

# Working Climate with Fatigue Levels of Timber Industry Workers in Probolinggo

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## ABSTRACT

The high-temperature work environment is an additional burden of heat pressure that results in the occurrence of subjective deficiencies in the worker and may cause disruption to the workforce. The purpose of this study is to analyze the relationship between work climate with the level of fatigue in workers in PT. Kutai Timber Indonesia Probolinggo. This research use analytic survey method with the cross-sectional approach and sampling technique using Cluster Random Sampling of 134 samples in Production I section that is hot press, shikumi, and putty. The study was conducted in January 2018. Data were analyzed by Chi-Square statistical test.

The result of the research shows that most of the working climate that exceeds threshold value with high fatigue category is 70 respondents (52,5%), almost half of them are 40 respondents (29,9%) with the moderate level of errors. While in the working climate that does not exceed the threshold value with the category of fatigue rate is a small number of 20 respondents (14.9%) and high fatigue rate of 4 respondents (3.0%). Calculation of Chi-Square statistic test with significance level  $\alpha = 0,05$  obtained result  $p = 0,000$  ( $0,000 < 0,05$ ) then  $H_0$  is rejected, so there is the significant relation between work climate with fatigue level at the worker in PT.KTI (Kutai Timber Indonesia) Probolinggo City. To minimize heat stress from a work climate that exceeds threshold value, it is better for the company to use an exhaust fan where the heat from the working environment sourced from the zinc roof and the production machinery is pulled out of the environment with lower temperatures, periodic health checks on labor, before work stretching for 3-5 minutes and suggest workers consume water every 20 minutes in the work.

**Keywords:** *Work climate, fatigue, worker, high-temperature, timber.*

## INTRODUCTION

Indonesia is a tropical country with its main characteristics are high temperature and humidity. High temperature work climate is a burden for the body, plus if the worker has to do heavy physical work and can shape the health condition and stamina of the worker. Heat pressure is one of the working conditions of physical factors which in certain circumstances can cause losses, therefore the work environment must be made as comfortable as possible by regulating and controlling air temperature, air humidity and airspeed

according to the Regulation of the Minister of Manpower and Transmigration No.PER / 13 / MEN / X / 2011 which is 31°C for light workloads and 28°C for medium workloads of 25°C for heavy workloads in working hours 8 hours a day with 1-hour rest. <sup>1</sup>

Based on data from the ILO (International Labor Organization) in 2010, almost every year as many as two million workers die due to work accidents caused by fatigue. If workers experience work accidents caused by fatigue, it will have a direct impact on the level of work productivity. Based on data on workplace accidents

published by the Indonesian National Police in 2012, on average there are 847 work accidents every day, 36% are caused by fatigue which is quite high.<sup>2</sup>

PT. Kutai Timber Indonesia is a company engaged in the field of timber to meet the needs and desires of consumers at home and abroad. Products produced include plywood, pulp, board, plywood and so on. PT. KTI (Kutai Timber Indonesia) Probolinggo has three production divisions namely production plywood, woodworking and particle board. These three divisions have used technology and machinery that can cause potential hazards to their workers, can cause accidents while working and remember work carried out continuously or continuously so that it can cause fatigue so that it raises the risk of accidents that can arise due to human error, as well as the work environment.

From this description it can be stressed that, the conditions that must be considered in each design and redesign of a factory are an adequate exhaust fan ventilation system, to ensure good air circulation, periodic health checks of general controls provide clear and written instructions, as well as other information about heat stress, suggest drinking cold water even if a little (about 150 ml) every 20 minutes<sup>3</sup>.

### MATERIALS AND METHOD

This research was conducted at PT. KTI (Kutai Timber Indonesia) Probolinggo City which took place in January-June 2018. This research is a type of analytic survey research using a cross-sectional study design to find relationships at a certain time, namely research that studies the relationship between variables free and dependent variable<sup>4</sup>. Data collection is done once at the same time. The instrument used in this study was the IFRC questionnaire (Industrial Fatigue Research Comminate) to measure the level of fatigue, and the Questionnaire tool to measure the temperature of the work climate. The population in this study are all workers of PT. KTI in the production section I, namely shikumi, hot press, and putty totaled 1515 workers. The sampling technique used is the cluster random sampling which is 134 people. Bivariate data analysis was performed by the Chi-Square correlation test.

