HUMANIS
(Humanities, Management and Science

Vol. 4 • No. 1 • December 2023

Pege (*p.*) : **276 – 287**

ISSN (*online*) : 2746 - 4482
ISSN (*print*) : 2746 - 2250

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Special Issue:
ICoMS2023
The 4th International Conference on Management and Science

Website. :
http://www.openjournal.unpam.ac.id/index.php/SNH

Implementation Of Lean To Reduce Unplanned Downtime Due To Material Shortage At PT. NPI Kalimantan Barat

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Abstract: The application of lean concepts in manufacturing has often been successful. And it should also be used in the plantation industry. The use of lean concepts is expected to make work processes more effective and efficient. The purpose of this study is to analyze and propose improvements to the work process that has been carried out so far, so that a series of work is obtained as expected. Lean principles, namely: value, value stream, flow, pull, and continuous development. One of the main tasks of Service Control at PT. Nusantara Plantation Indonesia is handling complaints regarding employee comfort at work. Based on 2022 data, the average unplanned downtime at Sempidan Mill in the last 6 months (January - June 2019) is 39.8 hours / month As a result of this, Sempidan Mill lost production processing time equivalent to 394 Tons of CPO output per month (39.8 hours x 45 Tons FFB/h x 22% OER) which is equivalent to 2.36 M of revenue per month. Sempidan Mill also has the potential to get penalties from CPO buyers, due to high FFA levels due to late fruit processing. Unplanned downtime also disrupts fruit transportation from orchards due to long truck queues due to late fruit processing. Sempidan Mill needs to achieve 0% unplanned downtime to increase productivity and minimize FFA penalties.

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Keywords: ***Lean, Process Mapping, Lean Service, Lean Tools, Visual Management.***

INTRODUCTION

Good performance is a reflection of achieving good results so that good performance will produce good productivity. One of the efforts that can be made to increase productivity and work improvement is to apply Lean as a way of working and acting in a work activity. Basically, Lean is a method that aims to improve a process by eliminating all activities that have no added value and improving work processes to make them more effective and efficient, faster results and better quality. The basic principles of lean aim to increase *the added value* of products (goods or services) in order to provide value to customers (*cutomer value*) in all work process flows in the company. The goal of lean is to increase customer value continuously by increasing the ratio between added value to waste *(*the value-to-waste ratio*).*

In 2006, the value-to-waste ratio *in Japan was around 50%, Toyota Motor was around 57%, the best companies in North America (United States and Canada) were around 30%,*

while the value-to-waste ratio of the best companies in Indonesia was only 10%. A company can be said to be lean if *the value-to-waste ratio* has reached a minimum of 30%. If the company is not said to be lean, then the company can be referred to as *an Un-lean Enterprise* and categorized as a traditional company.

Since its establishment, PT. NPI upholds its commitment to build a plantation business that is law-abiding, environmentally friendly and provides added value and benefits to the community around the plantation. These three aspects are important in order to establish a healthy partnership between the company and the community. This partnership principle aims to establish mutually beneficial cooperation between both parties.

PT. NPI had started its first planting in 2010, in one of its oil palm plantations in West Kalimantan. The inaugural planting was carried out in conjunction with the inauguration of the PT. NPI for garden assistants. Unplanned downtime is a problem that must be resolved or reduced because it can cause losses to the company, especially to production availability. In this study, downtime caused by internal factors will be discussed. Downtime that occurs due to internal factors can be analyzed using the Lean method is one of the parameters in the production process that can affect production throughput. To increase availability can be done by scheduling optimal equipment overhauls. Based on these problems, this study will conduct an availability analysis by considering equipment overhaul scheduling, availability of spare parts materials and visual aspects of existing management.

