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Optimization Model of Labour Based on Workload at Production Process of Autoclave Aerated Concrete AAC

(Case Study PT. BSB KALLA BLOCK)

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ABSTRACT

Brick light of Kalla Block is a subsidiary of PT.BUMI SARANA BETON at Kalla Group, which produces light brick of high quality raw materials with German technology that meet acceptable standards Deutch Industries Norm (DIN). Problems faced of Kalla Block this time is how to increase production ratio because increasing demand, one of the efforts is how to increase productivity and work efficiency. The purpose of this study was optimizing the number of labour based on production processes Autoclave Aerated Concrete (AAC) and assess the model in order to improve production efficiency AAC on Kalla Block company without increasing or reducing the amount of energy used is two models Workload Analysis. Model 1 according to Work Method of Load Analysis (WLA) and model 2 according to Theory Wakui (TW). The difference results workload calculation models Work Load Analysis located at Westinghouse adjustment factor and factor allowances which are based on factors such as the state of the working conditions of lighting, temperature and noise of the room. In an effort to improve production efficiency at the Kalla's company AAC Block without increasing or reducing the amount of labour then the review in terms of time is measured by calculating the standard time. Based on research results, it is recommended to use the model 2 which obtained total value of the work load at now conditions, AAC production process is currently at 407.89% to 278.31 minutes workloading time. After the analysis of the workload and workforce optimization has gained workload with model 2 formulation of 385.49% with a time of 260.39 minutes workloading resulting workload efficiency of 22.40%.

Keywords: *Labour, Optimization. Workload, Autoclave Aerated Concrete (AAC), Model*

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1. INTRODUCTION

Light brick AAC (*Autoclave Aerated Concrete*) was first developed in Sweden in 1923 as an alternative building material to reduce deforestation of forest .Light brick AAC is then further developed by Joseph Hebel in Germany in light 1943. Light Brick's Kalla Block is a subsidiary of PT BUMI SARANA BETON , which is a subsidiary of Kalla Group, which produces lightweight brick of raw materials high-quality with German technology that meet acceptable

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standards Deutch Industrie Norm (DIN). Kalla Block problems faced today is how to increase the production ratio as demand continues to rise, one of the efforts is how to increase productivity and work efficiency.

Based on the research background, the formulation of the problem in this research are:

1. How to optimize the amount of Labour-based workload on the production process of AAC to increase the quantity of production and efficiency in the company of PT. BSB Kalla Block this time?
2. How to assesment models in an effort to increase production efficiency AAC without adding or reducing the amount of Labour?

This study was conducted to address the following issues:

1. Optimizing the amount of Labour based on the workload of the production process of AAC
2. Assess models in an effort to increase production efficiency AAC in companies Kalla Block without adding or reducing the amount of Labour.

The benefits of research are as follows:

1. Practically, the findings of this research is the input for the company of Kalla Block optimizing workload based Labour in the production process of AAC.
2. Theoretically, this study was developed through several modeling approaches in improving Labour efficiency without increasing or reducing the amount of Labour in the production process of AAC are converted through methods, people, and time.

2. LITERATURE REVIEW

System and Production Process

In the company of all the activities necessary to control. Control is one of the functions of management conducted an assessment if necessary conduct a correction, so that what is done by the staff can be directed to the right path with the intention of achieving the objectives that were outlined previously. With the control in the production operations of the company can produce good results.

Production Process Control

The production process is a form of the most important activities in the implementation of production in companies. Smooth production process is strongly influenced production system that had been prepared before the company carrying out the production process. Additionally for the smooth production process is also necessary to control the production process that will be controlling all key components of a company.

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1) Control of the production process

So that the production process can run smoothly needed good control. Control of production processes include when production starts and when production ended and should be planned.

2) Control of raw materials

The raw material is a problem that is quite dominant in the field of production. The Company requires sufficient amount of inventory that production runs are not interrupted, then with their control of raw materials production activity is expected to run smoothly and can determine the standard of good raw material.

3) Control of Labour

Control of Labour is one important element in the production control. The success or failure of a production process will depend on the ability of Labour and employment seriousness of the company's workforce.

4) Control of production and repair costs

The superintendent of production at any time must oversee and make decisions related to the balance between Labour, raw materials and costs as well as remedial measures.

5) Quality control

"Quality control is an activity to maintain and directed that the company's product quality can be maintained as planned" (Agus Ahyari, 2002: 57).