### RESULT

Distribution of Respondents According to the Work Climate.

Working Climate Category	Frequency (f)	Percentage
Exceed Treshold value	110	82.1
Not Exceed Treshold value	24	17.9
Total	134	100

Based on the table above, it is known that most respondents are exposed to a work climate that exceeds the threshold value (82.1%).

Distribution of Respondents based on the Fatigue Level

Fatigue Level	Frequency (f)	Percentage
Moderate	60	44.8
High	74	55.2
<b>Total</b>	<b>134</b>	<b>100</b>

Based on the table above, it is known that most respondents have high levels of fatigue (55.2%).

Cross Tabulation Working Climate with Worker's Fatigue Level

Working climate	Fatigue Level				Total	
	Moderate		High			
	f	%	f	%	f	%
Exceed Threshold value	40	29,9	70	52,2	110	82,1
Not Exceed Threshold value	20	14,9	4	3,0	24	17,9
Total	60	44,8	74	55,2	134	100
N = 134 , $\alpha = 0,05$ , $p\text{-value} = 0,000$						

In the table above it is known that in a work climate that exceeds the threshold value most respondents experience high levels of fatigue (52.2%). The Chi-Square test results show that there is a significant relationship between work climate and the level of fatigue in workers.

### DISCUSSION

#### 1. Work Climate

Based on the measurement of the work climate in PT.

KTI (Kutai Timber Indonesia) in the Production I section, namely Shikumi, hot press, and putty. In accordance with the results of the measurement of the work environment using the questionnaire, the shikumi section based on the medium workload is exceeding the threshold value with a climate temperature of 29.91°C, the working climate of the hot press with moderate workload is exceeding the threshold value with temperature 30.48°C and putty with light workload is not exceeding the threshold value with a climate temperature of 30.18°C.

For workers who are exposed to a work climate that exceeds the threshold value that is mostly (82.1%) as many as 110 respondents and those exposed to the work climate below the threshold value are a small percentage, namely (17.9%) as many as 24 respondents. So it can be concluded that a large part of 82.1% of the Production I part of the workforce is exposed to a work climate that exceeds the threshold value in the hot press and shikumi.

According to the Minister of Manpower and Transmigration Regulation No.13 / MEN / X / 2011 Thn.2011 that for setting working hours every hour 75% -100% for Wet Bulb Globe Temperature Index workload is light 31.°C, a medium workload is 28°C and for heavy workloads 25°C. The results of interviews with Occupational Health and Safety and Environmental Health Division, climate temperature I production holders in the production section I were actually hot and exceeded the threshold value. Complaints of labor in the production of the shikumi section, hot press and putty experienced the same complaints as sweating, thirst and experiencing exhaustion of each individual worker. Due to the high temperatures in the production section I is not only affected by temperature but also the heat due to the engine if the wood produced is thick, the more it produces heat from the engine, the engine emits real heat so that the work environment becomes hot. various effects / effects on labor include influencing blood pressure and pulse frequency, fatigue, decreased work performance, reduced agility, prolonging decision making, disrupting motor nerve coordination, not easily stimulated and abnormalities due to high temperatures such as heat cramps, heat exhaustion, heat stroke and miliaria<sup>5</sup>.

#### b. Fatigue Level

The results of the interviews, workers did feel fatigue. The work fatigue experienced by Production

section 1 workers can be caused by workload, high work time which is 7 hours / day per shift without any rest, while for additional overtime plus 3.5 hours. This can result from exposure to the heat of the work environment that is collected and ultimately causes work exhaustion because it is a rule for the company to achieve production targets every day.

After doing research on the workers in PT. KTI for the frequency of the respondent's age based on the results of questionnaires mostly in PT. KTI Probolinggo age of respondents based on age categories, namely early adulthood as many as 36 respondents (26.9%), late adulthood as many as 42 respondents (31.3%) and the initial elderly period was 56 respondents (41.8%). Age can affect work fatigue the greater the level of fatigue The body's physiological functions can change due to age factors affect the body's resistance and work capacity of a person <sup>5</sup>. This is in line with research conducted by Stynten<sup>6</sup> obtained p-value = 0.003 <0.05 which means that there is a significant relationship between age and work exhaustion.

