore work together to satisfy the needs of changing local people's attitudes, local work methods and/or traditional ways of doing things. These issues are important for many developing countries (DCs), because the effects of poor health and lack of safety facilities, and non ergonomics conditions exist in various workplaces are a hindrance to the national economy and social progress. Since implementing the full concept of OHS and ergonomics application is a priority, understanding the meaning of the terms related to OHS and ergonomics applications is a major source of workplace improvement. It is therefore important for both foreign and local investors to investigate workplaces, to know how a tool, machinery and production process would match the local workers' physical and mental capabilities of the local population. OHS and ergonomics issues have a connection with various components in the regional economy since the provision of health, hygiene and safety in the workplace contributes to economic growth processes in a number of ways. OHS and ergonomic issues are also related with the production economy and social progress, and thus, important components of gross domestic product (GDP)—which are considered as inputs into the national economy through industrial development. It is therefore important to know what socio-economic and industrial strategies would be most fruitful if OHS and ergonomic applications are to be implemented in practice. This is because the GDP lost in work-related injuries and occupational disease stemming from a poor work environment is not counted in DCs. In many DCs, physical work practiced as manual materials handling (MMH) and strenuous tasks which usually take a toll as injuries, accidents and production loss, because numerous risky and hazardous jobs and strenuous tasks still have yet to be semi-automated or be transferred to other forms of controlled environment. Hundreds of thousands of workers living in DCs will be at risk if no future attempts are made successful for the improvement of health and hygiene. For unhygienic workplaces, these risks

are real, and there is a long term trends in occupational exposure in DCs. The rapid rate of changes in working life today also requires several types of flexibility with the consideration of occupational health, industrial hygiene and safety requirements in various workplaces.

New industrial entrepreneurs also need to have the capacity to provide a rational basis of new thinking and solutions for sustainable development of workplace safety and health. The efficiency of the work force should increase as the workers could devote their attention to the jobs rather than to the tools needed to pursue their job tasks. This devotion can be introduced as formal and informal methods to assist individuals in acquiring knowledge on OHS, as well as an ergonomic way of doing things. It is also believed that the sustainable development of the workplace will be achieved for long term benefits if health, safety and ergonomic issues are given priority in the local context. Fig (1.1)



**Fig 1.1: A conceptual model based on health, safety and ergonomic measures for sustainable workplace improvement that increase working capacity and decrease workload.**

## II. LITERATURE REVIEW

A. The main objective of this research was to investigate ergonomics, occupational health and safety problems of an oil industry in a developing country. Fifty-six industrial unit managers participated in the study. Forty-eight percent of the managers received worker complaints of back pain, 36% of fatigue, 32% of upper-body pain, 48% of stress and 46% of dissatisfaction. Fifty-seven percent of the managers reported a hot environment, 36% a noisy environment, and 41% a lack of resources and facilities. Sixty-two percent had no knowledge or access to ergonomics information, while 64% of the managers did not carry out an ergonomic assessment of their units. A significant correlation ( $p < 0.01$ ) was found among ergonomics and safety indicators and average injury rates. Lack of skills in ergonomics, communication and resources are believed to be some of the major factors contributing to the poor ergonomic conditions and consequent increase in health and safety problems in this industry it is large kind of

industries where so many workers are doing their work there might be lot more chances of accidents, utmost attention should be paid by management to improve ergonomics and OHS, as a result productivity can be increased.[07]

B. The ILO has a mandate to protect workers against sickness, diseases and injuries due to workplace hazards and risks including ergonomic and work organization risk factors. One of the main functions for the ILO is to develop international standards related to labour and work. ILO standards have exerted considerable influence on the laws and regulations of member States. The ILO standards take the form of international Conventions and Recommendations. ILO Conventions and Recommendations relevant to protection of workers against ergonomic risk factors at the workplace include Convention No. 127 and Recommendation No.128 which specify the international requirements concerning the manual transport of a load. To help member States in applying the ILO standards, the ILO produces practical guides and training manuals on ergonomics at work and collects and analyses national practices and laws on ergonomics at the workplace. The ILO also conducts technical cooperation activities in many countries on ergonomics to support and strengthen the capacities of its tripartite constituents in dealing with workplace ergonomic and work organization risks. The ILO's technical cooperation activities give priorities on the promotion of voluntary, participatory and action-oriented actions to improve working

conditions and work organizations of the small and medium sized enterprises. This paper reviews ILO's policies and activities on ergonomics in relation to occupational safety and health and prescribes ILO's considerations for its future work on ergonomics. ILO plays very vital role for ergonomics and OHS implementation. owner commonly don't care about health and safety of workers. Particularly in small scale industries never bother about OHS.[06]

