ANALYSIS OF ELECTRICAL LIGHTING INSTALLATIONS IN THE PALM OIL FACTORY OF PT. TUNAS HARAPAN SAWIT IN KARANG TENGAH VILLAGE

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ABSTRACT

In carrying out electrical installations for lighting in a room, it requires a good and correct calculation. Therefore, when installing electricity, you must follow the applicable regulations according to national standards, so that errors do not occur in electrical installations, you must use good tools and equipment. and correctly in using it and the types of materials and tools used such as cables, lights, switches, sockets must be of good quality so that they can last for a long time. Installation of indoor lighting must pay attention to the light of the lamp with the large size of the room so that the current used is not large. it is necessary to determine the number of light points that are to be installed in each factory room, so that when working you feel safe, comfortable and good for eye health. so in electrical installations for lighting there must be maintenance and upkeep at least once a year.

Keywords: Analysis of electrical installations, lighting, palm oil mills

1. INTRODUCTION

In the development and growth of advanced construction in society and companies, the need for electricity is very large and essential for people to use in their work, especially when working indoors, where good lighting is essential. Therefore, a system is needed. electrical installation Which good and correct according to the Indonesian National Standard (SNI) and the General Regulations for Electrical Installations (PUIL) of 2000. Therefore, in electrical installations, a design is needed. ripe so that it doesn't happen error on when installing electricity to provide good lighting in every part of the factory room so that it is safe and comfortable to work in .

In this final assignment, the author will analyze the electrical lighting installation in a palm oil factory. Using PLN current and supplied by a generator. The generator is used when PLN experiences problems to keep work running. For the electrical installation for lighting in this factory, analysis and calculation methods are used to determine the specifications of the components to be used, which refer to applicable regulations and provisions.

2. LITERATURE REVIEW

2.1 Understanding Electrical Installations

F.Suryanto 2002, Electrical installation is a circuit system that connects components that are installed properly in a building to channel electric current .

2.2 Definition of Lighting

Hakimah, Yusro and Lisma 2013, Lighting is a source of light in the form of lines of light which radiates light in all directions and spaces

3. RESEARCH METHODS

3.1 PLACE AND RESEARCH.

My research is in Karang Tengah Village, Serdang Bedagai Regency . This coconut factory is a branch of PT Harapan Sawit which is located on a small plot of land. This factory produces oil from palm fruit. The factory's sections consist of rooms such as: Office room

Administration , Laboratory room , Production machine room, Packing room , T alcum room roller , boiler room , panel room , warehouse room, lower room ,room t oilet , outside the factory

3.2 Research Procedures

In conducting research on analyzing good and efficient electrical installations in palm oil factories, the following methods are used:

1. Literature Study

this research activity, I collected data through a study tour of a palm oil factory by conducting a direct field visit or survey . In addition, this was also done by asking or interviewing workers at the factory . Then the data required was secondary and primary data.

2. Field Study

This method process is carried out directly in the field where the data is collected. obtained from the measurement results using a meter ruler and the data is entered into a laptop using Microsoft Visio 2016 software to find out the calculation results.

4. RESEARCH RESULT

This discussion will explain the results of the calculations, the number of light points installed in each factory room .

4.1 Administration office

This administration room has:

Wide Office space : 4 m2 **. Chemistry Laboratory Room**
Long office space : 16 m
Tall office space : 4 m
Tall field work : 2 m

Long	: 16 meters
Wide	: 8 m
Tall room	: 4 m
Field Height	: 3 meters
Reflection sky	: 0.3
Reflection wall	: 0.7

L. space = pxl : 16 x 4 = 64 meters

Type of lamp TL 40 w x 2

rw : 0.3 rp: 0.3rm: 0.1
thenHigh light h :

h = 4 – (2 + 0.3)
= 1.7 meters

K index obtained:

$$k = \frac{p \; XL}{h \; (P + L)}$$

= 16 x 4 Reflection measurement rm : 0.1
1 . 7 (16 + 4) lamp and type: 3 x 20 watt TL

= 1.88 index K is

Price K = 1.88

Interpolation :

$$\eta = 0.36 + \frac{1.88 - 1.5}{2 - 1.5} (0,40 - 0,36)$$

$$= 0,36 + \frac{0.38}{0.50} (0,04)$$

$$= 0,36 + 0,76 (0,04)$$

$$= 0,36 + 0,0304$$

$$\eta = 0,39$$

$$K = \frac{P \; X \; L}{h \; (P+L)} = \frac{16 \; X \; 8}{1,7 \; (16+8)} = 3,0$$

