Volume 9, Issue 5, May – 2024 International Journal of Innovative Science and Research Technology
ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY2437

Analysis of Work Measurement Using a Stopwatch in a Motorcycle Workshop

Muhammad Rizki[1]; Yusuf Perdinan Sihaloho[2]; Fajar Garninda[3]; Trima Fatwa[4]; Yudi Prastyo[5]
Industrial Engineering Study Program, Faculty of Engineering, Pelita Bangsa University
Jl. Kalimalang Inspection No. 9 Cibatu, Bekasi 17530

Abstract:- In realizing competitiveness, a company/ business organization must have operational excellence. Operational excellence is obtained through the provision of facilities in the form of tools or work systems that enable workers to operate them more efficiently and effectively, where efficiency and effectiveness are two things that produce productivity. Apart from many influencing factors, such as worker experience and knowledge, CV. XYZ – a work organization engaged in the repair of two-wheeled motorized vehicles – is also trying to create an advantage that allows them to increase their productivity. This research is a quantitative descriptive study, which takes time data from the two jobs most routinely carried out by CV. XYZ, namely changing engine oil and gear oil. This research was carried out with the aim of finding out the standard time needed for workers to complete their work and making recommendations for possible improvements to be implemented by CV management. XYZ, namely recommendations for the layout of work facilities and also the sequence of work processes. The measurement results show that the standard time required to complete the job of changing engine oil and garden oil is 372.68 seconds and 417.99 seconds, respectively. Creating an operational flow map (current FPC) shows that the average distance that workers need to travel while working on engine oil and garden oil is 22 meters. The results of the FPC recommendation provided show that the distance has decreased to 16.5 meters or 5.5 meters shorter.

Keywords:- *Work Measurement, Efficiency, Effectiveness, Productivity, and Operational Excellence.*

I. INTRODUCTION

In a business industry, profit and competitiveness are two goals that must be achieved to determine the value and position of the business company in market share. Profit is an important element to ensure the sustainability of the company, while competitiveness is an ability and skill which will later have an impact on profit. An organization that has competitiveness means it has an advantage in its operations. Operational excellence is not just about making a profit from changes made, but rather the ability to provide tools and frameworks that make operations easier [1]. To create a competitive advantage, a company must be able to build that advantage,where all people and departments must be buy in, companies that want to compete must be able to create their advantages through various kinds of innovations that can attract market attention. However, before new innovations can emerge, companies that want to compete must be able to increase their productivity through increasing the efficiency and effectiveness of using the resources they have.

The manufacturing industry sector is very concerned about efficiency and effectiveness which is a must to achieve company goals. Effective and efficient working time is a crucial element in the continuity of a company's production so that it can compete with other companies. Improving quality, performance and productivity is closely related to planning and scheduling the production process through standard time calculations to complete work according to the predetermined schedule and quality [2]. While movement studies are used to improve labor methods, the purpose of time standards is to provide standard time [3].

CV. XYZ is a company that operates in the field of two-wheeled motor vehicle repairs. In the midst of the automotive industry which is and continues to experience very significant developments, CV. XYZ strives to continue to make innovations regarding technological developments and also increase the productivity of employee performance, where the first step taken is to be inward looking by trying to improve and increase the efficiency of their work methods. Labor productivity is how much product a worker can produce in a certain time using various facilities available at the workplace [4]. A company requires performance measurement through every activity within the company, so an accurate measurement method is needed and provides accurate cycle time information for the company.

II. LITERATURE REVIEW

A. Efficiency, Effectiveness and Productivity

Efficiency is a measure that states the level of resource utilization used to create or achieve a company's business goals. In discussions about efficiency, the focus is on a number of inputs, not outputs , and is often interpreted as: a deep measure compare input usage (input) planned with actual use of input implemented, where the more savings that occur, the more efficient it will be [5].

Effectiveness is a measure or percentage of achieving a goal or target. An action can be said to be effective if it can produce or achieve the goal or target to be achieved. In assessing effectiveness, the main concern is the output produced, while the input used is not given much attention.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY2437

Ideally, effectiveness assessments should be accompanied by efficiency assessments. This is because often an action that is considered effective does not take into account the use of the costs required and ends up sacrificing quite large costs, even though with just a small budget the goal can be achieved.

The result of assessing efficiency and effectiveness is productivity. Productivity is the result of using the company's resources to achieve the goals it wants to achieve. Many factors such as workers, such as experience, knowledge, and age can influence productivity [6]. In simple terms, productivity is a comparison between the output produced and the input used , where the less input used and/or the greater the output produced, the greater the productivity. So, it can be concluded that productivity is a measure of how a company can produce as many products as possible using minimal or efficient resources.