LITERATURE REVIEW

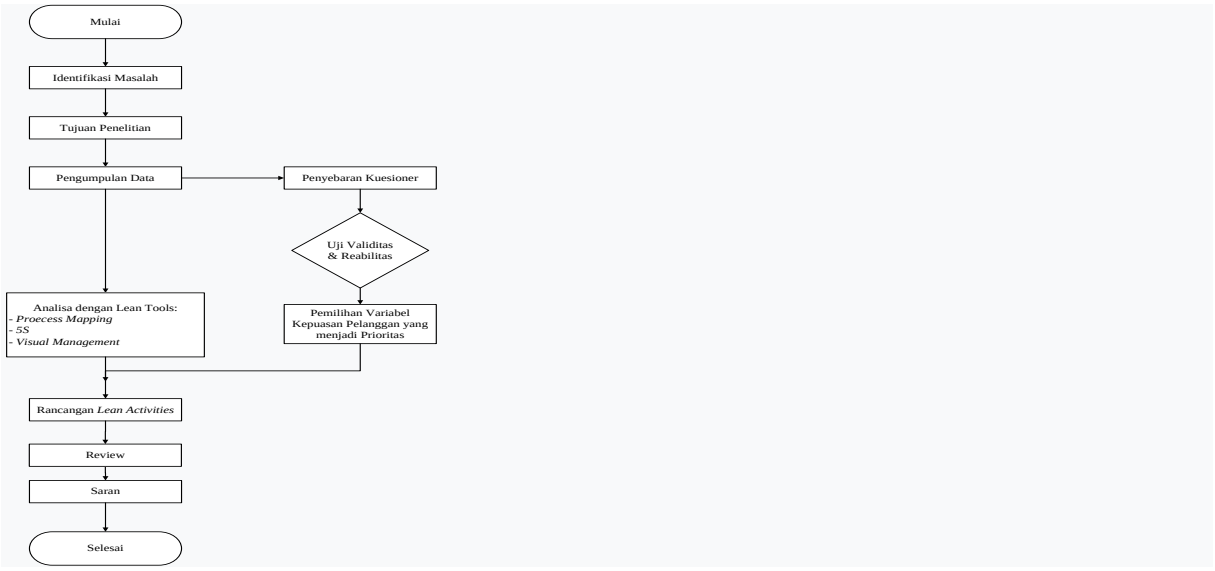
Conduct direct field observations to observe the actual conditions. In addition, a question and answer process was also carried out with interested parties in the flow of work processes in the *service control department*. From the results of these observations, it can be concluded several stages that will be carried out, including:

Questionnaire dissemination
Questionnaires are given to internal consumers to determine the importance of the attributes that make up the satisfaction and expectations of customers. The questionnaire given contained 20 questions using the Service Quality concept approach from Parasuraman (1988). The number of respondents was 50 departments within PT NPI, with one questionnaire representing one department.

Process Mapping Creation
The next stage is making process mapping of the work done by the service control department. The purpose of this stage is to know the overall activity that occurs clearly. So it can be seen the wastes that occur.

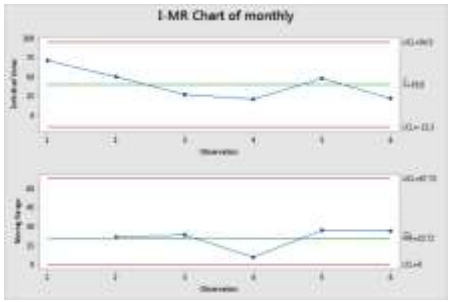
5S Analysis
In the condition of the service control department's spare part warehouse, an analysis is made using the 5S method. This is done to improve the condition of the warehouse which is still not neat and organized.

Use of Visual Management
There is still a lack of good information systems that occur in the work environment of the service control department. For this reason, it is necessary to use visual management to facilitate communication between parties in the service control department.



RESULT

Based on the average *work order* (WO) data for the last 1 year, it can be seen that complaints about unplanned machine downtime problems due to lack of lighting are the most. Furthermore, this complaint problem will be made *a mapping process*.



Based on 2022 year data, the average unplanned downtime at Sempidan Mill in the last 6 months (January - June 2022) is 39.8 hours / month.

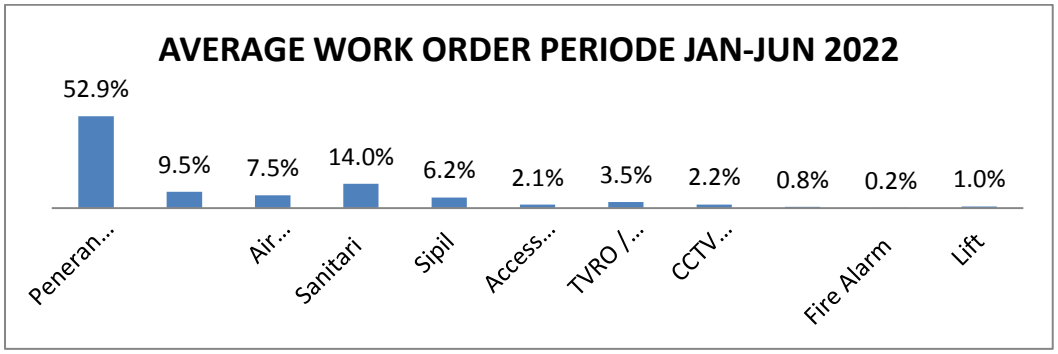


Figure 2. Average Work Order Period Jan - Dec 2011

Process Mapping

The following figure is a process flow of lighting problem complaint handlers performed by the *service control department*.

