International Journal of Economic, Technology and Social Sciences
e-ISSN 2775-2976
International Journal of Economic, Technology and Social Sciences
url: https://jurnal.ceredindonesia.or.id/index.php/injects
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Efforts To Reduce Rm-1 Refiner Disturbances At Pt Pln (Persero) Ulp Rimo From The Chronic Category With Network Maintenance Based On Inspections Using Thermacam

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ABSTRACT
PLN's business is closely related to service to the community. The main problem in carrying out such functions on the part of the distribution is to overcome the interference of the refiner . One of the improvements in the quality of service is by making efforts to reduce the frequency of disturbances and the duration of disturbances. In this journal, the author conducts an analysis on bulusema (RM-1) refiners located at PT PLN (Persero) ULP Rimo, where this refiner is one of the chronic refiners who have a fairly high level of disturbance, so initiatives are needed to improve the reduction of disturbances, in order to improve the quality of service to customers. Based on the results of the author's analysis, the cause of the RM-1 refiner disturbance *found was caused by animals, trees that crossed the safe limit, namely a minimum row of 3 meters. One of the efforts to maintain the reliability of the distribution network system from interference is to optimize the implementation of distribution network maintenance, which is prioritized on thermacam inspection to find potential disturbances, replacement of JTM materials based on thermacam inspection and tree planting according to ROW 3 meters implementation of RM-1 feeder network improvement initiatives was carried out in the period from Juneto August 2020 and the Evaluation Results of rm-1* refiner maintenance *can be seen in October 2020.*

Keywords : ***Improving, Service, Quality.***

INTRODUCTION

The office of PT PLN (Persero) ULP Rimo which serves six sub-districts, namely Gunung Meriah District, Simpang Kanan District, Subdistrict, Suro, Lake Paris District, Kuta Baharu District and Singkohor District. Office PT PLN (Persero) ULP Rimo has 6 outgoing refiners, one of which is bulusem refiner with the code RM-1. Data on distribution assets on RM-1 Refiners can be seen in the table below:

Table 1. Rm-01 Refiner Distribution Asset Data

No.	Data Type	Sum
1	SUTM Network Length	41.65 kms
2	SUTR Network Length	45.67 kms
3	Number of Transformers	43 pieces

Based on theitulation recap report of the refiner's disorder, it shows that rm-1 refiners are included in the chronic category of PLN UP3 Subulussalam within a period of 3 (three) consecutive months because the number of disorders is still high. This journal author raises the issue of Efforts to Reduce RM-1 Refiner Disorders from the Chronic Category, because the supplier'sangguan is a significant problem and has a major influence on the performance of PT

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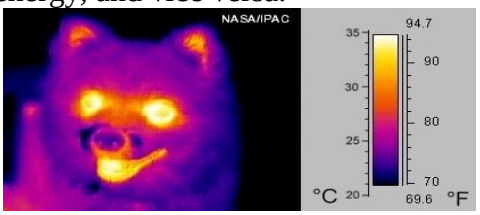
PLN (Persero), with the reliability of thedistribution network system, it will improve service and performance.

LITERATURE REVIEW

A Thermal Camera is a camera that captures and creates an image of an object using infrared radiation emitted from that object, in this process it is called **Thermal Imaging**. The resulting image represents the temperature of the captured object. Cameras are generally only capable of capturing wavelengths in the range of 400 – 700 nanometers of visible light, while thermal cameras can capture wavelengths from about 1000 nm (1 μm) to about 14,000 nm (14 μm).

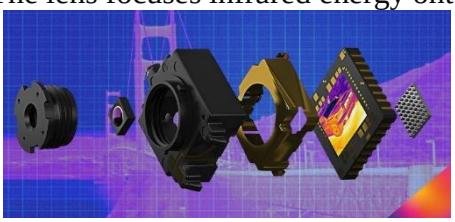
Figure 1. Thermocam Flir

Thermal cameras capture images from heat, not from visible light. Heat (infrared or thermal energy) and light are part of the electromagnetic spectrum, but cameras that can detect visible light will not see heat energy, and vice versa.



