

# Development of a Comfortable Ergonomic Chair for Workers

Mr. Savan S. Sidhdhapura<sup>1</sup>, Professor Hiren J. Yadav<sup>2</sup>, Mr. Dhaval M. Savaniya<sup>3</sup>  
Mr. Raj S. Sojitra<sup>4</sup>, Mr. Aakash H. Bhogesara<sup>5</sup>

<sup>1,2,3,4,5</sup> Department of Mechanical Engineering  
<sup>1,2,3,4,5</sup> Balaji Institute of Engineering & Technology, Junagadh, Gujarat, India

\*\*\*

**Abstract:** - In India, there are huge peoples searching for jobs. Peoples are going to work with a manufacturing companies as a labor. From the statistics of International Labor Organization for India, during 2009-10 the total employment is 459 million and during 2011-12 it increase to 472.9 million [1]. The aim of this work is to develop a device like chair for workers who standing continuously in industries. Providing this comfortable chair to worker have many advantages over regular work position. The development of this chair concerned with an ergonomics to increase a performance of the workers [2]. An attempt is done to overcome from worker's health problems and develop a ergonomic device for the future companies.

**Key Words:** - *Ergonomics, Exoskeleton, Health of workers*

## 1. INTRODUCTION

The manufacturing industry has experienced continuous growth due to requirements of customers. In company many operations are carried out like machining, cleaning, joining, inspections, etc. Generally workers are perform all this activities in standing operation. Many studies are conducted on the worker's safety, health and comfort [2]. Hazard magazine in UK give briefly report on problems due to standing position of workers in August 2005. Doctors warned that health problems occurs because of continuous standing of workers such as painful feet and legs, swelling in feet and legs, low back pain, restricted blood flow, arthritis in knees and hips, high blood pressure, heart and circulatory problems[3]. This design is aim to adopt a new approach to wearable ergonomic device comfortable chair which is unique itself. Comfortable chair enables a completely new experience of resting worker's legs while moving around. Our innovation is based on robotic principles for Bio-Inspired Legged Locomotion and actuation. Integrating the knowledge and insights gained from these research approaches has allowed us to overcome the weight. The "chair" is not only chair as we know it, but more of an exoskeleton for the legs with a belt to attach it to the hips and straps that wrap around the thighs. The advantage of this chair is that it can be worn anywhere and can also be used when standing and walking. This reduces the space required as compared to a traditional chair and reduces the hassle when compared to

other solutions, such as chairs that are strapped to the user.

## 2. METHODOLOGY

### 2.1 Survey

The study involves 10 workers in industry in Rajkot, Gujarat. A survey was conducted to collect necessary information about workers, where they feel more strain, pain during working. All workers for study consisted of male. They all are of age group between 22-30. They were work in company for 4-5 years. Their working hours are 8-10 hours per day and their working days are normally 6 days per week.

### 2.2 Evaluation

Comfort is a state and it is a subjective feeling corresponding with positive state, relaxation, free of pain, pleasant experience; and it includes physiological, psychological and physical satisfaction with the environment [4]. In spite of different understanding of comfort from different point of views, the methods of evaluating comfort are divided in subjective and objective evaluations [5]. Subjective evaluation methods are used to obtain the feelings of respondents (users) through mechanisms like questionnaire. There are many techniques for subjective evaluation like General Comfort Rating (GCR) and Overall Comfort Index (OCI). The evaluation method used for this test was subjective. To carry out subjective evaluation, new type of evaluation method was developed by merging and modifying other subjective methods [6, 7]. It was a questionnaire type which asked to rate comfort and discomfort of body parts and workstation parts. It was called Global User Comfort (GUC) evaluation and used to evaluate each type of working position comfort separately. In the evaluation, subjects performed three kinds of common operations. The tasks were drilling, inspection, assembly. Worker were perform this tasks in standing position.

### 2.3 Questionnaire

In the section of questionnaire, workers were stand for 1 hour and they rate their feeling for working position. The four general body parts were namely: shoulder and arm, lower back, thigh and knee and leg and foot. The rating of comfort was divided in 5 comfort scales. These are uncomfortable, normal, barely comfortable, quite comfortable and very comfortable, numerically -1, 0, 1, 2 and 3, respectively. The baseline for comfort was "normal" (0) comfort scale.



Fig. 1. Chair design

### 3. RESULT AND DISCUSSION

Among the 10 workers, all of them said that they do not feel body pain or discomfort during or after work. The neck, shoulders and back are the body parts where pain is mostly reported. Based on observations of this study and survey answers of the workers, workers were supposed to work continuously in standing position, this results in health problems. Also, the shoulders and back also suffer from pain. The result shows that there is need to change traditional working position of workers so that can reduce worker's health problems and increased worker comfort can also lead to the improvement of efficiency of them.

### 4. CONCLUSION

In conclusion, it is cleared that from references that continuous standing position of worker causes a health problems. So this chair is designed to improve efficiency of workers and give them a better workplace in addition to better health.

### 5. RECOMMENDATION FOR FURTHER STUDIES

Design of this chair with simple hand operated lock, hence further study could include power electronics for lock, and also include more light weight and sustainable material for chair.

### ACKNOWLEDGEMENT

I would like to express my gratitude to many peoples who have assisted me during this project work special thanks must go to my guide Prof. H. J. Yadav for their continued support and guidance. Also I would like to give special thanks to our HOD, and principal.

### REFERENCES

- [1] International labor organization for India, July 2016 ([www.ilo.org>publication>wcms\\_496510](http://www.ilo.org/publication/wcms_496510))
- [2] Rosanna Alojado\*, Benette Custodio, Klarissa Mai Lasala, Paco Lorenzo Marigomen, "Designing an ergonomic chair for pedicurists and manicurists in Quezon City, Philippines", 6th International Conference on Applied Human Factors and Ergonomics (AHFE 2015) and the Affiliated Conferences, AHFE 2015
- [3] "Standing problems", Hazard magazine, UK, August 2005 ([www.hazards.org/standing/](http://www.hazards.org/standing/))
- [4] Tom Bendix, Flemming Bo Jessen and Jorgen Winkel, An evaluation of a tiltable office chair with respect to seat, European Journal of Applied Physiology, 1986
- [5] Michiel P. De Looze, Lottie F. M. Kuijt-Evers and Jaap Van Dieen, Sitting comfort and discomfort and the relationships with objective measures, Ergonomics, 46 (2003), pp. 985-997
- [6] Guangyan Li and Peter Buckle, Current techniques for assessing physical exposure to work related musculoskeletal risks, with emphasis on posture-based methods, Ergonomic, vol. 42, No. 5 (1999), pp. 674-695
- [7] Waldemar Karwowski and William S. Marras, Occupational Ergonomics Engineering and Administrative Controls, CRC Press ILC (2003),ch. 26