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A Comparative Analysis Power Losses At The Connection Point Of Tap Connectors With Joint Press Connectors On Low Voltage Network East Binjai Customer Service Unit (ULP)

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ABSTRACT
In the electric power distribution network or a condition where a distribution system in the distribution of electric power experiences high power losses due to the connection point on the distribution cable to the consumer. Therefore, in this study, a calculation will be carried out between the value of the comparison of the input and output measurements between the connection points using Tap Connector with Joint Press Connector, after obtaining the measurement results, determine the calculation results for the loss of electrical power energy in rupiah units. A Tap Connector Joint Press Connector. After the measurement and calculation, the Power Loss is the result of the calculation between the input and output at the Tap Connector connection point. There is a difference in Power Loss of 134.3 Watts while at the Joint Press Connector the Power Loss Difference is 0 Watts. Power Loss Calculation Results in Rupiah Units From the results of the power loss analysis calculation, it can be seen that the power loss at the Tap Connector connection point with a difference in power loss value of 134.3 W and if calculated in rupiah units, then the loss of electrical energy in one month is Rp. 130,539.6, -. If it occurs in one year in a 24-hour time calculation, it is 130,539.6 x 12 Months = 1,566,475.2, -. The cause of power loss at the Tap Connector connection point is due to poor installation, as well as Tap Connector Equipment that is not SPLN standard and the age of the Tap Connector that has worn out

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INTRODUCTION

Power loss is a condition or state where the amount of power transmitted is not the same as the power received on the receiving side. The occurrence of this power loss can be caused by various factors, such as the distance area of electric power distribution from source/supply, voltage drop, load imbalance, equipment age, conductor diameter and others. The cause of total power loss is usually caused by the occurrence of a loss situation in the electric power distribution network or a condition where a distribution system in its electric power distribution experiences high power loss due to the connection point on the

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distribution cable to the consumer. Therefore, in this study, a calculation will be carried out between the value of the comparison of the input and output measurements between the connection points usingTap Connector With Joint Press Connector, after obtaining the measurement results, determine the calculation results for the loss of electrical power energy in rupiah units-tap connector With Joint Press Connector, from the measurement and calculation results will be obtained comparison of input and output values to determine which produces different voltage values. In the power distribution system, the Low Voltage (LV) network plays an important role in distributing electrical energy from distribution substations to customers. The performance of the low voltage network is highly dependent on the quality of the connections between its components. One of the critical components in this network is the connector that functions to connect cables, both in new connections and repairs. Connectors that are widely used in low voltage networks include tap connectors and joint press connectors. Power losses that occur at the connection point are one of the factors that affect the efficiency of electricity distribution. High power losses not only cause significant energy loss, but also reduce network performance and increase operational costs for electricity service providers. Therefore, choosing the right type of connector can play an important role in minimizing these power losses. Tap connectors are generally used because of their simple and fast installation process. However, the potential for power losses generated is often greater than other methods. In contrast, joint press connectors, although more complex to install, are known to provide stronger and more stable connections, so the potential for power losses is smaller.

With the growing need for efficiency in electricity distribution, it is important for the Binjai Timur Customer Service Unit (ULP) to conduct a comprehensive evaluation of the performance of these two types of connectors in the context of power losses. This study will focus on comparing the power losses that occur at the connection point using a tap connector with that using a joint press connector, in order to determine the most efficient and reliable connection method to be applied to low voltage networks.

METHOD

The research period began in September 2024. This research was conducted at PT. PLN (Persero) Customer Service Unit (ULP) East Binjai. The research location is in Medan Krio Village, Sunggal District, Deli Serdang Regency. The type of research that uses a quantitative method is research that uses a scientific method because it meets scientific principles, namely concrete/empirical, objective, measurable, rational and systematic. It is called a quantitative method because the research is in the form of numbers and analysis using statistics.