"Quality control is a tool for management to improve product when necessary, maintaining the already high quality and reduce the number of damaged goods" (Sukanto Reksohadiprodjo and Indriyo Gitosudarmo, 2000: 31).

2.1 Autoclaved Aerated Concrete (AAC)

AAC or lightweight brick is one of the building materials such as stone rocks that are not burned by the hardening of the mixture of sand, cement, water, and in the manufacture of other additives can be added to other materials (aditive) .Manufacture of AAC lightweight brick is in principle makes the air in the cavity brick. There are three different ways to make AAC (lightweight brick), namely:

a) The simplest is to provide aggregate / mixed stuffing lightly brick. The aggregate can be pumice (pumice), stereofoam, stone alwa or fly ash is used as a stone.

b) Eliminate fine aggregate (the fine aggregate filtered, for example, dust / ash cleaned flight) and blow or fill the air bubbles inside the brick.

c) By not taking the sand that contains many cavities brick so that its weight low / light. (Kardiyono Tjokrodimuljo, 2003).

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Labour (Manpower)

Labour is a population that is of working age. According to Law No. 13 2003 Chapter I Article 1 Paragraph 2 states that Labour is any person who is able to work in order to produce goods or services, both for subsistence and for community.In outline of a country's population is divided into two groups, namely Labour and not Labour. Residents classified as Labour if the resident has entered working age. The age limit applicable employment in Indonesia is 15 years old - 64 years.

Workload

The workload is a term that began to be known since the 1970s. Many experts who has proposed definition of the workload so that there are some different definition the work burden .It's a multi-dimensional concept, making it difficult to obtain a just conclusion regarding the other proper definition (Cain, 2007). Formulation of Workload in this research, used two models. According Anggara (2011) good workloads, preferably close to 100 % or under normal conditions. The workload of 100 % means that for 8 hours the worker is able to work continuously in normal conditions. Once known Performance Rating and Allowance are used to determine the workload for each - each work element by using the following formula:

$$\text{Workload} = \frac{\%\ \text{Productive} \times \text{Performance Rating} \times \text{Total minutes of observation} \times (1 + \text{Allowance})}{\text{Total minutes of observation}}$$ **-----Model 1.**

Where the performance rating using rating factor Westinghouse and allowances using tables Sutalaksana, et al (2006) the amount of the allowance based on the factors that affect.

According Wakui (2000), the activities undertaken by each position or office in order to carry out its duties as specified in the job description provides a workload at the position / positions, so that the calculation Work Load can be formulated as follows:

$$\text{Workload} = \frac{\text{Total Time Activity} + \text{Allowance}}{\text{Total time available}}$$ **.....(Model 2)**

Where Allowance : 10% total time available

3. RESEARCH METHODS

Research design

This study was conducted to optimize Labour models with do the work measurement structured work activities and results of the analysis will provide a model that will capable of optimizing work power with the aim of improving the productivity of the company.

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Location and Time Research

The research will be carried out by direct observation in the light brick industry PT. BUMI SARANA BETON (Kalla Block) address Jl. Kima 17 No. 17 Makassar with capture / recording data on the duration of activity of the production process.

Measurement techniques

The study was designed as an observational study, conducted against the workers on the production or fabrication on Kalla Block. Data were collected by using a measurement technique in the study of movement merged into one as a methods engineer.

Processing and Data Analysis

In this study the stages of processing and data analysis are as follows:

1. Processing and data analysis study of work time.
2. Processing and data analysis using the data uniformity test
3. The data processing using the test the adequacy of the data and Calculation proposed amount of Labour based on the workload.
4. Analysis of the results of processing and the proposed improvements by using models or methods of analysis workload alignment will provide repair work standardization.

4. RESULTS AND DISCUSSION

Research was conducted in Event 6, the process begins with preparing / move products to a light brick on pallets, load the car / car filled manually, to prepare the next band bind binder stapping light brick products.