Lighting intensity (E) depreciation (d) worth 0.8
For armature (ø 0):

$$Ø \, 0 = \frac{E.A}{\eta \; X \; d} = \frac{1000 \; x \; 64}{0,39 \; x \; 0,8} = 205128,2051 \text{ lumen}$$

TL = 2 x 2800 = 5600 lm /arm
room admin 16 x 4 so (n) : n = Ø 0 / Ø Lamp

= 205128. 2051 /5600

= 36.63 points

$$n = \frac{ø0}{ø\,arm} = 200.000 / 5600 = 35.,71 \text{ titik cahaya}$$

Lighting Efficiency Ƞ = 058. The intensity of the light E is : 2500 lux, Depression d :0 Light flux required ø0 :

$$Ø0 = \frac{E \; X \; A}{Ƞ \; X \; d} = \frac{2500 \; x \; 128}{2 \; x \; 0{,}8}$$

= 200,000 lumen

Type TL 40 watts x 2 plux light = 2800 lm x 2. point of light (n) :

$$Ƞ = 0{,}59 + \frac{2{,}3 - 2}{2{,}5 - 2} (0{,}63 - 0{,}59)$$

= 0,61

4.3 Lighting Installation on Production Machines

4.3.1 For water bath

Long space: 2.4 meters
Wide room: 2.4 meters
T. space: 1 3 meters
T. field : 5 meters
mercury lamps 250 watts x1
TL 40 watts x2
rm = 0.1 rw = 0.3 rp = 0.5

Indeks bentuk (K) :

$$K = \frac{P \; x \; L}{h \; (P+L)} = \frac{24 \; x \; 24}{7{,}7 \; (24+24)} = 1{,}6$$

For k = 2 n = 0 . 59
k = 2.5 n = 0 . 63

4.4 engine room production

4.4.1. For washing pool

Wide room : 24
Tall room : 13 m
Long room : 24 m
Tall field Work : 5 m

Indeks bentuk (K) :

$$K = \frac{P \; x \; L}{h \; (P+L)} = \frac{24 \; x \; 24}{7{,}7 \; (24+24)} = 1{,}6$$

Untuk :

K = 1,5 Ƞ = 0,36

K = 2 Ƞ = 0,41 (tabel 3.6)

Maka :

$$Ƞ = 0.36 + \frac{1{,}6 - 1{,}5}{2 - 1{,}5} (0{,}41 - 0{,}36)$$

= 0,37

Intensitas penerangan (E) = 1000 lux

Defresiasi (d) = 0,80

Fluks cahaya yang diperlukan (ø0) :

$$Ø0 = \frac{E \; x \; A}{Ƞ \; x \; d} = \frac{1000 \; x \; 576}{0.37 \; x \; 0.8}$$

= 1945945,9 lumen

Fluks cahaya / fluks armatur : 250 x 450 = 112500 lm/arm

Maka banyaknya titik cahaya (n) :

n = ø0 /øarm = 1945945,9/112500 = 17 titik cahaya untuk lampu TL

Untuk : K = 1,5 Ƞ = 0,41

K = 2 Ƞ = 0,46

Sehingga :

$$= 0.41 + \frac{1{,}6 - 1{,}5}{2 - 1{,}5} (0{,}46 - 0{,}41)$$

= 0,42

E = 50 lux

depreciation d = 0.8

Which required ray flux ø0 :

$$ø0 = \frac{E \times A}{\eta \times d} = \frac{50 \times 576}{0,42 \times 0,8}$$

= 85714,3 lumen = 15 titik cahaya

In 4 rooms machine there is lighting

Untuk : mercury type 1 x250 watt (4) = 68 lampu

TL type 2 x 40 watt (4)= 60 lampu

So point the light in the production machine is

m ercur i = 68 TL = 60 T ducks

4.4.2. **Curing room machine**

P . space = 16 m

L. space = 8 m

T. space = 4 m

T. field = 4m

light Which used :