## III. PROBLEM IDENTIFICATION

1. A Study of textile industry revealed that the productivity of the industry decreased as compared to the last third year.
2. It was found that the working condition and workers are the same.
3. Absentia is increased and interest in work has been reduced since last third year.
4. Increased complain of body related problems.
5. Above mentioned problems given me sufficient reason for ergonomics study.
6. Workers are switching over in another profession.
7. Owners are not implementing OHS norms in industry.

IV.METHODOLOGY

Productivity measurement by PO-P approach consists of the following steps:

- 1) Identifications of sub systems
- 2) Identification of KPA's in each of the sub systems
- 3) Setting of performance objectives
- 4) Ranking and weighting of sub systems, KPA's and Performance Objectives
- 5) Determination of Objectivated Output
- 6) Calculation of Productivity Index

PO-P The Model:

Under PO-P approach productivity index for the system is built up in stages from the productivity indices of the sub-systems constituting the system. Productivity index of a sub-system is in turn built up from the productivity indices of the Key Performance Areas(KPA's) of that sub-system.

Let

U=the sub-system

V=the KPA

Y=the Performance Objectives

W=the Weightage factor

O<sub>yvu</sub> =the Performance Value of PO-y in KPA-v in sub-system u

O'<sub>yvu</sub>=the Objectivated Output of PO-y in KPA -v in sub-system u

Productivity Index PI of a system S, is arrived at as,

$$PI = \sum_{U=1} W_u (PI)_u \text{ -----1}$$

Where,

$$\sum_{U=1} W_u = 1,$$

U=1

(PI)<sub>u</sub> the Productivity Index of sub-system u is determined as,

$$(PI)_u = \sum_{v=1} W_{vu} (PI)_{vu} \text{ -----2}$$

Where,

$$\sum_{v=1} W_{vu} = 1, \text{ for all } u's.$$

v=1

(PI)<sub>vu</sub> ,the Productivity Index of Key Performance Area,v of sub-system u is given as,

$$(PI)_{vu} = \sum_{y=1} W_{yvu} O_{yvu} / O'_{yvu} \text{ -----3}$$

$$\sum_{y=1} W_{yvu} = 1, \text{ for all } u \text{ and } v$$

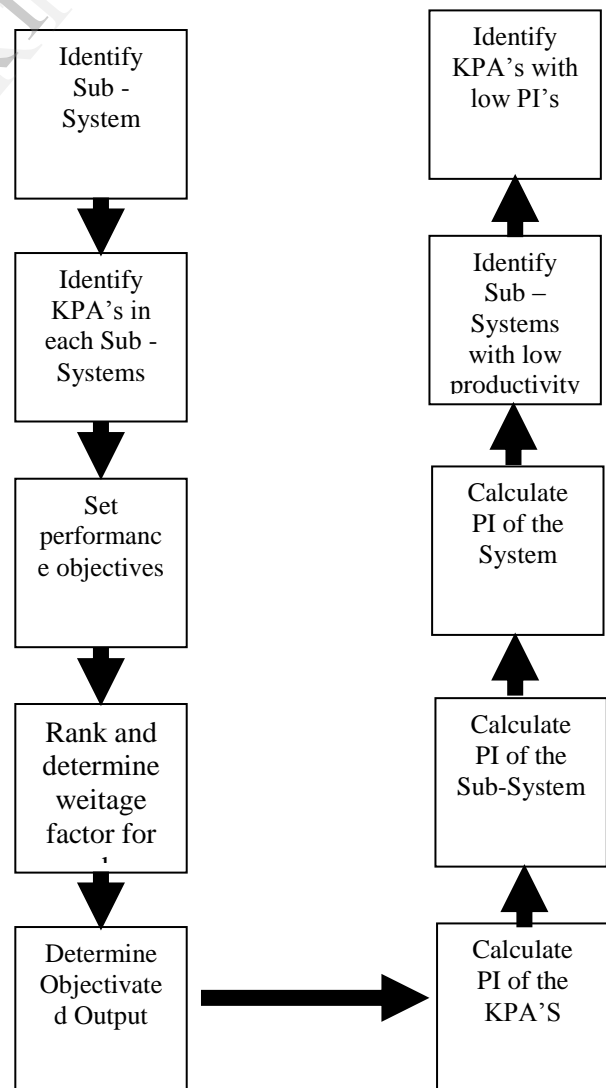
Substituting values of (PI)<sub>vu</sub> from equation (3) in equation (2) Productivity Index (PI)<sub>u</sub> of a sub-system u, can be rewritten as,