Table.1. Activities / ACTIVITY stages of the process / section

No	PROCES/Section	Work method		
		Material	Machine	Proces
1	**PROCES 1 BALL MILL & RAW MATERIAL**	Gypsum Silica sand mixture + +Water(Slurry)	Ball Mill	Milling
2	**PROCES 2 MIXING SECTION**	Slurry + Cement + lime + Aluminium	Phosphate Mixer	Mixer
3	**PROSES 3 POURING SECTION**	Selury + cement +lime + Aluminium Phospat	Moulding	Moulding (Cooling + casting)
4	**PROCES 4 CUTTING SECTION**	Selury + Cement + lime + aluminium Phosphate	Cutting	Cutting

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		Cutting		
5	**PROCES 5 AUTOCLAVE & BOILER SECTION**	Selury + Cement + lime + Aluminium Phosphate Combustion	Autoclave	Burning(+ temperature - 195 degrees Celsius pressure 12 bar)
6	**PROCES 6 PACKING & WARE HOUSE SECTION**	Selury + Cement + lime + Aluminium Phosphate Packing	Packing	Packing

Workload Each Process

The percentage of productive processes Section 3 Pouring Process operator at 43.79 or meaningful for 8 hours work load of the operator receives 56.06% with working time average of 210.20 minutes / shift. The percentage of the productive process operator 6 Packing and Ware House at 25.74 or meaningful for 8 hours work load of the operator receives 40.88%.

In this study, it is proposed to carry out the distribution of Labour so that each process the same workload. Researchers conducted a simulation of the distribution of Labour as in the table below

Table 2. Workload Measurement Model 1

ACTIVITY/ PROCES	WORKLOAD (%)	TOTAL OPERATO (MANPOWER)	TIME LOADING (Mnt)
PROCES 1	101,2	3	404,87
PROCES 2	77,42	3	288,09
PROCES 3	56,06	3	210,20
PROCES 4	91,41	3	351,00
PROCES 5	69,65	3	267,46
PROCES 6	38,61	10	148,25
JUMLAH	**434,35**	**25**	**278,311**

Table 3. Labour Distribution Simulation Model 1

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ACTIVITY/ PROCES	WORKLOAD AFTER DISTRIBUTION (%)	TOTAL OPERATORAFTER DISTRIBUTION (MANPOWER)	TIME LOADING AFTER DISTRIBUTION (mnt)
PROCES 1	60,73	5	242,92
PROCES 2	77,42	3	288,09
PROCES 3	84,08	2	315,30
PROCES 4	68,55	4	263,25
PROCES 5	69,65	3	267,46
PROCES 6	55,86	8	214,51
JUMLAH	**416,30**	**25**	**265,25**

Table 4. Workload Measurement Model 2

ACTIVITY/ PROCES	WORKLOAD (%)	TOTAL OPERATOR (MANPOWER)	TIME LOADING (Mnt)
PROCES 1	94,35	3	404,87
PROCES 2	70,02	3	288,09
PROCES 3	53,79	3	210,20
PROCES 4	83,13	3	351,00
PROCES 5	65,72	3	267,46
PROCES 6	40,88	10	148,25
JUMLAH	**407,89**	**25**	**278,311**

Table 5. Labour Distribution Simulation Model 2

ACTIVITY/ PROCES	WORKLOAD AFTER DISTRIBUTION (%)	TOTAL OPERATORAFTER DISTRIBUTION (MANPOWER)	TIME LOADING AFTER DISTRIBUTION (mnt)
PROCES 1	60,61	5	242,92
PROCES 2	70,02	3	288,09
PROCES 3	75,69	2	315,30
PROCES 4	64,84	4	263,25
PROCES 5	65,72	3	267,46
PROCES 6	48,61	8	185,31
JUMLAH	**385,49**	**25**	**260,39**