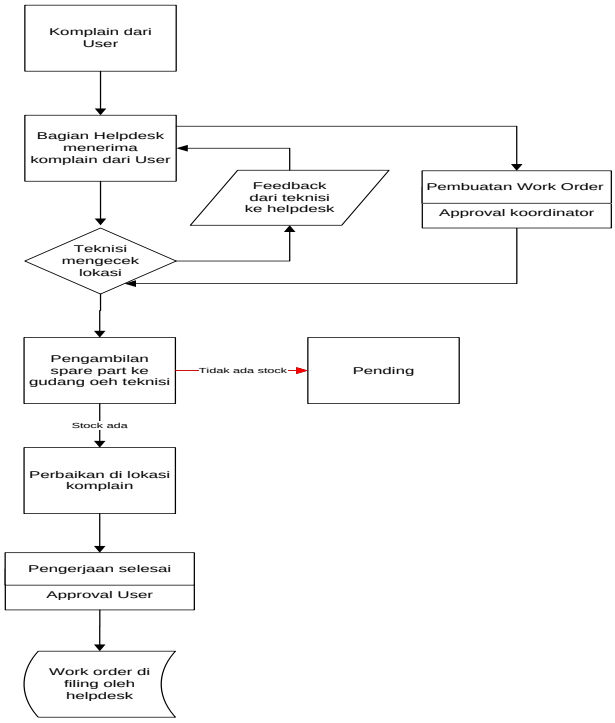


Figure 3. Service Control Department Complaint Process Flow

From the flow can be seen the work flow and the time required

Table 1. *Process mapping* complaint process lamp replacement

No	Uraian Pekerjaan	Mesin/Alat	Jarak (meter)	Waktu (menit)	Jumlah Tenaga Kerja	Aktivitas
1	Menerima komplain dari user	Telepon		1	1	○
2	Menelepon teknisi untuk mengecek lokasi komplain	Telepon		1	1	○
3	Teknisi menuju ke lokasi komplain		100	10	1	⇨
4	Teknisi mengecek lokasi komplain			15		□
5	Teknisi mengirim feed back ke bagian helpdesk	Telepon		1	1	○
6	Bagian helpdesk mengisi form komplain di website dan membuat Work Order	Komputer dan printer		3	1	○
7	WO menunggu approval dari koordinator			30		D
8	Menunggu kedatangan teknisi			10		D
9	Teknisi membuat bon gudang untuk mengambil spare part berdasarkan WO			1	1	○
10	Teknisi membawa WO dan bon ke gudang		50	5	1	⇨
11	Menunggu spare part diambilkan			5	1	D
12	Menuju ketempat komplain		100	10	1	⇨
13	Memperbaiki/menganti lampu	Spare part dan tools		5	1	○
14	Meminta approve dari customer		20	1	1	⇨
15	Teknisi menyerahkan WO yang telah di approve ke bagian helpdesk		100	10	1	⇨
16	Bagian helpdesk menyimpan (Filling) WO		5	1	1	▽

Table 2. Total Activity of the Light Replacement Complaint Handling Process

Aktivitas	Jumlah	Waktu (menit)
Operation	6	12
Transportation	5	36
Inspection	1	15
Delay	3	45
Storage	1	1

Spare Parts Warehouse

From the analysis used through Fish Bone, we can see that there is a source of the problem of the condition of the warehouse is still not neat (messy)