B. Working Time Measurement (Time Study)

Working time is the time needed to complete a job. Optimal use of working time allows the use of costs commensurate with the results obtained or in other terms a time cost trade off [7]. The effectiveness and efficiency of working time can be seen from the length of time the work is completed. The faster a job is completed, the more effective and efficient the use of work time will be. Working time measurements are carried out to measure and find out how much optimal time to complete a task by an operator. Work measurement is a method of determining the balance between human activities that contribute to a unit of output produced [8]. Basically, work research will focus its attention on how a certain type of work will be completed [9] so that by carrying out work measurements, it will be known what the optimal steps or procedures are as well as possible improvements to the work system to be able to complete the work.

C. Test Data Uniformity & Data Sufficiency

After several times collecting data on working time carried out by the operator, the next thing that needs to be done is to carry out an analysis of data uniformity and data adequacy tests. Data uniformity analysis according to Sari and Darmawan (2020) is needed to ensure that the data obtained comes from the same system.

➢ *In Carrying Out a Data Uniformity Test, the Steps that can be taken are as follows :*

- Calculating the average of measurement or observation data
- Calculating the standard deviation value (σ)

$$\sigma = \sqrt{\frac{\sum(x_i - \bar{x})^2}{n-1}}$$

- Calculate the value of the Upper Control Limit (UCL) and Lower Control Limit (LCL)

$$UCL = \bar{x} + k.\sigma$$
$$LCL = \bar{x} - k.\sigma$$

Create a diagram of the measurement data and control limits obtained for easy identification. Data that lies outside the control limits is usually called extreme data.

In addition, data adequacy analysis is carried out to ensure that the data collected and presented is objectively sufficient [10]. The following is the formula for testing data adequacy.

$$N' = \left[\frac{k/s\sqrt{N\sum x^2 - (\sum x)^2}}{\sum x}\right]^2$$

Where :

N’ = Amount of data that should be collected

N = Amount of data actually collected

k = coef. level of confidence

s = level of accuracy

σ = standard deviation (standard deviation)

D. Cycle, Normal, and Standard Times

The following is the formula for calculating standard time, starting from determining cycle time, providing adjustments, determining normal time and providing allowances, to determining standard time [11].

➢ *Average Cycle Time ($\bar{C}_T$)*

The length of time required to complete a job is called cycle time. Because in direct data collection the measured time often changes due to changes in operator performance, an average value is needed which is called the average cycle time.this means the average time required by workers to carry out engine oil and garden oil replacement work. The formula for finding the average cycle time value is as follows:

$$\bar{C}_T = \frac{\sum_{i=1}^{n} x_i}{n}$$

Where :

$\sum_{i=1}^{n} x_i$ = Total time of cycle time measurement

n = The amount of data/measurements carried out

➢ *Normal Time (N_T)*

Normal Time (N_T) is obtained from cycle time given an adjustment factor. Zadry, et al (2015) say that normal time for an element of work operations is simply to show that an operator is well qualified will work to complete the job on normal working speed. So, normal working time is the length of time the operator completes his work under normal conditions or at normal speed.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY2437

$$N_T = C_T \times p$$

Where :

$\bar{C}_T$ = Cycle Time

p = Adjustment Factor

➢ *Standard Time (s_T)*

After determining amount of allowance, the next step is to determine the standard time. Zadry, et al (2015) say standard time is the time for one complete cycle of an operation with the recommended method after combining with appropriate adjustment factors and still deep leeway operating control limits. Determination of standard time is as follows:

$$S_T = N_T(1 + L)$$

Where :

L = Looseness Factor

E. Adjustments & Allowances

➢ *Adjustment*

The adjustment (denoted by p) functions to normalize the cycle time obtained through measurements. Adjustments can be made if during the measurement, the observer finds something unnatural about the measurement value obtained. These irregularities are caused by operators who are not in their normal or normal condition, such as working too fast or too slow. There are separate provisions regarding the amount of adjustment (p) based on the operator's work, namely [11]:

- If p>1, it means the operator is working too fast so additional time is needed to adjust.
- If p<1, it means the operator is working too slowly so time reduction is needed to adjust.
- If p=1, it means the operator is working fairly, in other words, working neither too fast nor too slow.

There are several methods for determining adjustment factors, including the Schumard method, Westinghouse, and objective methods. In measuring the work carried out, researchers used the Westinghouse adjustment method to provide adjustments to the working time carried out by operators/service workers. Westinghouse's way of directing assessments is based on four factors considered to determine the fairness and unfairness of work namely skill, effort, working conditions, and consistency. Every factor divided into classes with their respective grades [11].