Figures 2. Image Results usingThermocam

The thermal camera consists of a lens, a thermal sensor, a processing electronics and several mechanical *housings*. The lens focuses infrared energy onto the sensor.



Figures 3. Thermocam Lenses

The sensors applied there are various kinds, from 80 × 60 to 1280 × 1024 pixels or more, this is referred to as camera resolution. This resolution is lower compared to typical visible light cameras, as thermal camera detectors must be able to sense energy that has a wavelength much greater than visible light, which requires each sensor element to be much larger. As a result, thermal cameras have a lower resolution compared to sensors visible from the same mechanical size.

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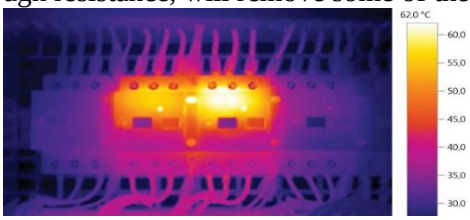
The thermal application of this camera is quite a lot, including:

1. **Electrical Wiring Maintenance**

   Electrical wiring connections involve physical connections between cables and various connections, and also between connections with electrical equipment. A feature of a good electrical connection is that the value of the electrical resistance at the connection is very low. The electrical efficiency of the juag depends on the resistance value of this connection. Electricity that goes through resistance, will remove some of the electrical power.

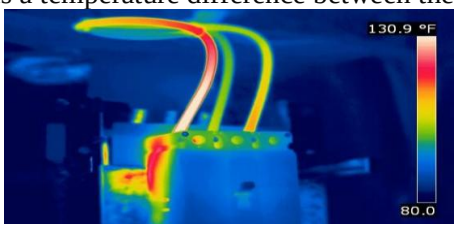


Figures 4. Thermocam Image Results on Cable Connections

   This lost energy will turn into heat. If the quality of the joint decreases, it will cause the energy lost as the heat increases. With increasing resistance, cable or connector connections will experience a phenomenon called ***ohmic heating***. Maintenance and electrical technicians will use thermal cameras to search for hot spots on electrical panels and cable manning.

2. **3 *Phase* Equipment Checking**

   3-phase electrical equipment is connected to the power source through 3 wires. The current flowing in each cable or *phase*must have the same nominal. However, there will definitely be the possibility of *unbalance* or a state where the current or voltage value is not balanced in each *phase*. As a result, there is a temperature difference between the three joints.



Figures 5. Thermocam Image Results on Connectors

   Thermal cameras can illustrate this imbalance easily. As a consideration, with the ease of thermal cameras, we can inspect *overhead* electrical connections or transformers that are installed away from the ground level.

3. ***Maintenance* of Mechanical Installations**

   Installation on mechanical machines requires a good level of precision, otherwise the machine will experience disturbances such as excessive vibration or corrugated pressure. Using thermal cameras, we can see the heat created by forces such as friction.

Figures 6. Thermocam Image Results on Electrical Machines

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That's a short article about thermal cameras or Thermal Cameras and also their application to electrical tools. If this article is useful, don't forget to share it on fb, ig, what'sapp, or other social media.

Rm-1 supplier is one of the suppliers at PT PLN (Persero) ULP Rimo Office which is supplied from GI Rimo. The rm-1 refiner load at the time of WBP (Peak Load Time) was 27 A and became the highest contributor to disturbances in August 2020 as many as 6 trips and in June 2020 as many as 4 trips, and was categorized as a chronic refiner so that it entered the top 10 (ten) PLN UP3 Subulussalam Refiner Disorders for 3 (three) consecutive months.