$$(PI)_u = \sum_{Y=1} \sum_{V=1} W_{vu} W_{yvu} O_{yvu} / O'_{yvu} \text{ -----4}$$

Value of (PI)<sub>u</sub> from equation (1.4) can be substituted in equation (1.1) to provide PI, the Productivity Index of a system S, as

$$PI = \sum_{U=1} \sum_{V=1} \sum_{Y=1} W_u W_{vu} W_{yvu} O_{yvu} / O'_{yvu} \text{ -----5}$$

**Flow chart for the procedure for use of PO-P approach for productivity measurement**



A typical industrial organization engaged in manufacturing and marketing of engineering goods can be considered to operate as a system with the following sub-systems;

1. Production sub-system
2. Marketing sub-system
3. Financial sub-system
4. Technology sub-system
5. HRD sub-system
6. Materials sub-system

## V. DIFFERENT TYPES OF HAZARDS

### **Diseases and Disorders** **Musculo skeletal problems**

#### **Sitting position:**

#### **Discrepancies:**

Flexors knee compression with over acting of muscle group of knee and over stretching extension of knee.

Compression of knee joints with over action of hip flexors and over stretching of hip extension leading to osteoarthritis of knee.

Leading to osteoarthritis of hip.

#### **Deformity:**

Over flexors of spine leading to hyper stretching of flexors group of spinal muscles and over stretching of back spinal muscles, leading degenerative position of spine.

#### **Remedies:**

Correct posture, avoid knee bending and hip bending for pro long period.

Try to sit in straight posture without bending of spine.

Strengthening exercises of knee extension around knee and hip joint and back muscles.

#### **Discrepancies:**

Spinal muscles and Knee under compression.

Neck muscles under compression.

Over stretching of spine.

Hip joint muscle under great compression.

#### **Deformities:**

Knee and spine under compression leading to degenerative position of spine.

Compression of knee joints leading to osteoarthritis.

Compression of neck muscles leading to spondylitis.

#### **Remedies:**

Correct posture, Try to keep straight and stable standing posture without bending of spine.

Strengthening exercises of knee extension around knee and hip joint and back muscles, mobilizing exercises of shoulder joints, neck muscles

#### **Stretching:**

#### **Discrepancies:**

Spine is not in proper position forward bending is more? So flexors of spine are more acting as compared to extensor muscles group.

Knee under over compression.

Improper foot position, foot joints under and over compression

Shoulder under over compression.

#### **Deformity:**

Forward spine bending leading to degenerative changes in position of spine.

Mild flexion of hip and knee joints.

Under compress shoulder leading to degenerative changes in shoulder including stiffness of muscles around shoulder joint.

#### **Remedies:**

Correct posture with back support in chair

Shoulder and elbow mobilizing exercises

Avoid forward bending for prolong period

Try to maintain straight posture without bending of spine

Muscles strengthen exercises of knee extension, hip joints and back muscles

#### **Bending:**

#### **Discrepancies:**

Bending of lower spine and cervical region, knee under compression, over stretching extensors of knee with overacting of flexors muscles group of spine, knee and hip.

Leading to hyper stretching of flexors group of spinal muscles.

Leading to degenerative position of spine.