Table 1 Class in the Westinghouse Method

Factor	Class	Symbol	Mark
Skills	Super Skills	A_1	+ 0,15
		A_2	+ 0,13
	Excellent Skills	B_1	+ 0,11
		B_2	+ 0,08
	Good Skills	C_1	+ 0,06
		C_2	+ 0,03
	Average Skill	D	0,00
	Fair Skills	E_1	− 0,05
		E_2	− 0,10
	Poor Skills	F_1	− 0,16
		F_2	− 0,22
Business	Excessive	A_1	+ 0,13
		A_2	+ 0,12
	Excellent	B_1	+ 0,10
		B_2	+ 0,08
	Good	C_1	+ 0,05
		C_2	+ 0,02
	Average	D	0,00
	Fair	E_1	− 0,04
		E_2	− 0,08
	Poor	F_1	− 0,12

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY2437

		F_2	$-0,31$
Working Conditions	Ideal	A	$+0,06$
	Excellent	B	$+0,04$
	Good	C	$+0,02$
	Average	D	$0,00$
	Fair	E	$-0,03$
	Poor	F	$-0,07$
Consistency	Perfect	A	$+0,04$
	Excellent	B	$+0,03$
	Good	C	$+0,01$
	Average	D	$0,00$
	Fair	E	$-0,02$
	Good	F	$-0,04$

Source: Zardy, et al (2015)

➢ *Allowance/Looseness (L)*

If the normal time states that the time needed is limited to completing a job, then before getting the standard time, an allowance factor must first be given. The allowance factor (symbolized by the letter L) is a factor given by considering the needs in the work process, both the personal needs of the operator and the needs if an obstacle occurs in the middle of the work activity.

Allowance exists to give operators the opportunity to do the things they need to do, so that standard time is said to be complete time data and represents the observed work system. The concessions provided include:

- Looseness for personal needs
- Looseness for relieve fatigue
- Unavoidable slack

III. RESEARCH METHODOLOGY

This research is included in quantitative descriptive research, namely explaining descriptively the work time required to carry out an activity or work activities in one cycle (cycle time) and determining the optimal time that should be taken to complete the work.

Based on the trend of customers who come to the workshop are customers with automatic motorbikes , the analysis carried out is on the service process for automatic motorbikes . According to the management of the CV motorbike repair shop. XYZ, the majority of customers who come are regular customers, where changing engine oil and axle oil is a mandatory action. The initial stage of the analysis carried out is to first carry out direct work measurements on the process that is the object of observation, namely changing the engine oil and changing the axle oil, where this aims to find out how much work time the workshop employee (service man) spends to complete the replacement work. the oil. Researchers carried out direct measurements using the stopwatch method on operators appointed by management based on the company's average performance. After the data is collected, the average Cycle Time ($\bar{C}_T$) , Normal Time (N_T), and Standard Time (S_T) are determined.

IV. RESULTS AND DISCUSSION

The following is presented in Table 2, namely work measurement data from two Motorcycle Workshop operators for changing engine oil and axle oil.

Table 2 Operator Time Measurement Data

Work	Operator 1 (second)			Operator 2 (second)		
Engine Oil Change	320	335	348	335	378	325
	331	350	357	340	390	335
	325	322	360	357	400	350
	340	330	356	380	395	385
	330	326	375	365	380	380
Axle Oil Change	295	295	312	310	318	297
	299	298	297	325	295	299
	310	325	320	330	335	300
	315	330	317	298	310	310
	325	310	297	300	320	340

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY2437

➢ *Test the Adequacy and Uniformity of Data*

As a first step to ensure its validity, the data obtained was tested for data uniformity and data adequacy. Thirty data were taken from two operators who had relatively the same productivity. In this test, a confidence level of 98% and an accuracy of 5% were used. From the test results, it was found that the data taken was sufficient and Figure 1 below is a visualization of the data uniformity test results.