The data on the disruption of refiners that occurs is still very high. A recapitulation of rm-1 refiner interference data for the period June-July-August 2020 can be seen in the appendix. Based on the Recapitulation of the disorder, the rm-1 bribery status of bulan Juni-August 2020 is:

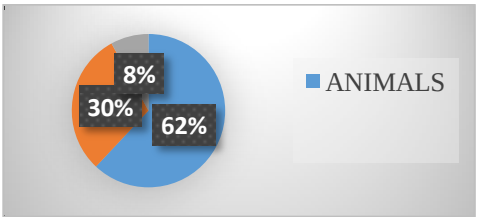
Tables 2. Turtle Disruption Status RM-1 Juni-August 2020

Moon	Number of Disorders	Categories Of Refiners
June 2020	4	Sick
July 2020	3	Sick
August 2020	6	Chronic

With a note of the quality standards of refiners:

a. Chronic = ≥ 5 disorders
b. Pain = 3 – 4 disorders
c. Medium = 1 – 2 disorders
d. Healthy = 0 disorders

Based onthe data on rm-1 refiner disturbances for the Juni-August period of 2020 the cause of the disturbance for rm-1 refiners for the period Jun i-August 2020 can be seen in Figure 2.1



Figures 7. Percentage Graph of Causes of RM-1 Disturbances for June-August 2020

From the Percentage Graph of Disturbance Causes, it can be seen that the largest contributor to disturbances for RM-1 is animals that hit SUTM 8 times, there are no disturbances found 4 times and one disturbance caused by trees. Efforts to reduce RM-1 refining disorders are prioritized withanti-animal feeding, pioneering logging and Thermacam Inspection. The installation of anti-animal is prioritized because based on the percentage of disturbance caused by animals by 62% and geographically, RM-1 refiners have many trees and oil palm plantations so that there are many and often passed by animals along the Medium Voltage network. Meanwhile, Thermacam Inspection is prioritized because there are still many disturbances that have not been found, so that with the inspection of thermacam, potential disturbances can be found that are not visible if carried out by visual inspection.

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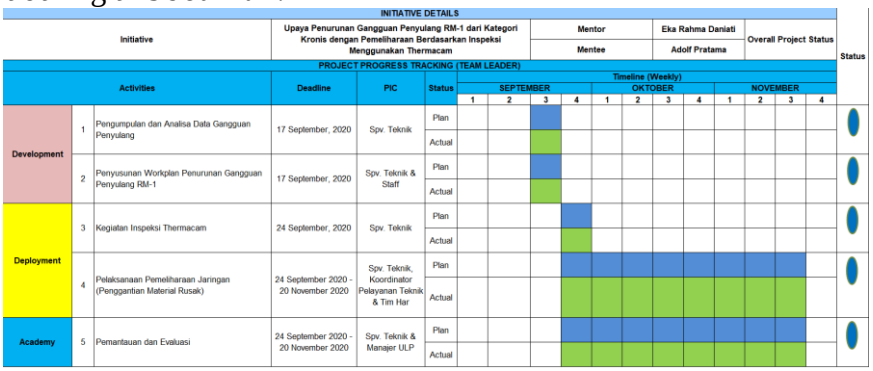
METHODS

The next step is the creation of a Workplan. Broadly speaking, the workplan is divided into 3 parts, namely Development, Deployment and Academy. The description of the activities filled into the Workplan are the action items that have been formulated on the Improvement Initiative Chart. In preparing a work plan to be more measurable, a workplan is made as a measurement and supervision of work. Where this workplan is made based on the stages that will be carried out during this *Journal* .