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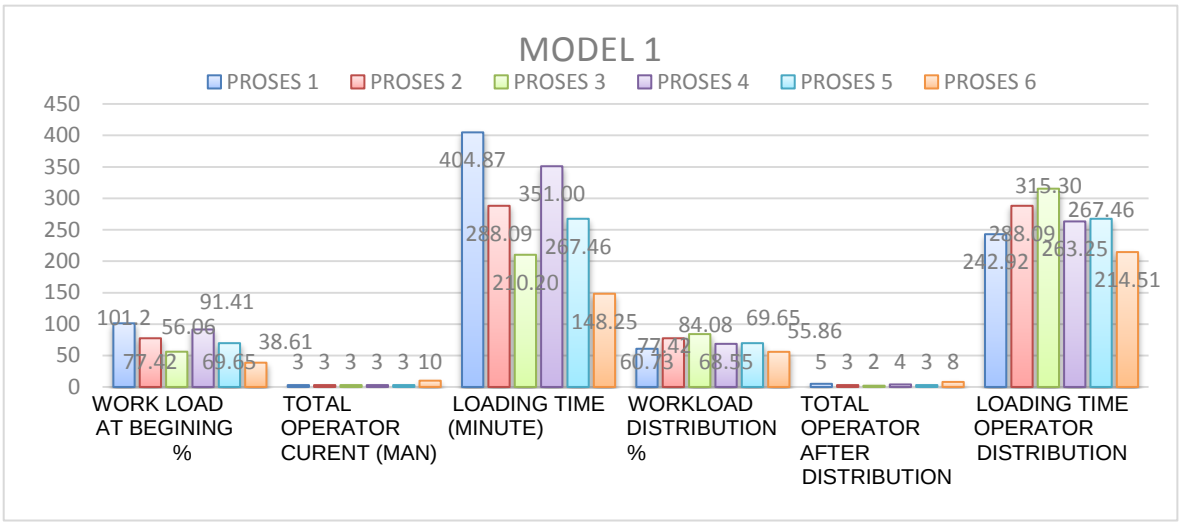


Figure 1. Graph comparison efficient working time and workload before and after Labour distribution model 1

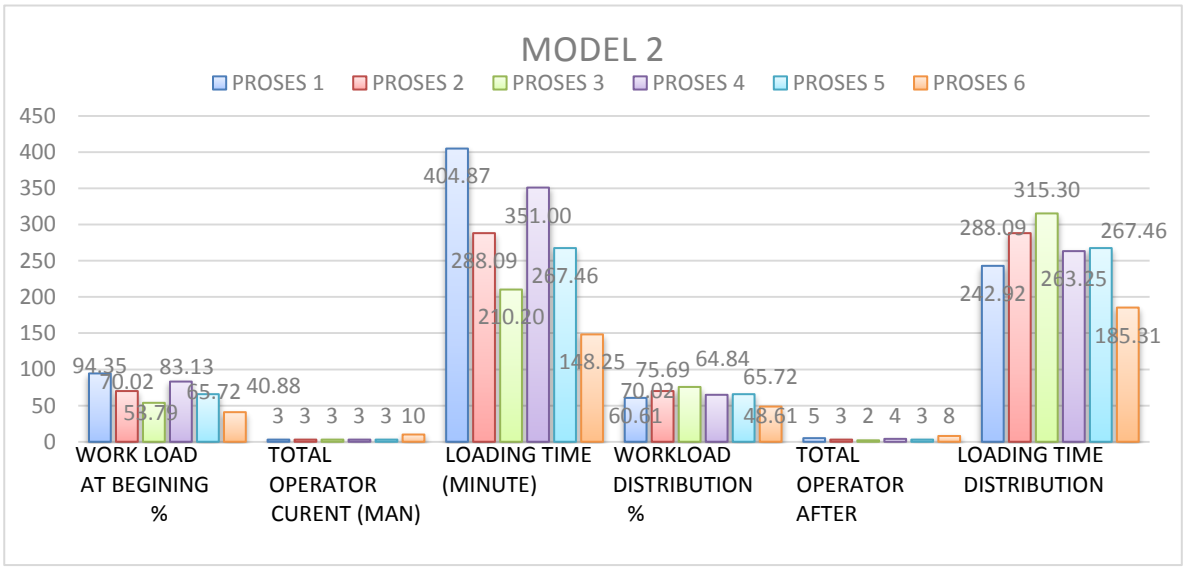


Figure 2. Graph comparison efficient working time and workload after and before the power distribution model 2

Based on the results of the simulation calculation that the workforce can be distributed to the process / section that has a substantial work load.