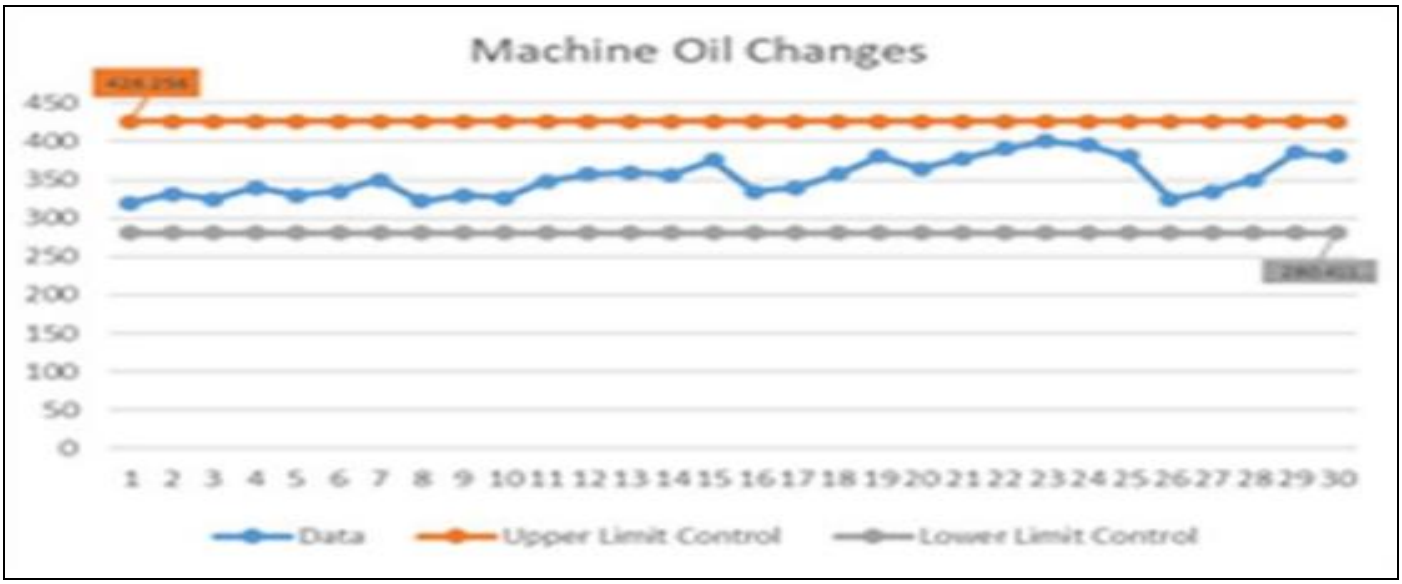

Fig 1 Control Map for Engine Oil Changing

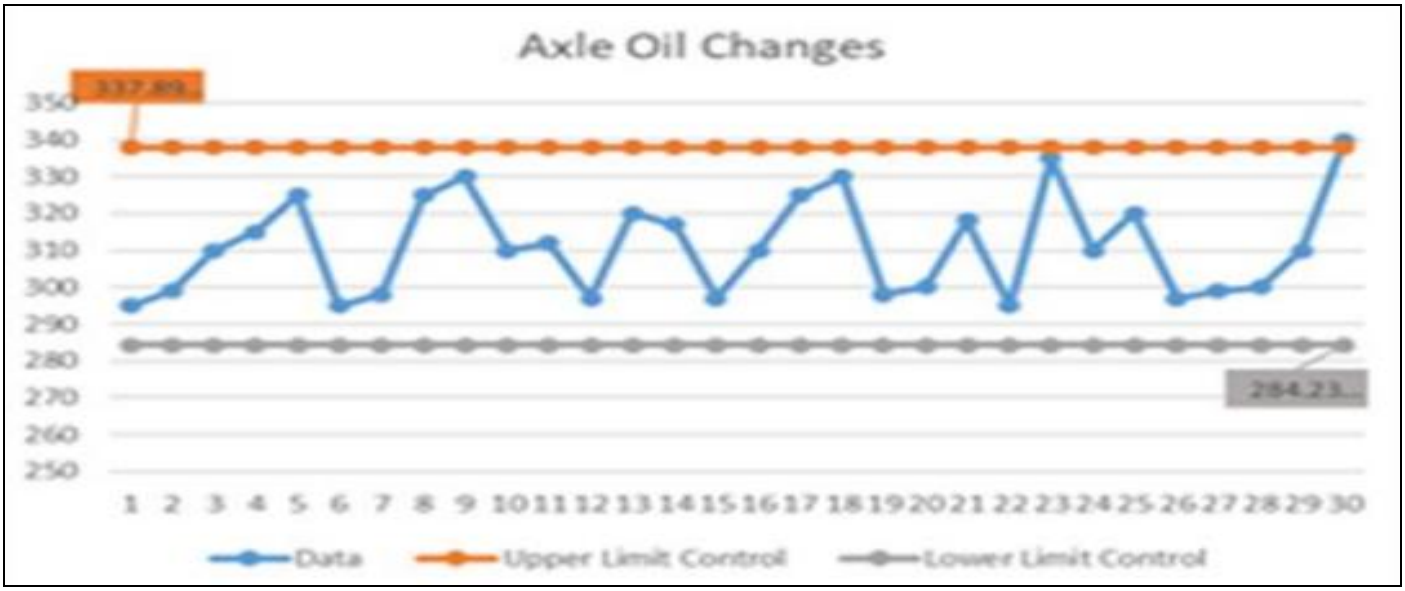

Fig 2 Control Map for Axle Oil Changing

➢ *Determination of Standard Time*

The following are the steps in determining the standard time for changing engine oil and garden oil.