The results of the interviews, workers did feel fatigue. The work fatigue experienced by Production section 1 workers can be caused by workload, high work time which is 7 hours / day per shift without any rest, while for additional overtime plus 3.5 hours. This can result from exposure to the heat of the work environment that is collected and ultimately causes work exhaustion because it is a rule for the company to achieve production targets every day. Workloads almost all have moderate workloads, namely (82.1%) as many as 110 respondents and a small portion of light workloads (17.9%) are 24 respondents.

So it can be concluded that the workload in the production part I includes the medium workload of 110 respondents. In the research in production I to determine the category of the workload based on the level of calorie needs of the Indonesian National Standard according to energy expenditure intended to realize national uniformity in assessing workload experienced by work in his work<sup>7</sup>.

The assessment of workload is carried out by measuring the workforce weight, observing the workload and calculating calorie requirements based on energy expenditure according to the normative table estimated workload according to energy requirements.

As for light workloads of work that require calories for energy expenditure of 100 kcal / hour-200kcal / hour, the workload is work that requires calories for energy expenditure greater than 200kcal / hour-350kcal / hour and for heavy workloads that require calories for energy expenditure greater than 350kcal / hour-500kcal / hour. According to research from Styne<sup>6</sup> there is a significant relationship between workload and fatigue in labor. Based on the theory of workload is the volume of work caused to both physical and mental workforce and responsibility. The workload that exceeds ability will result in work exhaustion

### **c. Relationship between Work Climate and Fatigue Level of Workers at PT. KTI (Kutai Timber Indonesia) in Probolinggo City**

The results of the Chi-Square Test between the relationship of the work climate and the level of fatigue of workers in PT. KTI (Kutai Timber Indonesia) of Probolinggo the result that there is a significant relationship between work climate and the level of fatigue of workers  $p\text{-value} = 0,000 < 0.05$  which means  $H_0$  rejected and it can be concluded that the relationship between work climate and the level of fatigue of workers at PT. KTI.

These results are in accordance with Su'mamur's<sup>5</sup> theory that a hot working climate stimulates the body to sweat, wherein sweating the body loses large amounts of sodium and sodium salts. If the situation occurs continuously and in the long term, it can cause fatigue. In addition to the high work climate, it can cause heat cramps, heat exhaustion, and heat stroke. This is in line with the research conducted by Kartika Wulandari, which shows that the  $p\text{-value}$  obtained is 0.049 ( $< 0.05$ ) which can be concluded that there is a relationship between the work climate and the fatigue of the construction workers.

The working climate for the production of the hot press and shikumi section includes exceeding the threshold value with a high level of fatigue, as much as (52.5%) 70 respondents complaining of weight in the head (dizzy), stiff in the shoulder and feeling tired in the whole body. While the putty section does not exceed the threshold value with a high level of fatigue as much as (3.0%) 4 respondents and moderate fatigue level as much as (14.9%) 20 respondents. In the putty section for high fatigue due to manual work putty, putty workers carried out repetitive movements (lifting bare-core to be

putty or putty on the throat table to putty putty on the surface of bare core, awkward work position when the throwing that has exceeded the hands of workers tends to tiptoe so that the body pulls and the work position stands and is static so that the body's burden rests on the worker<sup>8-11</sup>.

General fatigue is usually characterized by the reduced willingness to work caused by monotony, intensity, and duration of physical work, environmental conditions of mental causes, health status and nutritional status<sup>12-14</sup>.

**Conflict of Interest :** None

**Source of Funding ;** Author their selves

**Ethical Clearance:** Obtained from institute committee

## **CONCLUSIONS**

Based on the results of research and discussion about the relationship between the working climate and the level of employment at the PT. KTI (Kutai Timber Indonesia) of Probolinggo City, the following conclusions can be drawn. Most of the working climate in the PT KTI workers' room exceeds the threshold value, most of the level of fatigue in workers at PT. KTI (Kutai Timber Indonesia) has a high level of fatigue, and there is a relationship between the work climate and the level of fatigue in workers at PT. KTI (Kutai Timber Indonesia) in Probolinggo City.