INITIATIVE DETAILS																					
Initiative		Upaya Penurunan Gangguan Penyulang RM-1 dari Kategori Kronis dengan Pemeliharaan Berdasarkan Inspeksi Menggunakan Thermacam			Mentor		Eka Rahma Daniati		Overall Project Status		Status									
					Mentee		Adolf Pratama														
PROJECT PROGRESS TRACKING (TEAM LEADER)																					
Activities			Deadline	PIC	Status	Timeline (Weekly)															
						SEPTEMBER				OKTOBER				NOVEMBER							
						1	2	3	4	1	2	3	4	1	2	3	4				
Development	1	Pengumpulan dan Analisa Data Gangguan Penyulang	17 September, 2020	Spv. Teknik	Plan																
					Actual																
	2	Penyusunan Workplan Penurunan Gangguan Penyulang RM-1	17 September, 2020	Spv. Teknik & Staff	Plan																
					Actual																
Deployment	3	Kegiatan Inspeksi Thermacam	24 September, 2020	Spv. Teknik	Plan																
					Actual																
	4	Pelaksanaan Pemeliharaan Jaringan (Penggantian Material Rusak)	24 September 2020 - 20 November 2020	Spv. Teknik, Koordinator Pelayanan Teknik & Tim Har	Plan																
					Actual																
Academy	5	Pemantauan dan Evaluasi	24 September 2020 - 20 November 2020	Spv. Teknik & Manajer ULP	Plan																
					Actual																

Figures 9. Workplan Table

From *the Workplan* that has been prepared, the implementation of work is carried out according to the specified schedule. The author is in charge of coordinating and being responsible for the process of carrying out the work.

Research Steps

In the period June-August 2020 there are still many undiscovered disturbances for RM-1 refiners. Therefore, to find the potential causes of the disorder, you can not only rely on the visual inspek, but also have to use thermacam. Inspection of thermacam using FLIR ThermaCam E45. Thermacam inspection serves to determine the state of the components based on the working temperature of the components themselves. By knowing the temperature conditions using the ThermaCam tool on each component of the JTM network such as TM connections, tensile insulators, fulcrum insulators and others. so that with the results of thermacam inspections carried out, JTM materials that have abnormal temperatures can be determined for maintenance.

The duration of the thermacam inspection work in the workplan is one week, so that the work target can be achieved and the thermacam inspection runs effectively, a special team is formed to carry out thermacam inspection. The team consists of 2 people, namely the technical service officer who is not picketing at night and the author as the PIC. The Inspection Team began to carry out inspections starting from 19.00 WIB – 00.00 WIB, because at night the comparison of the temperature of the JTM material and the temperature in the surrounding environment was more clearly visible.

The team conducted an inspection per TM pole along the RM-1 Supplier SUTM network, by bringing a picture of the RM-1 supplier's SUTM network per pole, making it easier to mark the location of the inspection findings. Here is the documentation of the team that is carrying out the inspection using thermacam.

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Figures 10. Implementation of Inspection Using Thermacam

From the results of the implementation of thermacam inspection, it was found that many JTM materials had abnormal temperatures, where there was a hot temperature compared to the temperature in the surrounding environment, Figure 2.6 showed the findings of materials with abnormal temperatures using thermacam. The findings are then marked on the network image per SUTM pole to facilitate the marking of the location of the findings. The medical record of the results of the inspection of thermacam can be seen in the appendix.

Tables 3. Realization of the implementation of Thermacam Inspection

No	Lokasi	Material	Jumlah
1	Ds. Sikontang	Isolator Tarik / Hang Isolator	2
2	Ds. Lipat Kajang	Isolator Tarik / Hang Isolator	1
3	Ds. Silatong	Isolator Tumpu / Pin Isolator	2
4	Ds. Bulusema Percabangan Kompi	Isolator Tarik / Hang Isolator	3
5	Ds. Bulusema	Isolator Tumpu / Pin Isolator	6
6	Ds. Pangkalan Sulampi	Isolator Tumpu / Pin Isolator	1

Figures 11. Findings of Thermacam Inspection Tensile Insulator

RESULTS AND DISCUSSION

Thermacam Inspection Result

After an inspection using a thermacam, then a replacement is carried out on all JTM materials from the findings of thermacam inspection shown in Table 2.2. It aims to reduce the