Calculation example: Engine Oil Change work as a first step, the average cycle time for an engine oil change will be determined as follows.

$$C_T = \frac{\sum_{i=1}^{n} x_i}{n}$$

$$C_T = \frac{320 + 331 + 325 + \cdots + 385 + 380}{30}$$

$$C_T = \frac{10.600}{30}$$

$$C_T = 353{,}33 \ seconds$$

From thirty time measurements carried out on two operators, an average cycle time was obtained, namely 353 seconds. Next, to make things uniform, time adjustments are made using the Westinghouse method to get normal time. Based on the observations made, engine oil change time adjustments were obtained as shown in Table 3 below.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY2437

Table 3 Assessment of Engine Oil Change Adjustment Level

Factor	Class	Mark
Skills	*Good Skills* (c_1)	+0,06
Business	*Average (D)*	0,00
Working Conditions	*Average (D)*	0,00
Consistency	*Fair (E)*	-0,02
Adjustment		**+0,04**

Adjustment (P) = 1 + (+ 0.04)

P = 1.04

Using the Westinghouse method , an adjusted value of 1.04 is obtained. Therefore the normal time obtained is as follows.

$$N_T = \bar{C}_T \times p$$
$$N_T = 353{,}33 \times 1{,}04$$
$$N_T = 367{,}12 \; seconds$$

After obtaining the normal time value, the next step is determining the allowance value given in the engine oil change job. The allowances given are as presented in Table 4 below.

Table 4 Engine Oil Change Clearance Assessment

Allowance	Mark (%)
Individual needs	2
Eliminates Fatigue	22.05
Things that can't be avoided	5
Total Allowance (L)	**29.05**

Based on the determination of allowances together with management and operators, the allowance value given for the engine oil change process is 29.05%. So the standard time obtained for the Engine Oil Change activity is as follows.

$$S_T = N_T(1 + L)$$
$$S_T = 367{,}12(1 + 29{,}05\%)$$
$$S_T = 372{,}68 \; seconds$$

The following is the standard time calculation for the process of changing engine oil and axle oil as presented in Table 5 below.

Table 5 Time Assessments for Changing Engine Oil and Axle Oil

Work	Cycle Time	Normal Time	Standard Time
Engine Oil Change	353.33 seconds	367.12 seconds	372.68 seconds
Axle Oil Change	314.44 seconds	323.90 seconds	417.99 seconds
Total Time	**667.77 seconds**	**691.02 seconds**	**790.67 seconds**

➢ *Proposed Improvements*

In an effort to help CV. XYZ in improving the quality of their operators' work, analyzed the work environment and work processes carried out by operators by drawing current layouts and flow process charts and then making proposals for layout designs and work process steps as follows.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY2437