To analyze the power loss calculation data, this study carried out measurements at the low voltage network (JTR) input and output connection points-tap Connector With Joint Press Connector, after that the data is processed to achieve the goal by using the Active Power Calculation method in watts, to find out the total input and output currents. Calculation of power losses, by subtracting the input results from the output and Calculation

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of electrical power energy losses in rupiah units, to find out the rupiah value of power losses.

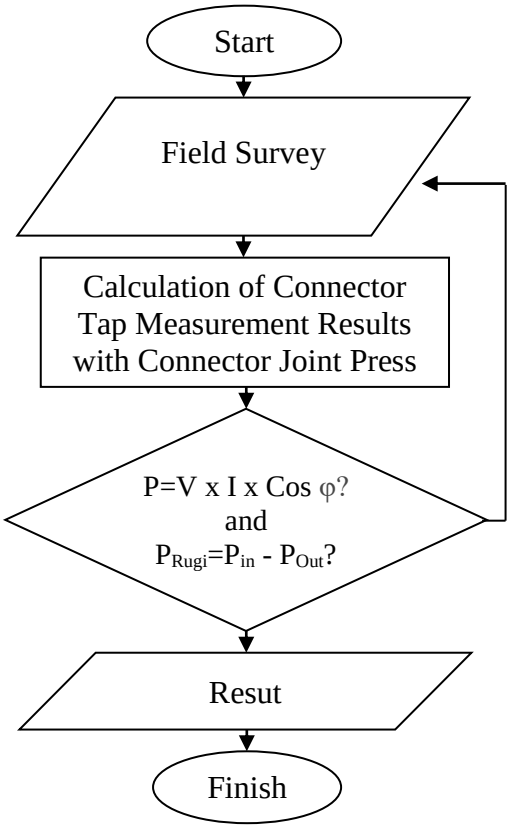

Figure 1. Research Flow

RESULTS AND ANALYSIS

Measurement Connector Tap With Joint Press Connector

In this research on the problem of comparative measurements*Connector Tap*With Joint Press Connectoron low voltage networks (JTR).

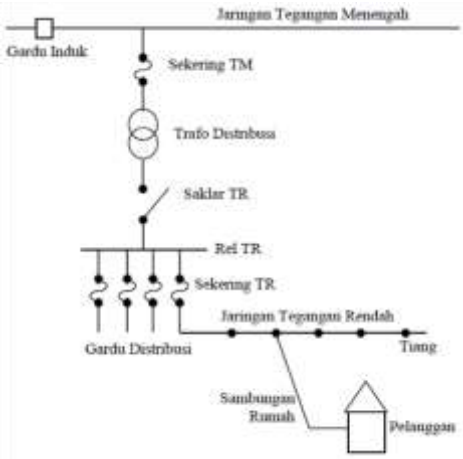

Figure 2. Low Voltage Network (LVNT) Line Diagram

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From the results of the field survey, it was found that the JTR line cable connection point uses a Tap Connector with a Joint Pres Connector, so measurements were taken and data was taken to be analyzed. Measurement of the low voltage network connection point (JTR) is done by measuring the RN, SN and TN values at the input and output of each connector installed on the low voltage network (JTR)

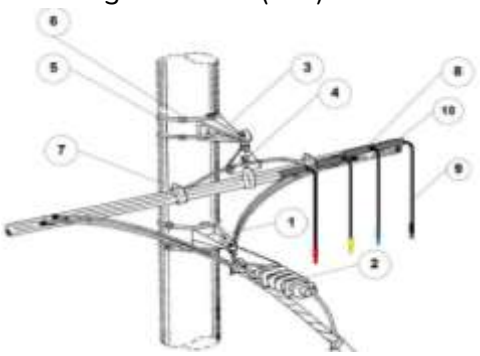

Figure 3. Low Voltage Network Connection Point to Consumers

(a) (b)

Figure 4. (a) Connection Point Using Connector Tap. (b) Connection Point Using Joint Press Connector

