

Analysis of physiological workload approach in packing stations to determine optimal workload

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Abstract. This is where the research company which produces flour. The actual conditions on the production floor are found a lot of manual activity one is packing. Physical workload examined in order to determine the energy consumption and % CVL operator. Based on the calculation of the workload is known that the operator has a very heavy percentage category, namely 47.82%, for the Measurement of energy carriers showed that 80% of energy consumption in the category of heavy operator is 401.95 Kcal / hour based on % CVL operator, operators are in category required immediate action. Based on the calculations made through this research turns out the workload at a packing station is classified by weight category, causing significant fatigue for the operator where the number of carrier pulse exceeds normal limits. Energy needs necessary operator still not been met, where the category workload largely classified as severe. The result shown that timing of rest required by each operator is not enough.

1. Introduction

Activities that use physical energy of the labor, would affect the system of the body, particularly on the condition of pulse/heart. The development of system studies body functions with heart rate measurement is important in the operator health field as well as in industry, especially in the field of the determination of workload and ergonomics working system design. Determining the classification of the workload is based on the increase in the maximum pulse rate because of the burden of cardiovascular (cardiovascular load = %CVL) on each activity carried out by worker. By knowing the classification of physical work load, then the company will be able to adjust the workload of employees in order to obtain optimal results.

This study was conducted based on the results of previous research and interviews with stakeholders such as operators at a packing station and also the results of interviews with the operator on duty at the packing station, it turns out there are complaints from operators working. Complaint of the operator is the fatigue caused by excessive workloads of operators. At the packing station there are three operators who work manually move the section in charge of packing sacks of flour that are ready to place the buildup, using both hands carrier carrying sacks of flour that has been packed to the buildup place. 1 sack of flour has a weight of 80 kg.

There are many previous research that discusses physiology, including examining the influence of mental workload for monitoring physiological and subjective traffic density [1].



Then there are also the addresses comparative physical labor relations done to operators working in France [2]. Another study also examines the workload by using cognitive workload analysis to predict and reduce the workload for the simulation training, this research using simulation methods in doing research [3]. All methods are examined operator workload is to find a level of comfort while working, it is most important because of the high level of comfort when working can increase productivity, it is also seen in other studies that examine the workload on the taxi drivers at the end of this study issued tools to perform the work [4]. Not only the workers, even the student workload also affect their performance in the academic field, on that research discusses the influence of workload on academic performance, this study was conducted on student techniques [5]. In addition there are also students who discusses the accounting profession and the effects of mental workload see depressive symptoms [6].

Through previous research on already clearly stated that the assessment of workload analysis is very important to do, and not merely only a profession, but also a research for all professions.

This study is different from previous studies, because the operators working in the company that became the object of research is never analyzed previously given workload, while highly visible operator fatigue with the job description that has been described previously.

2. Method

The methods used in solving this reseach problem are as follows:

1. Formulation of the problem and goal setting
This activity was preceded by observations that can be formulated what problems exist today and what goals wanted to be achieved from this research. Can also through interviews with workers that exist in the research location. In this observation, the problem is physical work load on the operator packing station.
2. Literature study
The study intends to determine the theoretical literature that will be used in analysis and problem solving as a result of the research that has been done.
3. Data collection
 - a. Primary Data
Include measurement data and direct observation.
 - b. Data sekunder
Include documentation data or company administrative data.
4. Data processing
Furthermore, the data processing of the heart pulse data collection of every operator packing station.
5. Analysis of the data processing result
From the data processing will be obtained workload of each operator, then the data is analyzed and the determination of the workload can be determined the relationship between working duration with the pulse of the workers.
6. Conclusion and suggestion

From all the research steps above, it can be concluded the result that become the matter of the research conducted and advice to companies in order to be used as suggestion in making improvements to provide added value for the company.

Here is a research flow chart picture.