Figure 3. Proportion of workload before and after the distribution Labour (manpower) in model 1

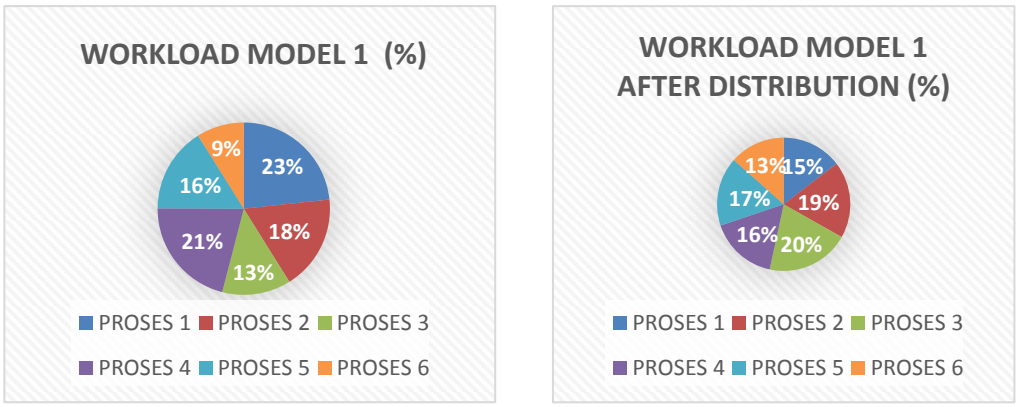
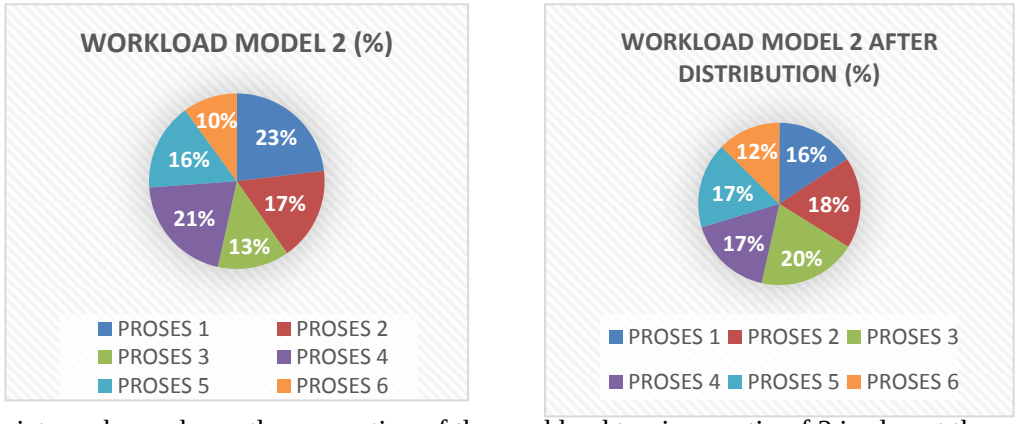


Figure 4. Proportion of workload before and after the distribution Labour (manpower) in model 2



In the picture above shows the proportion of the workload to give a ratio of 2 is almost the same measurement models

5. 1 CONCLUSION

1. Optimizing workforce with workload measurement based on several alternative measurements of ;

- In model 1 obtained total value of the work load at now conditions, AAC production process is currently at 434.35% to 278.31 minutes workloading time. After the analysis of the workload and workforce optimization has gained workload with one model formulation of 416.30% with a time of 265.25 minutes workloading resulting workload efficiency 18.05%.

- In model 2 obtained total value of the work load at now conditions, AAC production process is currently at 407.89% to 278.31 minutes workloading time. After the analysis of the workload and workforce optimization has

gained workload with 2 model formulation of 385.49% with a time of 260.39 minutes workloading resulting workload efficiency of 22.40%.

- The difference in the results of the calculation of the workload model 1 and model 2 is located on an adjustment factor which the model first using Westinghouse Rating factors and factors allowance. The factor is based on the working conditions such as the state of lighting, temperature, noise room. While the model 2 uses only factor allowances on the assumption that the operators working properly, then the price adjustment equal to 1 (p = 1) and allowance factor clearances 10% of the total working time.

2. From the formulation of the model used in the effort to improve production efficiency at the company AAC Block Kalla done without adding or reducing the amount of Labour in terms of workload (workloading) investigator mengasesmen 2 models for performance evaluation and future development of the company.

5.2 RECOMMENDATION

1. The study provides a measurement model workloads using two models as a workload analysis tool, and this models can be applied in companies for the improvement of the management and performance of a company.

2. In order to achieve better results than ever before, the company should undertake the distribution of Labour of the section which has a low work load to process / section that has a high work load so that the performance of the workforce can be optimized and the target company can be reached.

3. Need to be back in the standardization work in order to get a true picture after Labour distribution, especially for time-use patterns of activities, job description, and the workforce so that factor -

4. The factors causing low work efficiency can be known

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