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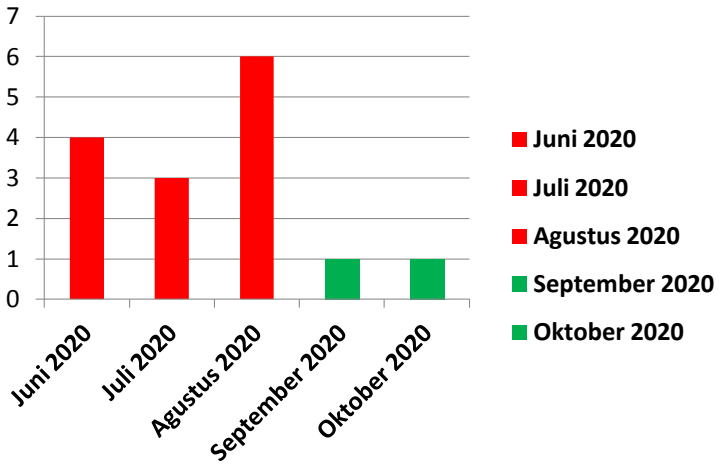
potential for interference in refiners. Although visually there is no visible damage, but because the inspection results show abnormal temperatures, these materials must still be replaced. Here is the realization of material replacement based on inspeksi thermacam:

Figures 12. Material Replacement Based on Thermacam Inspection

The implementation of the *Workplan* in the Journal resulted in a progression of reducing refiner disturbances. In June-August 2020 the rm-1 repeating disturbance was still high, yaitu 13 times, this was due to the fact that workplan implementation work only started at the end of August 2020. In September 2020, the disruption of refiners has dropped to as much as one cali, and in October once.

Efforts to reduce interference made on RM-1 refiners have succeeded in reducing interference and making **RM-1 refiners out of the chronic category,** here is a graph of the decrease in RM-1 refiner disorders:



Figures 13. RM-1 Refiner Interference Decline Chart

Safter maintenance in the period September 2020 – October 2020 can be seen in the percentage chart in figure 2.10. From the chart, it can be seen that although there are still disturbances caused by animals and other disturbances, the number has been greatly reduced compared to the period from June 2020 to August 2020 before maintenance was carried out.

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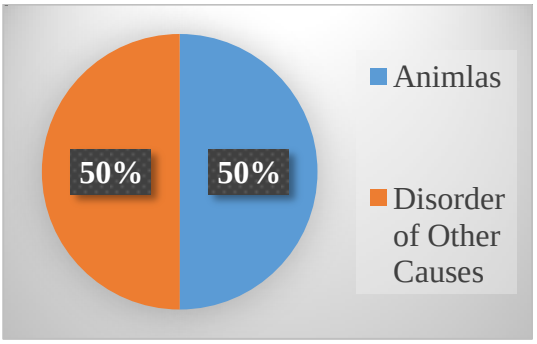

Figures 14. Rm-1 Nuisance Cause Percentage Graph September 2020 - October 2020

Calculation

Based on the supplier interference data contained in the attachment, the average GFR interference value is 296 A with a contact time of 1 second. Each time a single disturbance is obtained saving kWh of :

$$Energi\ (kWh) = \frac{V\ x\ I\ x\ cos\ \omega}{3600\ x\ 1000}$$

$$Energi\ (kWh) = \frac{20.000\ x\ 296\ x\ 0.85}{3.600.000}$$

$$\boldsymbol{Energi\ (kWh) = 1,64\ kWh}$$

CONCLUSION

Based on the work that has been done and the discussion above, several things can be concluded, namely as follows:

1. By analyzing the causes of the RM-1 disturbance from the period June-August 2020, there are still many disturbances caused by trees and disturbances that are not found.
2. Efforts to reduce rm-1 refiner interference include conducting inspections using thermacam, replacing materials based on the results of thermacam inspection, and pioneering
3. After the implementation of remedial initiatives, the RM-1 refiner disorder managed to drop to twice in September 2020, and once in October 2020 so that rm-1 refiners were out of the category of chronic refiners

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