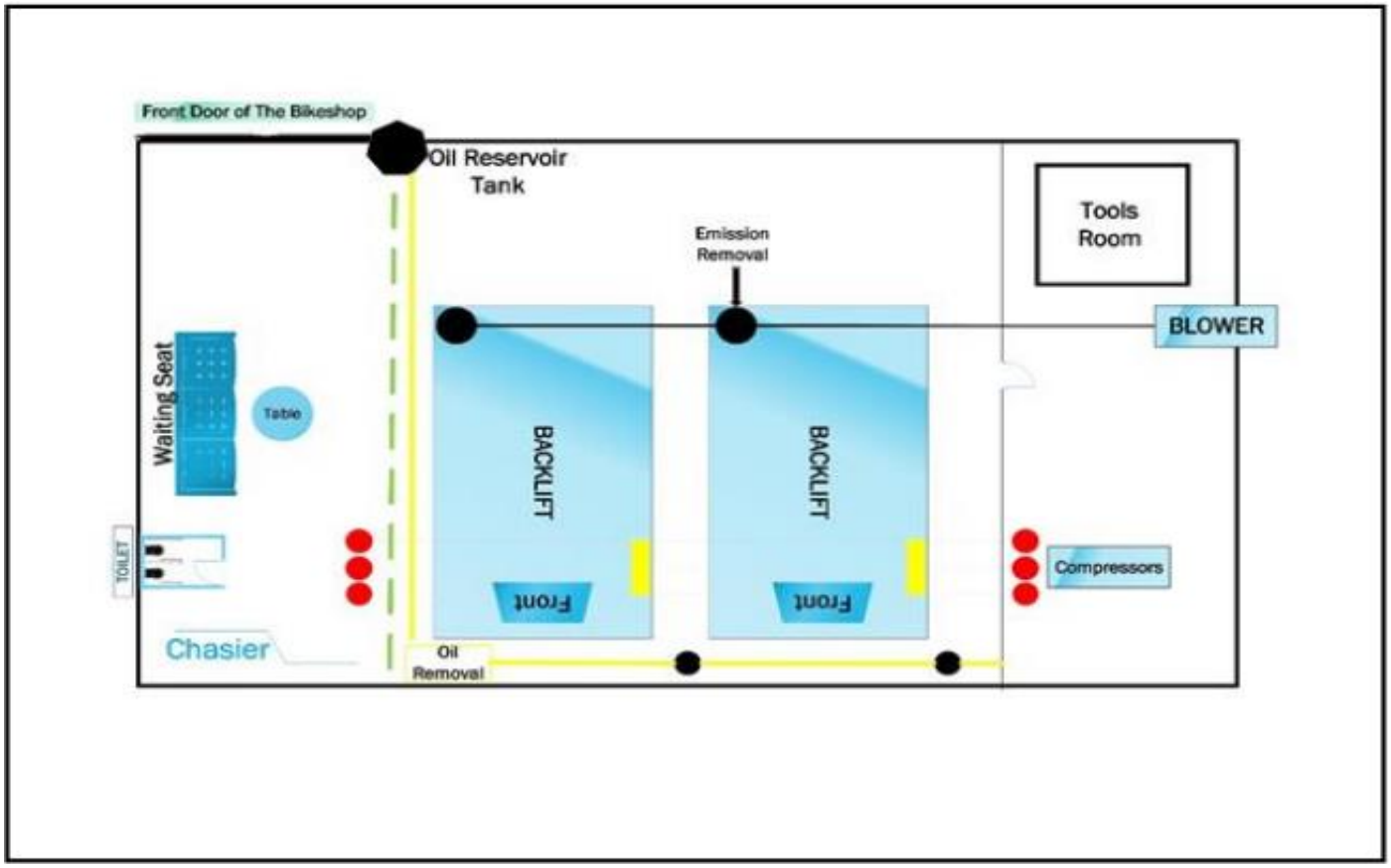

Fig 3 Current Layout

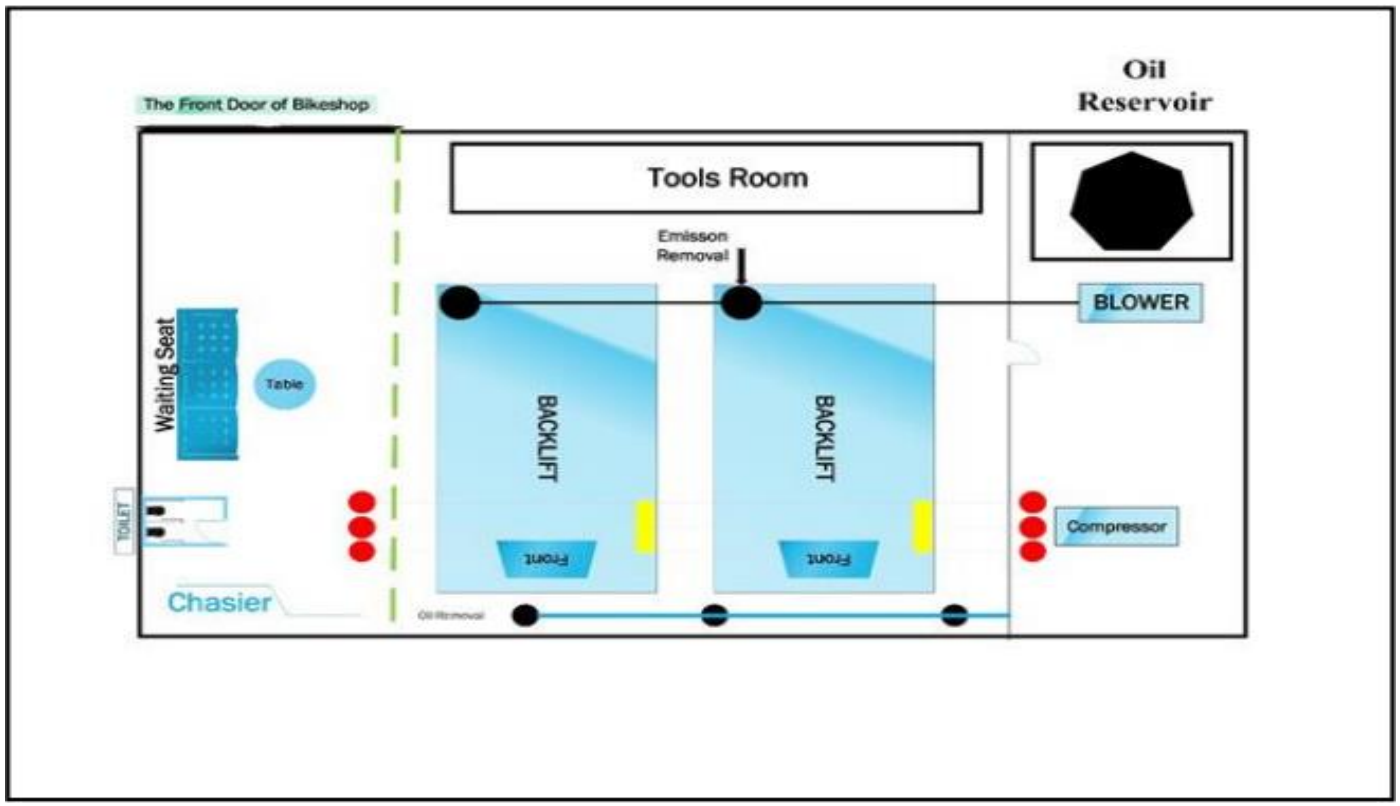

Fig 4 Proposed Improvement

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY2437

FLOW PROCESS CHART

Summary	Current		Proposed		Diferrence	
KEGIATAN	Qty	Time	Qty	Time	Qty	Time
OPERATION	20	350				
INSPECTION	6	28.5				
TRANSPORTATION	3	312				
DELAY	0	0				
INVENTORY	3	0				
TOTAL DISTANCE (meter)	22					

AASSIGNMENT : Enginee & Axle Oil Changes
MAP NUMBER : 1
EMPLOYE ☑ MATERIAL ☐ PAPER ☐
CURRENT ☑ PROPOSED ☐
MAPPED BY : Fajar and Rizki
MAPPED DATE : March 28th, 2024

Description of Activities	Symbols	Distance	Quantity	Time	Analize					Note	Action Change					
		m		s	What	Where	When	Who	How		Room	Merge	Sequence	Place	People	Improve
The motorcyle came to bikeshop			1	0												
Operator prepared the tools while waiting for its enginee to cool down		9.5	2	300												
Operator made sure the enginee wasn't hot			1	5												
Openned the enginee oil outlet			1	22												
Allowed the oil flew out of enginee into the oil reservoir			1	15												
Openned the enginee oil inlet			1	18												
Took the air compressor to remove the remaining oil		1.5	1	6												
Sprayed the oil tank to remove the oil residue			1	23												
The operaetor made sure that there was not oil residue left inside			1	8												
Closed the enginee oil outlet			1	18												
The operator made sure the outlet has closed well			1	6												
Put the funnel on the enginee oil inlet			1	5												
Prepared the new enginee oil			1	15												
Pour the new oil through the funnel			1	30												
Remove the funnel from the oil inlet			1	6												
Closed the enginee oil inlet			1	13												
The operator made sure that the inlet has closed well			1	4												
Enginee oil change was done			1	0												
The operator prepared the oil reservoir and openned the axle oil outlet			1	6												
The operator openned the axle oil outlet			1	18												
Allowed the axle oil flew out of the axle tube into the reservoir			1	35												
Openned the axle oil inlet			1	18												
The operator took the air compressor for used to remove the remaining oil in axle tube		1.5	1	6												
The operator sprayed the axle oil residue out into the reservoir			1	22												
Made sure that the old oil was removed completee			1	2												
Closed the axle oil outlet			1	25												
Made sure that the axle oil outlet was closed well			1	2.5												
Prepared the new axle oil			1	7												
Pour the new axle oil by funnel			1	34												