#### **Deformity:**

Hip and knee under over compression leading to degenerative changes in hip joint and lower spine, including stiffness of muscles around hip joint .

#### **Remedies:**

Correct posture with back support.

Spinal muscles strengthening exercises, hip joint mobilizing exercise

Avoid knee bending and hip bending for prolong period.

#### Deformity:

Forward spine bending leading to degenerative changes in position of spine.

Mild flexion of hip and knee joints.

Under compress shoulder leading to degenerative changes in shoulder including stiffness of muscles around shoulder joint.

#### Remedies:

Correct posture with back support in chair

Shoulder and elbow mobilizing exercises

Avoid forward bending for prolong period

Try to maintain straight posture without bending of spine

Muscles strengthen exercises of knee extension, hip joints and back muscles

#### VI. Suggestions

- Proper shop-floor design to improve workers efficiency. "The big problem is no uniformity of intensity of light.
- The workers should work on shift basis.
- Congestion of machine installation creates lot of problems.
- Need to develop a proper ventilation process, so it eliminates the suffocation.
- Employ laborer act.
- Govt should provide more continuous power to industries.
- Chhattisgarh should export spun cloth to earn more foreign exchange.
- Machinery should be upgraded.
- Output per laborer should be increased.

#### WEIGHTAGE OF SUB-SYSTEMS

CODE	SUB SYSTEMS	RELATIVE MARKS	WEIGHTAGE	SUB-SYSTEMS	RELATIVE MARKS	WEIGHTAGE
A	production	5	0.192	production	5	0.208
B	technology	5	0.192	technology	5	0.208
C	materials	1	0.038			
D	goals & values	1	0.038			
E	marketing	10	0.384	marketing	10	0.417
F	ergonomics	4	0.153	ergonomics	4	0.167
	TOTAL	26	1		24	1

#### VII. RESULT AND DISCUSSION

From a survey of the handloom or power loom operating in various parts of the chhattisgarh state .I have a firm conviction that it is very much possible to make these shop-floor 'CLEAN' to provide congenial and hygienic atmosphere to the workers. The way is there, will is needed. All the improvements hinted above need be followed strictly. It will not only result in overall saving of power ,fuel but will also make the workplace clean. Minor investments in these efforts will be more than compensated by the healthy and hygienic environment that has so far eluded the textile industries.

It is time textile industry quits its old fashioned look of an introvert organized system and comes forward as a progressive and modern looking organization. The industry should voluntarily cooperate with statutory bodies in state and national interest to safeguard to be available to the prosperity . I hope the state government will rise to be occasion and take up the challenge of providing a 'CLEAN' 'HYGEINIC' environment to the workers in their . I am convinced they will succeed in this earnest effort.

The anticipated productivity index have increased from .6791 to .7832. Productivity can be increased by the application OHS and Ergonomics in small scale industries

by more than 10% . Application of OHS and Ergonomics are generally ignored by small scale industries management people.

#### IX.CONCLUSION

- The existing level of productivity is measured using technique of productivity measurement, termed as Performance Objectives – productivity (PO-P). PO-P approach lays stress on the aspects of identification of areas with low productivity so as to bring about improvements. Its basic philosophy lies in the belief that input resources of an organization cannot be viewed in isolation. A methodology has been presented to help in identification of key performance areas, performance objectives and their weightage. To include performance objectives of qualitative nature's questionnaire is used. For productivity measurement three sub – systems mainly 'Technology', 'Workplace' and 'Market' has been identified where improvement in productivity was needed. For productivity enhancements, in the area of 'Technology ', 'workplace' and 'Market factor', the Study looked at each of these sub - system and came up with suggestions that enhances productivity of these significantly.

- From a survey of the shopfloor operating in various parts of the Chhattisgarh state .I have a firm conviction that it is very much possible to make these



floor 'CLEAN' 'HYGEINIC' 'VENTILATED' 'PROPER LIGHTING INTENSITY' to provide congenial and hygienic atmosphere to the workers. The way is there, will needed. All the improvements hinted above need be followed strictly. It will not only result in overall saving of power but will also make the workplace clean. Minor investments in these efforts will be more than compensated by the healthy and hygienic environment that has so far eluded the shopfloor.

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