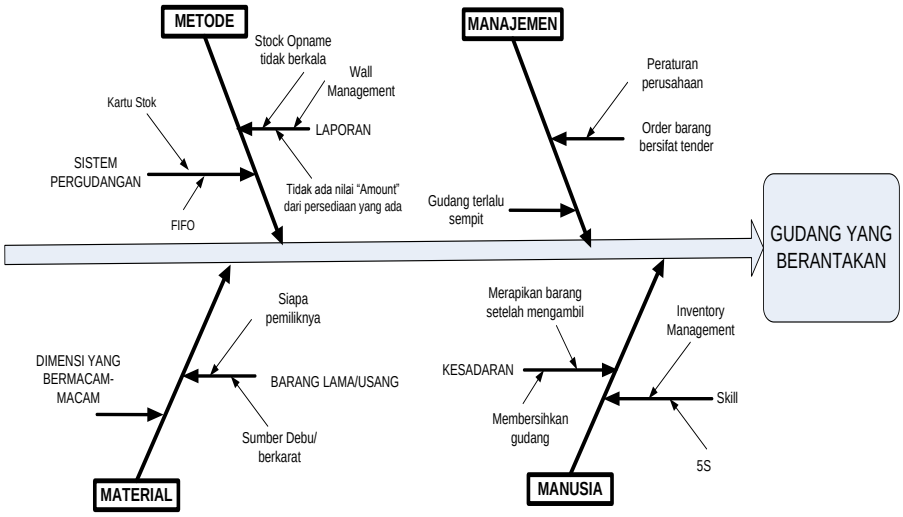


Figure 4. *Fish Bone* Diagram Warehouse Conditions

From the analysis of *the fish bone diagram,* it can be concluded the main problem of each existing factor.

Table 3. The Main Factors Causing Warehouse Problems

Faktor	Permasalahan
Manusia	Minimnya skill si petugas gudang. Ini disebabkan petugas saat ini adalah berasal dari bagian lain. Bukan khusus orang yang direkrut dengan kemampuan masalah pergudangan
Manajemen	Komitmen yang rendah dari pihak manajemen. Gudang yang digunakan saat ini, pada awalnya bukan diperuntukan untuk gudang. Selain itu juga pengadaan barang yang bersifat tender menyebabkan barang datang dalam satu kali kedatangan
Material	Banyaknya barang yang usang dan kotor, sehingga menjadi sumber debu. Serta banyak barang yang tidak diketahui siapa pemiliknya.
Metode	-Tidak adanya kartu stok secara fisik yang menempel pada barang
	-Tidak adanya laporan stock opname/stock taking secara periodik

The Need for Visual Management

To facilitate communication between parties involved in the operational processes of the service control department, one of the existing lean tools can be used, namely Visual Management. But unfortunately this has not been widely used in the work environment of the service control department. For more details can be seen below.

Table 4. The need for *visual management*

No	Area	Information
1	CCMS Room	- There is no info about the WO, neither its status, its officers, nor its time. - Officer on duty - Monthly report data on WO work
2	Warehouse	- No information on the stock of goods that are out of stock or critical - No *Stock card* attached to each item - No marks for items that are no longer used or damaged - No inventory value report data per period

Questionnaire

From the existing questionnaire data, five attributes with the largest gap value were obtained . The *gap value* is obtained by subtracting the average expected value by the average expected value.

Table 5. Five attributes with a gap score between expectations and performance

No	Service Quality Attributes	Expected Value	Value Performance	*Gap Score*
1	Courtesy of technicians when making repairs	3,82	3,46	-0,36
2	Resolution of complaints is done appropriately to the problem	3,78	3,5	-0,28
3	Technicians answer questions from users	3,82	3,54	-0,28
4	Length of time to repair the device	3,86	3,6	-0,26
5	Rescheduling if the complaint cannot be resolved by then	3,88	3,62	-0,26

RESULTS AND DISCUSSION

By *Current Process Mapping* Next made *Future Process Mapping* as a corrective step. From the result m*Apping* It can be seen that there are several job descriptions that can be removed or added, so that a simpler and faster workflow will be obtained. The job descriptions that can be omitted, or added, include:

1. Call the technician to check the location of the complaint.
    - Problem: This seems to be a huge waste of time, because as for what technicians do in the checking process, most of them are just to check what type of lamp is used. Actually, information from users about what types of lights are damaged will be very useful, but unfortunately almost all *users* do not understand the types of lights that exist. So to get clear information, the technician must go directly to the location to check it.
    - Solution: Create a *data base* or *mapping* the use of all existing lamps both types to the specifications used. It is expected that when *users* file complaints, they just mention the address of the lamp that must be replaced, such as the floor, room, and location.

2. Check the stock of *spare parts* in the warehouse.
    - Problem: Previously, there was no check whether the stock of the item in question was present or not. The availability of goods is only known when the technician requests goods to the warehouse with *a work order* (WO) position already made. So that it will cause a pending WO due to the absence of stock.
    - Solution : So far, warehouse stock is only used by the warehouse. In the future, it's good that stock information can also be shared with the department *Help Desk*. So it will not waste time if the item in question does not exist and will also eliminate the WO that *Pending* as a result of the absence of stocks.