Closed the axle tube inlet			1	18												
Made sure the tube was closed well			1	3												
Axle oil changie was done			1	0												

Fig 5 Current Flow Process Chart Changing Engine Oil and Axle Oil

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY2437

FLOW PROCESS CHART

KEGIATAN	Current Qty	Current Time	Proposed Qty	Proposed Time	Diferrence Qty	Diferrence Time
OPERATION	20	350	18	284	2	66
INSPECTION	6	28.5	7	20.5	1	8
TRANSPORTATION	3	312	2	306	1	6
DELAY	0	0	0	0	0	0
INVENTORY	3	0	2	0	1	0
TOTAL DISTANCE (meter)	22		16.5		5.5	

AASSIGNMENT : Enginee & Axle Oil Changes
MAP NUMBER : 1
EMPLOYE ☑ MATERIAL ☐ PAPER ☐
CURRENT ☐ PROPOSED ☑
MAPPED BY : Yusuf and Trima
MAPPED DATE : March 30th, 2024

Description of Activities	Distance (m)	Quantity	Time (s)	Analize: What	Where	When	Who	How	Note	Action: Change: Room	Merge	Sequence	Place	People	Imprv
The motorcyle came to bikeshop		1	0												
Operator prepared the tools while waiting for its enginee to cool down	7.5	2	300												
Operator made sure the enginee wasn't hot		1	5												
Prepared the enginee and axle oil reservoirs		1	22												
Opened the enginee oil outlet		1	15												
Allowed the oil to flew out of enginee into the oil reservoir		1	18												
Opened the enginee oil inlet		1	6												
Opened the axle oil outlet		1	23												
Allowed the oil to flew out of axle into the oil reservoir		1	8												
Opened the axle oil inlet		1	18												
The Operator took the air compressor to remove the remaining oil	1.5	1	6												
The Operator removed the enginee oil residue by air compressor		1	5												
Made sure that there was not the oil residue left inside		1	1												
The Operator removed the axle oil residue by air compressor		1	15												
Made sure that there was not the oil residue left inside		1	1												
Closed the enginee oil outlet		1	6												
Made sure the enginee oil outlet has closed well		1	3												
Closed the axle oil outlet		1	4												
Made sure the axle oil outlet has closed well		1	2												
Put the oil funnel on the enginee oil inlet		1	6												
Prepared the new enginee oil		1	18												
Pour the new enginee oil into machine tube		1	35												
Closed the enginee oil inlet		1	18												
Made sure the enginee oil inlet closed well		1	6												
Prepared the new axle oil		1	22												
Pour the new axle oil into the axle tube		1	2												
Closed the axle oil inlet		1	25												
Made sure that the axle oil inlet closed well		1	2.5												
Enginee and Axle Oil Changes was Complet		1	7												

