DOI 10.18551/rjoas.2019-05.21

ANALYSIS OF EMPLOYEES' WORKLOAD QUALITY CONTROL

Muhsin Ahmad*, **Budaya Pinkie Winandari**
Faculty of Industrial Engineering, University of Pembangunan Nasional, Indonesia
*E-mail: ahmad.muhsin@upnyk.ac.id
ORCID: 0000-0003-2457-268x

ABSTRACT
PT XYZ Indonesia is a pharmaceutical company that manufactures medicines, clinical nutrition, intravenous fluids, and medical tools. PT XYZ has a Quality Control Department which includes several divisions. Based on observations, the workload of workers in the Biology Division Quality Control Department is quite high; the job description that has been determined by the company is only done by a workforce of 9 people and 1 supervisor, causing fatigue due to excessive workload. The workload calculation was done by using the Workload Analysis method. The first step was to observe the level of worker productivity using work sampling, determine the value of Performance Rating, Allowance, workload value, and the number of proposed workers. The amount of workload received by workers was then used to determine the number of workers who should be employed so that the employee will not have excessive workloads. The workload calculation results show that 9 workers have a high workload of 161%. The proposed improvement given to overcome this high workload is to add 6 workers.

KEY WORDS
Workload, workload analysis, number of workers, quality control.

Work is a burden for those who undergo it which can be physical or mental. From an ergonomic point of view, the workload received must be appropriate for both the physical abilities and the limitations of the person who receives the burden. Workloads that exceed work capacity will certainly have a bad impact. PT XYZ Indonesia is a large company that has hundreds of employees. The products produced are very diverse and are produced in large quantities. This is what causes so many products to be identified and analyzed by the Quality Control Department employees. The Biology Division Quality Control Department itself is responsible for hundreds of documents about testing and controlling product quality from the production department.

Time measurement is the work of observing and recording the working times of each element or cycle by using the tools that have been prepared (Ade and Muhsin, 2017). Employees are valuable assets for the company. Without the employees, the company is impossible to run properly. Employees are ordinary people who can experience fatigue (Ramadhan *et al.*, 2014). The company predicts that the low performance is due to the number of defective products, and the length of the process (Muhsin, 2016). In the production process, there is often a disruption in the machine or equipment used, so that it can disrupt the production process (Ningrum and Muhsin, 2016). Constraints faced by companies are that the company often experiences failure to achieve daily production targets (Ristyowati, Muhsin and Nurani, 2017).

The responsibilities of the employees including the task to analyze the products of 120 samples each day (sample delivery time depends on the Production Department) are not balanced with the number of employees employed in this division (nine people plus one supervisor). This imbalance is caused by more samples being tested than employees working in this laboratory. The work that must be done includes testing and copying data in writing (both manual and computerized). The workload received by each employee becomes large between 140% to 170%, exceeding the maximum limit that is supposed to be 100%. When the workload becomes higher than the maximum limit, there are adverse effects that

will occur. The adverse effects are a decrease in the level of productivity, rapid fatigue, and increased psychological burden that is not good for the health of employees.

METHODS OF RESEARCH

This study observes the workload experienced by employees using the Workload Analysis method and determines the optimal number of employees that should be employed. The steps taken in conducting this research is collecting general overview data of PT XYZ Indonesia, organizational structure, number of current employees, job description of each job, the productivity and non-productivity of the employees, performance rating, and allowance.

Data processing carried out in this study:

- Calculating the percentage of productivity and non-productivity with the work sampling method;
- Determining the performance rating using the Westing House System method;
- Determining the *allowance*;
- Calculating workload with Workload Analysis method;
- Determining the number of workers/ employees.

The analysis carried out in this study are: analyzing the percentage of productivity and non-productivity of each operator, analyzing the workload conditions related to the causes of high workloads, and analysis related to the number of workers, in terms of the number of workers who are present compared to the number workers based on their workload.

RESULTS AND DISCUSSION

Productive activities are those that are in accordance with the predetermined job description while non-productive activities are activities that do not produce added value. These productive and non-productive activities are used for the calculation of workload. The workload can then be used to identify whether the workload received exceeds the maximum limit (more than 100%) or not. When the workload received is more than 100%, it is suggested to add employees.

Productive and non-productive activities can be done by comparing the job description of each worker with the activities they actually did at the time of observation. Data on the number of productive and non-productive activities carried out by workers during observations is shown in the following tables.