3. The WO awaits approval from the coordinator.
    - Problem: Often coordinators are busy with their affairs and difficult to ask for approval. Not to mention if the coordinator does not come to work, so the WO will run without approval and will only be asked for approval afterwards.
    - Solution : Approval process for existing WO by the coordinators is eliminated. Instead, simply the signature of the section *Help Desk* only states that the WO is valid. For the validation process whether *Spare* what is required in WO used properly, can be done by comparing the amount *Spare* that came out of the warehouse with the amount requested in the WO.

So that for the next time a new working design is obtained, as shown in the picture below

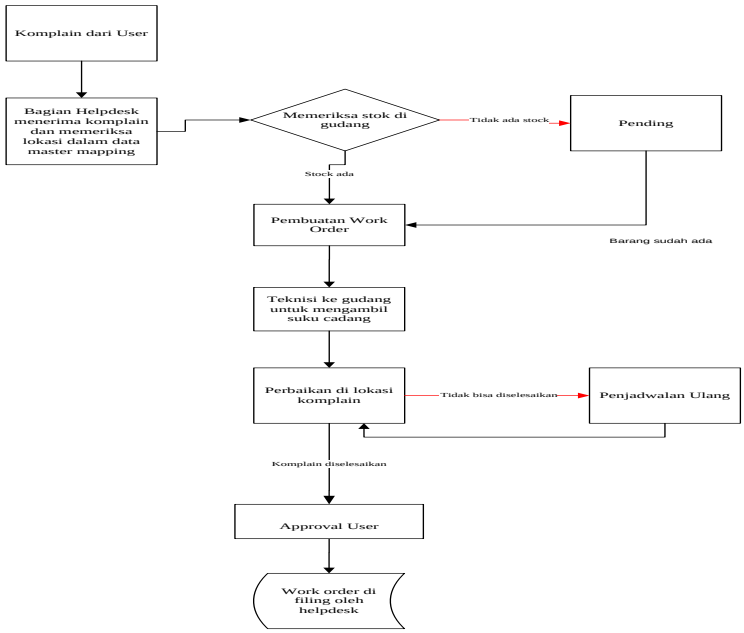


Figure 5 Draft Complaint Handling Procedure

From The results of future process mapping, obtained 12 job descriptions, reduced by 4 job descriptions from the previous series of work.

Table 6. *Future State Process Mapping*

No	Uraian Pekerjaan	Mesin/Alat	Jarak (meter)	Waktu (menit)	Jumlah Tenaga Kerja	Aktivitas
1	Menerima komplain dari user dan mengecek ke master data lampu	Telepon		1	1	○
2	Bagian Helpdesk mengecek stok barang yang dimaksud			15		□
3	Menelepon teknisi perihal adanya WO	Telepon		1	1	○
4	Bagian helpdesk mengisi form komplain dan membuat Work Order	Komputer dan printer		3	1	○
5	Teknisi membuat bon gudang untuk mengambil spare part berdasarkan WO			1	1	○
6	Teknisi membawa WO dan bon ke gudang		50	5	1	⇨
7	Menunggu spare part diambilkan			5	1	D
8	Menuju ketempat komplain		100	10	1	⇨
9	Memperbaiki/mengganti lampu	Spare part dan tools		5	1	○
10	Menunggu approve dari customer		20	1	1	⇨
11	Teknisi menyerahkan WO yang telah di approve ke bagian helpdesk		100	10	1	⇨
12	Bagian helpdesk menyimpan (Filing) WO		5	1	1	▽

Table 7. Total *Future State Process Mapping Activities*

Activity	Sum	Time (Minutes
Operation	5	11
Transportation	4	26
Inspection	1	15
Delay	1	5

Storage	1	1

With the reduced time spent changing lights from 109 minutes to 58 minutes, it is in line with the purpose of the approach *Lean* in this process. Provides shorter response times with a working plan *Lean* is something that can be given to consumers (Hobbs, 2004).

Use of Visual Management

Based on the area or room that is the working area of the service control department is the Central Control Monitoring System (CCMS) room where technicians and Helpdesk and *spare part warehouses.*

Room Area Central Control Monitoring System (CCMS)

Not yet visible usage *Visual Management* can be seen in the CCMS room that does not provide information about complaints that are being and will be handled. With this condition, it will be difficult for the other party to know what work is being done by the technicians.