Fig 6 Proposed FPC Changing Enginee Oil and Axle Oil

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY2437

V. CONCLUSIONS AND RECOMMENDATIONS

Productivity is something that needs to be measured and planned well to ensure the quality of the business company concerned. Apart from applying the latest technology to support better work productivity, internal aspects such as the efficiency of work area layout and implementation of work steps also need to be considered. Adopting sophisticated technology does help work effectiveness and efficiency, but it needs to be adapted to current needs. The technology used is technology that suits the needs and capabilities of the work organization concerned and perhaps just improving work processes or implementing 5S can increase the productivity of a work organization without updating the technology used. CV. XYZ in its operational activities has areas whose use is still less than optimal and with the suggestions given, it is hoped that it can increase the effectiveness and efficiency of CV's work. XYZ.

REFERENCES

[1]. P. Found, A. Lahy, S. Williams, Q. Hu, and R. Mason, “Towards a theory of operational excellence,” Total Qual. Manag. Bus. Excell., vol. 29, no. 9–10, pp. 1012–1024, 2018, doi: 10.1080/14783363.2018. 1486544.

[2]. R. Afiani and S. M. Darminto Pujotomo, “Penentuan Waktu Baku Dengan Metode Stopwatch Time Study Studi Kasus Cv Mans Group,” Jur. Tek. Ind., vol. 6, no. 3, p. 30, 2017.

[3]. P. S. Kalne and A. M. Mehendale, “The Purpose of Time-Motion Studies (TMSs) in Healthcare: A Literature Review,” Cureus, vol. 14, no. 10, 2022, doi: 10.7759/cureus.29869.

[4]. A. A. Masruri, M. Hastarina, P. Lavender,) Prodi, and T. Industri, “Analisis Produktivitas Pekerja Dengan Menggunakan Metode Time And Motion Study (PT. Astra Honda Motor Palembang) Analysis of Worker Productivity Using Time And Motion Study Method (PT. Astra Honda Motor Palembang),” vol. 2, no. 1, 2017.

[5]. H. Indrayani, “Penerapan Teknologi Informasi dalam Peningkatan Efisiensi, Efektivitas, dan Produktivitas,” no. september 2016, pp. 1–6.

[6]. B. A. Studynka, E. Aryanny, J. R. Rungkut, and M. Surabaya, “Improvement Productivity Menggunakan Metode Time Motion Study Pada Area Dissolving Soy PT XNX,” Venus J. Publ. Rumpun Ilmu Tek., vol. 2, no. 1, 2024, [Online]. Available: https://doi.org/10.61132/venus.v2i1.96

[7]. M. Priyo and M. Risa Anggriani Paridi, “Studi Optimasi Waktu dan Biaya dengan Metode Time Cost Trade Off pada Proyek Konstruksi Pembangunan Gedung Olah Raga (Gor),” Semesta Tek., vol. 21, no. 1, pp. 72–84, 2018, doi: 10.18196/st.211213.

[8]. W. M. Alfaruqi, “Pengukuran Waktu Kerja Karyawan Pada Proses Pembuatan Sepatu Di Ud. Putri Diana Jombang,” pp. 1–77, 2015.

[9]. T. Akhir and Y. I. Saputri, “STOPWACTH TIME STUDY PADA IKM O l e h : POLITEKNIK ATI MAKASSAR,” 2021.

[10]. E. Sari and M. Darmawan, “PENGUKURAN WAKTU BAKU DAN ANALISIS BEBAN KERJA PADA PROSES FILLING DAN PACKING PRODUK LULUR,” vol. 2, pp. 51–61, 2020.

[11]. H. Zadry, Raimona, 1689–1699.nti Lusi, SusaZadry, Raimona, H., Lusi, S., Yuliandra, B., & Desto, J. (2015). Analisis Dan Perancangan Sistem Kerja. Journal of Chemical Information and Modeling, 53(9), B. Yuliandra, and J. Desto, Analisis Dan Perancangan Sistem Kerja, vol. 53, no. 9. 2015.