Transformer Pole Substation (GTT) Measurement Results

a. Voltage and Cos φ value
   RN : 239.6 V Cos φ R : 0.9.3
   SN : 241.4 V Cos φ S : 0.9.0
   TN : 239.5 V Cos φ T : 0.9.3
b. Current and Cos φ value
   R : 38.7 A Cos φ : 0.9
   S : 27.1 A Cos φ : 0.9
   T : 49.7 A Cos φ : 0.9
   N : 18.4 A Cos φ : 0.9
c. Phase-phase Voltage
   RS : 417 V
   RT : 414 V
   ST : 420 V

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Measurement resultsTap Connector Connection Point And Joint Press Connector

Table 1. Input and output measurement of Tap Connector Connection Point

Phase Type	V In	V Out
RN	235.8	233.7
SN	243.7	241.6
TN	235.7	235.4

(a B C)

Figure 5. Input Measurement DocumentationConnector Tap Connection Point
(a) RN (b) SN (c) TN

(a B C)

Figure 6. Output Measurement DocumentationConnector Tap Connection Point
(a) RN (b) SN (c) TN

Table 2. Input and output measurement of Joint Press Connector Connection Point

Phase Type	V In	V Out
RN	236.6	236.6
SN	240.7	240.7
TN	233.1	233.1

Figure 7. Input Measurement DocumentationJoint Press Connector Connection Point
(a) RN (b) SN (c) TN
(b)

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Figure 8. Output Measurement DocumentationJoint Press Connector Connection Point (a) RN (b) SN (c) TN

Power Loss Calculation Results

a. Calculation of active power in watts.

$$P = V \times I \times \cos\varphi \quad (1)$$

b. Calculation of power loss in watts

$$Prugi = Pin - Pout \quad (2)$$

Input CalculationConnector Tap Connection Point

$$\begin{aligned} R-N{:}235,8\ x\ 38,7\ x\ 0{,}9 &= 8.212,9 \\ S-N{:}243,7\ x\ 27,1\ x\ 0{,}9 &= 5.943,8 \\ T-N{:}235,7\ x\ 27,1\ x\ 0{,}9 &= 10.542,9 \\ &= 24.699,6\ \text{Watt} \end{aligned}$$

Output CalculationConnector Tap Connection Point

$$\begin{aligned} R-N{:}233,8\ x\ 38,7\ x\ 0{,}9 &= 8.143,3 \\ S-N{:}241,6\ x\ 27,1\ x\ 0{,}9 &= 5.892,6 \\ T-N{:}235,4\ x\ 49,7\ x\ 0{,}9 &= 10.529,4 \\ &= 24.565,3\ \text{Watt} \end{aligned}$$

Profit = Pin – Pout = 24,699.6 – 24,565.4 = 134.3. So the Difference in Power Loss is 134.3 Watts

Input CalculationJoint Press Connector Connection Point

$$\begin{aligned} R-N{:}236,6\ x\ 38,7\ x\ 0{,}9 &= 8.240,8 \\ S-N{:}240,7\ x\ 27,1\ x\ 0{,}9 &= 5.870,7 \\ T-N{:}233,1\ x\ 49,7\ x\ 0{,}9 &= 10.426,6 \\ &= 24.538,1\ \text{Watt} \end{aligned}$$

Output CalculationJoint Press Connector Connection Point

$$\begin{aligned} R-N{:}236,6\ x\ 38,7\ x\ 0{,}9 &= 8.240,8 \\ S-N{:}240,7\ x\ 27,1\ x\ 0{,}9 &= 5.870,7 \\ T-N{:}233,1\ x\ 49,7\ x\ 0{,}9 &= 10.426,6 \\ &= 24.538,1\ \text{Watt} \end{aligned}$$

Prugi = Pin – Pout = 24,538.1 - 24,538.1= 0. So the Difference in Power Loss is 0 Watts. From the results of the analysis of power loss calculations, there are calculation results between Input and Output at the connection point.*Connector Tap*is 134.3 Watts While*Joint Press Connector*is 0 Watts.