Application *Visual Management* in the CCMS room, it is intended that there is good and efficient communication between technicians and the Helpdesk in their operational activities. With good and efficient communication will lead to quick and appropriate decision making. Like which complaints still have to be postponed because of the absence of *Spare*. This will make it easier for the Helpdesk to answer questions from the Helpdesk *user*, when they asked why their complaint could not be resolved. For technicians, this will also help them prioritize the work they are responsible for. And for management, there is *Visual Mangement* will assist them in understanding the work and *progress* in progress.

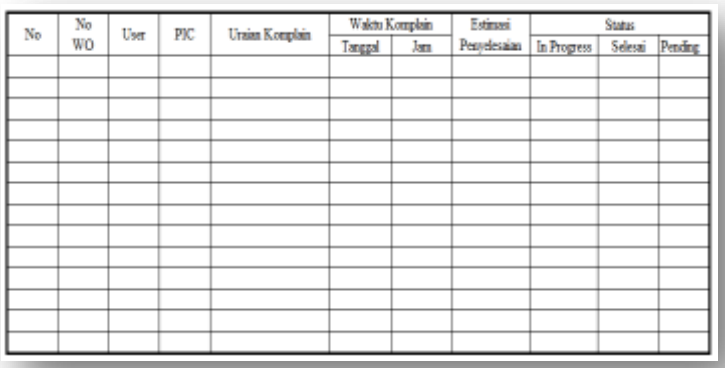


Figure 6. *Visual Management Examples*

Information:

- No : Work sequence number
- No WO : Number *Work Order* for such complaints
- User : The complaining party
- PIC : The technician in charge of the WO
- Description Complaint: Contains a detailed description of the complaint
- Complaint Time :Time the complaint goes to the Helpdesk
- Estimated resolution: The estimated time for completion of the complaint
- Status : What is the status of the WO, is it still worked on, completed or postponed.

Often a supervisor has a very large and scattered work area. They cannot always communicate with all subordinates for whom they are responsible. Use *Visual Management* will help provide the information they need (Bielous, 1997).

Spare Part Warehouse *Area*

One of the things that should be of concern is, the absence of stock cards that are physically available near the area where goods are stored. So far, the stock is only in *Update* through data formats *soft copy*. This has a very high risk value. When data *soft copy* Whether it is lost, erased or damaged, it will be very difficult for us to know the stock history of the item. In addition, with the stock card as a stock control tool, warehouse officers will be able to easily carry out recording activities when there are transactions of goods out or in. Here is an example of a stock card that can be used in a spare parts warehouse. After the existence of a stock card that is physically attached to the goods, the next thing that needs to be done is the manufacture of some kind *Wall Management* In the warehouse room one of the most important items is the notification of which items are in stock *critical* as well as those that have run out. In this way, interested parties to the goods in the warehouse can pay more attention to the goods in stock and those that have run out. This will also make it easier for the warehouse to answer questions about the availability of goods in the warehouse. This information will also help the technicians in planning their work.

Figure 7. Spare Parts Stock Information Board

No	Item No	Nama Barang	Minimum Level Stock	Paket Kerja	PIC	Status	
						Critical	Pending

CONCLUSION

This study aims to create a work design using a *lean* service approach in the service control department. So that in the end there will be a series of more streamlined and effective complaint handling work, by eliminating existing wastes.

1. The design of *lean activities* carried out in the work environment of the *service control department*, among others:
   - Making *master data* on the use of all lights in the head office building of PT. NPI.
   - The use of stock cards on goods in the spare parts warehouse.
   - Making *wall management* in the *Control Central Monitoring Sytem* (CCMS) room.
   - Creation of information boards on the issue of stock of goods in the warehouse.

2. In *the future process mapping* of handling complaints of lighting problems, 58 minutes were obtained. 51 minutes faster than *the current process mapping time.*

SUGGESTION

From the research and discussion that has been done, researchers assume that the work design that has been made can be applied using a good information system. The things from the new working design that can be made the system are:

Making *a data base* on the use of lights and specifications and then can be linked to the stock in the warehouse and the estimated service life. So that the output of this software can also be in the form of *demand* or the need for existing *spare parts*.

Visual management that explains the status of the Work Order (WO), along with the status of the work and technicians can be entered into the server, or the website of the service control department. So that users who have filed complaints can see the status of their complaints along with other information.

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