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RESEARCH ARTICLE

Furnace Redesign to Reduce Levels of Dust in the Air, Fatigue, Workload, and Increasing Blacksmith Productivity in Batu Sangiang Village, Tabanan, Bali-Indonesia

Ida Ayu Made Sri Arjani[1*], Ni Nengah Ariati[2], Cok Dewi Widya Hana Sundari[3]

Polytechnic of Health Denpasar.

***Corresponding Author: Ida Ayu Made Sri Arjani**

Abstract

Introduction: Exposed to a hot environment for work is a situation that can potentially pose a danger to the safety and health of workers. Besides resulting in pain and injury, it can also cause occupational diseases. Blacksmithing was carried out with furnace and open flame, where the iron that will be heated with a sharp object repeatedly were sharpened again. The working process is quite heavy with exposure to heat radiation from the furnace and dust increasing fatigue and workload of a blacksmith. Therefore, to avoid the occurrence of health problems caused by exposure to high heat furnaces, a need for an ergonomic and good chimney that can provide comfort for its workforce. The purpose of this research is to reduce levels of dust in the air, fatigue, workload, and increasing blacksmith productivity in Batu Sangiang Village, Tabanan with furnace redesign. Methods this is an experimental research study. This research was conducted in the Batu Sangiang Village, Tabanan with a sample of 15 workers. Data collected include: levels of dust in the air, fatigue, workload, and work productivity. Before setting up a different test, the data normality was tested using Shapiro-Wilk test with a confidence level $\alpha = 0.05$. In normal distributed data, Paired Sample t-test with $\alpha = 0.05$ was used and abnormal distributed data were analysed using the Wilcoxon different test, $\alpha = 0.05$, Results After working furnace was redesigned, decreased levels of dust in the air 89.20%, 24.03% reduction in fatigue, reduced workload of 14.48% and 83.26% increase in productivity. Results analysis using Paired Sample t-test, the amount of dust in the air, fatigue and workload in Period I and Period II, there is a significant difference ($p < 0.05$), as well as analysis data using Wilcoxon test, labor productivity in Period I and period II, there is a significant difference ($p < 0.05$). Conclusion: From this study we can conclude, after the furnace redesign was done, there was a significant decrease in the levels of dust in the air, fatigue and workload, and there was a significant increase in labour productivity. Suggested artisan blacksmith always applies and pay attention to the principle of ergonomics for improvements such as the redesign of the furnace shown to reduce levels of dust in the air, fatigue, and the workload and increase productivity.

Keywords: *Furnaces redesign, Levels of dust in the air, Fatigue, Workload and work productivity.*

Introduction

Most workers feel comfortable working at an air temperature of about 20 ° C to 27 ° C, when the air temperature is higher, the person will feel uncomfortable at work. For optimum work efficiency, work should be done in a manner and in an environment that meets health requirements. Environment and the intended manner include heat stress, lighting in the workplace, dust in the working space's air, posture, human and machine compatibility. In a work environment, workers will face the pressure of the environment. The pressure can be physical, chemical, biological and psychological [1, 2]. Especially physical pressure in the form of heat stress plays an important role, therefore, the work environment must be created as comfortable as possible in order to achieve work efficiency and increase productivity. This is a concern of every workplace in order to create health and safety in the workplace. In addition, there are various factors that affect the environment and working conditions in the workplace that must be considered in order to be categorised as a workplace free of hazards, namely physical factors, chemical factors, biological factors, ergonomic factors