Mercure i 2 50 watts x 1 , t armature 2 50 watt x 4 50 im tl 40 watt x 2 , p lux 2800 lm x 2

rp = 0,5 rw = 0,3 rm = 0,1

indeks bentuk (K) :

$$K = \frac{P \times L}{h\,(P+L)} = \frac{36 \times 24}{8,7\,(36+24)} = 1,66$$

By interpolating the index η = 0.376 E = 100 lux

De p resiasi d = 0.8

pl uks light (ø0) :

$$ø0 = \frac{E \times A}{\eta \times d} = \frac{1000 \times 864}{0,376 \times 0,8}$$

mercury armature 250 x 450 = 112500 lm

many point light (n) :

n = ø0 / øarm = 2872340/112500 = 26 lampu Untuk lampu TL

Untuk K = 1,5 = 0,41

K = 2 = 0,46

Where k = 1 . 66 interpolation calculation η = 0 . 426 Lighting intensity E = 50 lux d e p resiasi d= 0 . 8 p lux Light (ø0) :

TL = 2 800 x 2 = 5 600 arn

light tick n :

n = ø0/ø arm = 126760 . 6 / 5600 = 23 dots

4.5 . Room Area Distiller

P . space = 2 4 meters

L . space = 10. 8 meters

T . space = 1 3 meters

Field height = 6 meters

L . space = 2 4 x 10 . 8 = 259 . 2 meters

fluorescent lamp 40 watts x 2 , t armature 2800 lm x 2 i index k :

$$K = \frac{P \times L}{h\,(P+L)} = \frac{24 \times 10,8}{4,7\,(24+10,8)} = 2,0$$

with index k = 2.0

lighting η = 0. 4

intensity E = 500 lux

D e p resiasi d = 0 . 8

P lux Light ø0 :

$$ø0 = \frac{E \times A}{\eta \times d} = \frac{500 \times 259,2}{0,46 \times 0,8} = 352173,9\ lm$$

type of lamp TL = 280 x 2 = 560 in

point Light n :

n = ø0 / ø arm = 352173 . 9 /5600 = 6 3 dots

4.6. Packing area room

P. space ; 2 4 meters

L. room ; 1 2 meters

T . space ; 1 3 meters

Field Height ; 8 meters

Type m ercur i 250 watt x 2 , t armature = 250 x 4 50 arm tl 40 watt x 2

rp = 05 rw = 03 rm = 01

Index k :

$$K = \frac{PXL}{(P+L)} = \frac{24\,X\,12}{4,7\,(12+24)} = 1,7$$

light mercury lighting efficiency Ƞ = 0.38
Illumination intensity E = 100 lux
freciency d = 0.8
Lots P lux ø /o :

$$Ø\,o = \frac{E\,X\,A}{Ƞ\,X\,d} = \frac{1000\,x\,288}{0,38\,x\,0,8} = 947368,4\ lm$$

Mercur = 450 x 250 = 112,500 arms
Light n :
n = øo/ø = 947368.4 /112500 = 9 lamp points
index k = 1.7,
efficiency obtained:
k = 15 Ƞ = 041
k = 2 Ƞ = 046

$$Ƞ = 0.41 + \frac{1,7-1,5}{2-1,5}\,(0,46-0,41)$$

$$= 0,41 + 0,4\,(0,05)$$

$$= 0,41 + 0,02$$

E-light = 500 Luk
De p reasi D = 08
Big Light ø o :

$$Øo = \frac{E\,X\,A}{Ƞ\,X\,d}$$

$$= \frac{50\,x\,288}{0,43\,x\,0,8}$$

Tl = 2800 x 2 = 5600 arms
point lighting n :

$$N = \frac{øo}{ø\,armatur}$$

$$= \frac{41860,5}{5600}$$

4.7 rooms t roller
P. room : 4 meters
L . space : 4 meters
T . space : 4 meters
Field height : 4 meters
T l 40 watt x 1
Index (K) :

$$K = \frac{P\,X\,L}{(P+L)}$$

Nouse fitting work, index

Ƞ = 0 . 46 E = 50 Lux D = 0 . 8
Light øo ;

$$Øo = \frac{E\,X\,A}{Ƞ\,X\,d} = \frac{50\,x\,16}{0,46\,x\,0,8} = 2173,9\ lumen$$

the total amount as much as = 4 lights

4.8 boiler/thermo room
P . room : 2 0 meters
L . room : 10. 8 meters
T . room : 1 3 meters
High biudang : 6 meters
width : 10.8 x 2 = 216 meters
Lamp , type : T 1 20 wa thx 2
Index (K) :

$$K = \frac{P\,X\,L}{(P+L)} = \frac{20\,X\,10,8}{6,7\,(20+10,8)} = 1,0$$

(Ƞ) = 0. 11
(E) = 250 lux
(d) = 0.8
Flux light (øo)

$$Øo = \frac{E\,X\,A}{Ƞ\,X\,d} = \frac{250\,x\,10,8}{0,11\,x\,0,8} = 613636,4\ lm$$

t armature: 1354 x 2 = 2708 im
Point light pen n :
n = øo/ø = 613636 . 4 /2708 = 2 7