Table 1 – Data on productive/non-productive activities of the workers

Workers	Activities	Observation Day				
		1	2	3	4	5
Worker 1	Productive	27	28	29	29	28
	Non-Productive	3	2	1	1	2
Worker 2	Productive	28	30	30	28	29
	Non-Productive	2	0	0	2	1
Worker 3	Productive	27	29	30	28	29
	Non-Productive	3	1	0	2	1
Worker 4	Productive	29	30	30	28	29
	Non-Productive	1	0	0	2	1
Worker 5	Productive	30	30	26	30	30
	Non-Productive	0	0	4	0	0
Worker 6	Productive	29	28	28	30	28
	Non-Productive	1	2	2	0	2
Worker 7	Productive	30	29	29	30	27
	Non-Productive	0	1	1	0	3
Worker 8	Productive	28	28	28	28	28
	Non-Productive	2	2		2	2
Worker 9	Productive	29	29	29	29	29
	Non-Productive	1	1	1	1	1

Data adequacy test is done to determine the number of observations that must be done in the work sampling. To calculate the number of measurements needed for an accuracy level of 5% and a confidence level of 95%, the following formula is used.

$$N' = \frac{k^2\,(1-\bar{p})}{s^2\,.\,\bar{p}}$$

The results of the calculation of the data adequacy test are shown in Table 2 below.

Table 2 – Test results for data adequacy

Name	N	N'	Description
Worker 1	150	102	N > N', adequate data
Worker 2	150	56	N > N', adequate data
Worker 3	150	91	N > N', adequate data
Worker 4	150	44	N > N', adequate data
Worker 5	150	79	N > N', adequate data
Worker 6	150	44	N > N', adequate data
Worker 7	180	65	N > N', adequate data
Worker 8	180	65	N > N', adequate data
Worker 9	180	65	N > N', adequate data

The data homogeneity test was conducted to find out whether the data obtained was homogeneous and did not exceed the upper control limit (BKA) and the lower control limit (BKB) that had been determined. The formula of the upper control limit and lower control limit are as follows.

$$BKA = \bar{p} + k\sqrt{\frac{\bar{p}(1-\bar{p})}{n}}$$

$$BKB = \bar{p} - k\sqrt{\frac{\bar{p}(1-\bar{p})}{n}}$$

The results of the calculation of the data homogeneity test are shown in Table 3 below.

Table 3 – Data homogeneity test results

Name	% of productivity	Upper	Lower	Description
Worker 1	94	1,157	0,723	Homogeneous data
Worker 2	96,6	1,131	0,801	Homogeneous data
Worker 3	94,6	1,152	0,740	Homogeneous data
Worker 4	97,3	1,114	0,832	Homogeneous data
Worker 5	95,3	1,111	0,795	Homogeneous data
Worker 6	97,3	1,114	0,832	Homogeneous data
Worker 7	96,1	1,119	0,803	Homogeneous data
Worker 8	96,1	1,119	0,803	Homogeneous data
Worker 9	96,1	1,119	0,803	Homogeneous data

The calculation of this rating is expected to "normalize" the measured work time. The adjustment factor data used in this study is using the Westinghouse method. Westinghouse directs the assessment of four factors that are considered to determine reasonableness or irregularity in work, namely skills, effort, working conditions, and consistency. Determination of spare time (allowance) will then be included in the calculation of the total time required for a position to complete its activities is very necessary. The results of calculating the rating factor and allowances are summarized in Table 4 below.

Workload is defined as a difference of the capacity or ability of workers based on the demands of work to be faced. Workload Analysis (WLA) is a way to calculate the amount of workload caused by the performed activities. A good workload should be close to 100% or under the normal conditions.

Table 4 – Summary of *rating factor* and *allowance*

Name	Rating Factor	*All* (%)
Worker 1	1,386	16,70
Worker 2	1,368	14,25
Worker 3	1,644	17,90
Worker 4	1,644	17,90
Worker 5	1,368	18,00
Worker 6	1,368	18,00
Worker 7	1,644	17,90
Worker 8	1,644	17,90
Worker 9	1,644	17,90

The calculation of the workload of each element can be known by using the following formula.

$$\text{Workload} = \frac{\%\ of\ Productivity\ \ x\ Performance\ \ Rating\ x\ Total\ Minutes\ of\ Observation\ \ x\ (1+Allowance\ )}{Total\ Minutes\ of\ Observation}$$

The procedure that is often used to determine how many workers needed is to analyze the experience. Records of work results can show the volume of average results achieved by each workforce. The average can then be used to estimate the worker requirements.