To minimize the heat pressure from the work climate that exceeds the threshold value, the company should use an exhaust fan where the heat from the work environment sourced from the zinc roof and production machines are pulled out of the environment with a lower temperature, periodic health checks in accordance with a certain time for the workforce, before starting work activities carried out 3-5 minutes stretch. In addition to avoiding the level of fatigue in the workforce, a pattern of work time management is not required to exceed 8 hours per day in accordance with regulations.

## **REFERENCES**

1. Harahap Sahara P, dkk., Hubungan antara suhu lingkungan kerja panas dan beban kerja terhadap kelelahan pada tenaga kerja di bagian produksi PT. Remco (SBG) Kota Jambi Tahun 2016. Riset

- Infomarsi Kesehatan, Vol.6.No.1 Juni 2017.
2. Aryal, A., Ghahramani, A., & Becerik-Gerber, B. Monitoring fatigue in construction workers using physiological measurements. *Automation in Construction*, 2017; 82, 154-165.
  3. Tustin, A. W., Lamson, G. E., Jacklitsch, B. L., Thomas, R. J., Arbury, S. B., Cannon, D. L., & Hodgson, M. J. Evaluation of Occupational Exposure Limits for Heat Stress in Outdoor Workers—United States, 2011–2016. *Morbidity and Mortality Weekly Report*, 2018; 67(26), 733.
  4. Muhith, A., Nasir. *Buku Ajar Metodologi Penelitian Kesehata*, Yogyakarta: Nuha Medika 2012.
  5. Suma'mur, P.K. *Hygiene Perusahaan dan Kesehatan Kerja (Hiperkes)*. Sagung Seto. Jakarta. 2014
  6. Stynen, D., Jansen, N. W., & Kant, I.. The impact of work-related and personal resources on older workers' fatigue, work enjoyment and retirement intentions over time. *Ergonomics*, 2017; 60(12), 1692-1707.
  7. Muhith, A. *Aplikasi Komunikasi terapeutik Nursing & Health* Yogyakarta: Andi. 2018
  8. Muhith, A.. *Work Position and Low Back Pain In Elderly Farmer*. UNEJ e-Proceeding, 2018; 24-28.
  9. Muhith, A.. *Pendidikan Keperawatan Jiwa (Teori dan Aplikasi)*. Yogyakarta: Andi. 2015.
  10. Muhith, A. *Pendidikan Keperawatan Gerontik (Teori dan Aplikasi)*. Yogyakarta: Andi. 2016
  11. Muhith, A., Saputra, M.H., fardiansyah A., Risk factor of rheumatoid arthritis among Eldely in UPT Panti Werdha Mojopahit Mojokerto distric Indonesia. *Medicine: Public health, Evironmental and Occupational Health. Indian Journal of Public health Research & Development. Indian Journal of Public health Research & Development*, 2018 Volume. 9 Number, 6 June 2018, ISSN 0978-0245 (print), ISSN 0976-5506 (Electronic). DOI number: 10.5958/0976-5506.2018.00589.2.
  12. Muhith, A., fardiansyah A., Saputra, M.H., Nurmiyati. Analisis of causes Impacts of Early Marriage on Madurese Sumenep East Java Indonesia. *Medicine: Public health, Evironmental and Occupational Health. Indian Journal of Public health Research & Development. Volume. 9 Number 8. First page 412-416. (08 Agustus 2018)*, ISSN 0978-0245 (print), ISSN 0976-5506 (Electronic). DOI Number: 10.5958/0976-5506.2018,00944.0.
  13. Mallongi, A., dkk,. The spatial patten and risk factors of leprosy occurence in barru indonesia. *Medicine: Public health, Evironmental and Occupational Health. Indian Journal of Public health Research & Development. 2018; Volume. 9 Number 8. First page 1489-1494. (08 Agustus 2018)*, ISSN 0978-0245 (print), ISSN 0976-5506 (Electronic). DOI Number: 10.5958/0976-5506.2018,00943.9.
  14. Tarwaka,. *Ergonomi Industri Revisi Edisi II*, Penerbit, Surakarta :HARAPAN PRESS, 2015.