4.9. Distribution Panel Room
P . space : 6 meters
L. space : 1 0 meters
T. room : 4 meters
T. area : 6 meters
Type T l 40 watt x 2
Rp = 0 . 5 Rw = 0 . 3 Rm = 0 . 1
i ndek k :

$$K = \frac{P\,X\,L}{(P+L)} = \frac{6,5\,X\,10,8}{3,7\,(17,3)} = 1,0$$

index (K) = 10 (Ƞ) = 034 light E ; 500
Lux factorde p resiasi D = 0. 8

$$Øo = \frac{E\,X\,A}{Ƞ\,X\,d} = \frac{500\,x\,70,2}{0,34\,x\,0,8} = 129044,1\ lm$$

T l = 2800 x 2 = 5600 light point n :

N = øo/ø = 129044 . 1 / 5600 = 2 3
10 x 6 m2 room as many as 23 light point

4.10. warehouse space

P. room : 1 5 meters
L. space : 10 meters
T . room : 6 meters
T.field : 4 meters
Lamp , type : T l 40 watts x 2
Rp = 07 Rw = 05 Rm = 01
i ndek k :

$$K = \frac{P \times L}{(P+L)} = \frac{15 \times 10,8}{1,7\,(15+10,8)} = 3,7$$

lighting (η) interpolation, where :

$$\eta = 0,58 + \frac{3,7-3}{4-3}\,(0,62 - 0,58) = 0.608$$

Light intensity (E) = 250 luxury, depreciation (d) = 0.8
Flux light (øo) :

$$Øo = \frac{E \times A}{\eta \times d} = \frac{250 \times 162}{0,608 \times 0,8} = 83264,8 \text{ lm}$$

Needed n :
n = øo/ø = 83264 . 8 / 5600 = 15 light points

4.11. **Room blower machine**

P. room : 8 m

L . space : 4 meters

T. space : 4 meters

T.area : 4 meters

Lamp type : T l 40 watt x 2

index (K) :

$$K = \frac{P \times L}{(P+L)} = \frac{10 \times 4}{(10+4)} = 2,86$$

price η big = 0 . 57 lighting conditions E = 500 luxury , d = 0 . 8 Flu light pen T l ø :

$$ø0 = \frac{E \times A}{\eta \times d} = \frac{500 \times 40}{2,86 \times 0,8} = 43859,6 \text{ lm}$$

T l = 2800 x 2 = 5600 ln Total point n :

$$n = \frac{ø0}{øarmatur}$$

$$= \frac{43859,6}{5600}$$

4.12. **Space Generator operator**

= +8 titik cahaya

P. room : 8 m

L.room : 8 m

T.room : 4 m

T.area : 2 meters

Types of lamps T l 40 watts x 2

K index :

$$K = \frac{P \times L}{h\,(P+L)} = \frac{8 \times 8}{1,7 \times (16)} = 2,35$$

price (K) = 2.35 calculation obtained η = 0.48 light intensity E = 500 lux dep resiasi D = 0 . 8 Pen c a light Which needed ø0 : Ø T l : 280 x 2 = 560 arm

point light pen needed n :

$$Ø0 = \frac{E \times A}{\eta \times d} = \frac{500 \times 64}{0,48 \times 0,8} = 83333 \text{ lm}$$

$$n = \frac{ø0}{øarmatur}$$

$$= \frac{83333}{5600}$$

= 14 ,8 titik cahaya

4.13. toilet room

The room has 2 toilets for men and women

P . space : 8 m

L . space : 4 m

T . space : 4 m

field work : 2 m

Type TL 20 watt X 2

Armature flux 2 X 1354 = 2708

Index (K) :

4.14. Lighting Light road

P . Area : 34 m

L . Area : 19 m

T . root cause : 9 m

P x L = 34 x 19 = 662 m2

Mercur i 250 watt lamp type

lamp light pen : 450 x 250 = 11. 2500 lumen index form (K) :

$$K = \frac{P \times L}{h\,(P+L)} = \frac{66290,532}{9\ (535,78)} = 13,75$$

K index = 5 For K index = 13.75 Ƞ = 0.46 Intensity E = 250 Lux

depreciation (d) = 0.8

$$Ø0 = \frac{E \times A}{x\,D} = \frac{250 \times 66290,5}{0,46 \times 0,8}$$

$$= 45034307,06$$

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