The calculation of the number of workers that should be employed is by dividing the amount of workload that has been calculated using the WLA method with an estimated number where the results of the division can show a percentage below 100%. The results of the calculation of the workload and the number of optimal employees proposed are shown in Table 5 below.

Table 5 – Workload summary

Number	Workload (%)
Worker 1	149,7
Worker 2	150,9
Worker 3	183,4
Worker 4	188,6
Worker 5	153,8
Worker 6	157,1
Worker 7	155,2
Worker 8	155,2
Worker 9	155,2

Based on the workload data above, the total overall workload is 1449 with an average of 161 workers so that assuming the normal conditions of workers, it should have a value of 100 then the excess workload on the Quality Control Department is 1449 - 900 = 549, which means to get the normal workload, it requires 549: 100 = 5.49 or 6 additional workers.

CONCLUSION

Based on the results of data processing, it can be concluded that the workload of employees in the Biology Division Quality Control Department is high at an average of 161%, where the maximum workload limit that should be received is 100%. Therefore, to get a normal workload, 6 additional workers need to be added. The cause of the high workload was due to the large number of jobs which was not matched by the equivalent number of employees so that every employee also had full job and many tasks.

ACKNOWLEDGEMENTS

The authors would like to thank the Institute for Research and Community Service (LPPM) of UPN “Veteran” Yogyakarta Ministry of Research, Technology and Higher Education Republic of Indonesia for facilitating this research in Research Scheme and providing financial support to produce this publication.

REFERENCES

1. Ade, M. and Muhsin, A. (2017) ‘ANALISIS BEBAN KERJA MEKANIK PADA DEPARTEMEN PLANT DENGAN METODE WORK SAMPLING (STUDI KASUS PADA PT XYZ)’, Jurnal (OPSI) Optimasi Sistem Industri, 10(1), pp. 35–42. Available at: http://jurnal.upnyk.ac.id/index.php/opsi/article/view/2165.
2. Muhsin, A. (2016) ‘ANALISIS PERFORMANSI DEPARTEMEN MACHINNING MENGGUNAKAN METODE OVERALL EQUIPMENT EFFECTIVENES (OEE) (Studi Kasus pada Perusahaan Pengecoran Logam XYZ)’, OPSI (Optimasi Sistem Industri), 9(1), pp. 16–23. Available at: http://jurnal.upnyk.ac.id/index.php/opsi/article/view/2170.
3. Ningrum, N. S. and Muhsin, A. (2016) ‘LINE MACHINING PROPELLER SHAFT UNTUK PRODUK FLANGE MENGGUNAKAN METODE OVERALL EQUIPMENT EFFECTIVENESS (OEE) (STUDI KASUS DI PT HINO MOTORS MANUFACTURING INDONESIA)’, Jurnal Optimasi Sistem Industri, 9(2), pp. 109–118. Available at: http://jurnal.upnyk.ac.id/index.php/opsi/article/view/2167.
4. Ramadhan, R. et al. (2014) ‘ANALISA BEBAN KERJA DENGAN MENGGUNAKAN WORK SAMPLING DAN NASA - TLX UNTUK MENENTUKAN JUMLAH OPERATOR (Studi Kasus : PT XYZ) ANALYSIS OF WORKLOAD WITH WORK SAMPLING AND NASA - TLX TO DETERMINE THE NUMBER OF OPERATORS (Case study : PT XYZ)’, Jurnal Rekayasa dan Manajemen Sistem Industri, 2(5), pp. 964–973. Available at: http://jrmsi.studentjournal.ub.ac.id/index.php/jrmsi/article/view/142/175.
5. Ristyowati, T., Muhsin, A. and Nurani, P. (2017) ‘MINIMASI WASTE PADA AKTIVITAS PROSES PRODUKSI DENGAN KONSEP LEAN MANUFACTURING (Studi Kasus di PT . Sport Glove Indonesia)’, Jurnal (OPSI) Optimasi Sistem Industri, 10(1), pp. 85–96. Available at: http://jurnal.upnyk.ac.id/index.php/opsi/article/view/2191.