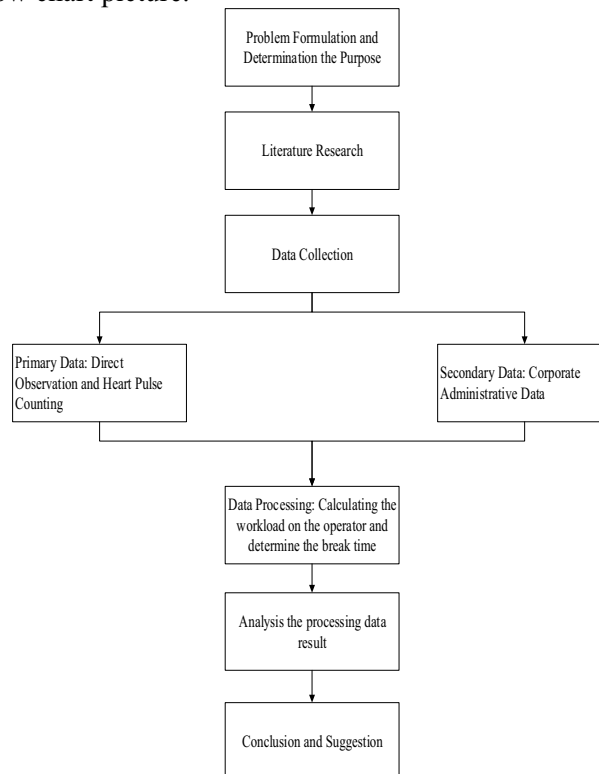


Figure 1. Research flowchart

3. Results and Discussions

Here are the results of data calculations:

1. To calculate the workload at a packing station with cardiovascular load method (CVL) of the data obtained during the research period.

Table 1. Operator workload table

Name	DN _{Bekerja}	DN _{Isti} rahat	Age	DN _M aks	%CVL	Workload Classification
Rusmadi	122	80	37	183	40,77	Repairs Needed
Maringan	119	77	38	182	40,00	Repairs Needed
Kamarudin	129	85	43	177	47,82	Repairs Needed

Based on table 1 it is clear that after the measurement of 3 working operators, workload classification has been done by three operators are categorized into the repairs needed. The purpose of repairs is able to form the working methods as well as a reduction in workload, depending on the results of subsequent analysis. Solutions that use to overcome is needed a repair, one of which is to redesign the workplace and a working tool (for workers), as well as the need to conduct adequate rest after work. However, this needs further analysis of the operator.

2. Energy expenditure calculation results

Direct measurement methods by measure of energy expenditure (energy expenditure) through the intake of oxygen during the work. Increasingly heavy workload will be more and more energy is needed for consumption. This can be seen in table 2.

Table 2. Energy expenditure

Name	DN _{Kerja}	Energy Expenditure (Cal/min)	Heart Rate during work (Beats/min)	Energy Needs (Cal/min)
Rusmadi	122	2,5 – 50	100 – 125	8,7
Maringan	119	2,5 – 50	100 – 125	8,4
Kamarudin	129	2,5 – 50	100 – 125	9,4

3. The result of Direct Appraisal

Table 3. Direct appraisal

No	Name	DNK (dpm)	Y		Workload Category
			(KCal/minute)	(KCal/hours)	
1	Rusmadi	122	6,03	361,84	Hard
2	Maringan	119	5,75	345,50	Medium
3	Kamarudin	129	6,69	401,95	Hard

Table 3 shows that the two operators have a heavy workload, so the category of the data needed immediate treatment and further observation. Observations is needed is to provide solutions are the most effective in reducing the work load. The alternative solution is the addition of the operator and the working methods of design improvements that exist at the moment. The solution depends on the company, which most likely applied.

4. The result of break time determination

Tabel 4. Breaks time determination

Name	S	W	T	(W-S)	W-1,5	T(W-S)	R (Minute)	Result
Rusmadi	5	6,03	9	1,03	4,53	9,27	2,04	Requires Breaks
Maringan	5	5,75	9	0,75	4,25	6,75	1,58	Requires Breaks
Kamarudin	5	6,69	9	1,69	5,19	15,21	2,93	Requires Breaks

Table 4 illustrates that this working station needed repairs as soon as possible, because the three operators need more rest time than applied previously.

Through the data collection and analysis results showed that for the work stations necessary repairs as soon as possible, because it is feared could lead operator to more severe effects than has happened. This study became the basic for the company to take action to rescue workers and increase the productivity of the company.

4. Conclusions

Here are some of the conclusions that can be obtained from the study of physical work load on the operator packing station in flour mills, among others:

1. Based on calculations performed by researchers turned out the workload at a packing station is classified by weight category, causing significant fatigue for the operator where the number of carrier pulse exceeds normal limits. These results indicate that the operator works in a zone of meaningful excessive fatigue.
2. From the calculation of the value of % CVL in the overall packing station, operator does not experience fatigue. Value % CVL of this operator is more than 40% so that it is necessary to do some repairs for the operator.
3. The need of energy is required by operator still not been reached, where the workload category largely classified as severe. As for the timing of rest required by each operator is not enough. This is due to the relatively heavy workload that requires the appropriate break

5. References

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