Results of Calculation of Electrical Power Losses

In Rupiah Units From the results of the analysis of power losses that occur at the connection point*Connector Tap*, then the nominal value of the loss of electrical energy in rupiah units can also be known, based on the 2024 electrical power tariff (TDL) for 900 Va power per kWh is Rp. 1,350-

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W=P x H..... (3)

Power Loss Difference = 134.3 Watts
Time = 24 Hours

$$W = P\ x\ t\ x\ 30\ \text{Hari}$$
$$= 134,3\ x\ 24\ x\ 30$$
$$= 96.696\ \text{Wh}$$
$$E = \frac{96.696}{1000} = 96,696\ \text{kWh}$$
$$= 96,696\ x\ 1.350 = 130.539,6$$

So the loss of electrical energy in one month is Rp. 130,539.6,- If it occurs in one year in a 24-hour time calculation is: 130,539.6 x 12 months = Rp. 1,566,475.2,-

Causes of Power Loss in Use Connector Tap

a. In terms of installation *Connector Tap* the bad one
b. Bolt *Connector Tap* which is not tight enough
c. Equipment *Connector Tap* non-standard SPLN
d. Condition *Connector Tap* which has become obsolete so that there is lost contact at the connection

Efforts of PT. PLN (Persero) ULP East Binjai to Overcome Power Losses

From the problems and measurement results that have been carried out, it is clear that in order to reduce the occurrence of power losses when installing connection points...*Connector Tap*, PT. PLN (Persero) ULP Binja Timur is trying to carry out reconnection, namely replacing the connector, from *Connector Tap* replaced with *Joint Press Connector* with a press system. The benefits of this reconnection are:

a. Reduces the loss or shrinkage of electric current for some time
b. Balanced electrical load or balancing the electrical load used
c. Stabilizer of electric current for some time (non permanent)
d. Tidying up the connection point between JTR and SR (non-permanent)

CONCLUSION

From the results of measurements and calculations of data and implementation during the research, the following conclusions can be drawn: The results of the analysis of the Power Loss Calculation show that the calculation results between the input and output at the Tap Connector connection point show that there is a difference in power loss of 134.3 Watts, while at the Joint Press Connector the difference in power loss is 0 Watts. Calculation Results of Power Loss in Rupiah Units From the calculation results of the power loss analysis, it can be seen that the power loss at the Tap Connector connection point with a difference in power loss value of 134.3 W and if calculated in rupiah units, then the loss of electrical power energy in one month is Rp. 130,539.6,-. If it occurs in one year in a 24-hour time calculation, it is 130,539.6 x 12 Months = 1,566,475.2,-. The cause of power loss at the Tap Connector connection point is due to poor installation, as well as Tap Connector equipment that is not SPLN standard and Tap Connectors that are worn out due to age.

REFERENCES

[1] Hamles L. Latupeirissa, Halamoan M. Muskita, Critter A, Leihitu, 2018 "Voltage Loss Analysis in Low Voltage Network (Jtr) 380/220 Volt Distribution Substation of Ambon State Polytechnic" SYMMETRIC JOURNAL VOL.8, NO.1, JUNE 2018. p-ISSN: 2302-9579/e-ISSN: 2581-2866

[2] Ahmad Syaifuddin F, Arief Budi Laksono, Suharijanto.2018 "Comparative Analysis Study of Power Loss at Piercing Connector Connection Point with Line Tap Connector on Low Voltage Network" JE: Electronic Control, Telecommunication, Computer Information and Power Systems. ISSN: 2502-0986 | Vol 3 No 1 March 2018

[3] Winda Puspitasari, Arfitariah, Hardianto. 2023 "Distribution Transformer Maneuver At PT.PLN (Persero) Customer Service Unit Bontang City With Transformer Mutation" Journal Of power electric and renewable Energy (JPER). Vol. 1No. 2. December2023P-ISSN 2986-8335E-ISSN 2987-0100

[4] Asfihanuddin Muhtar, Iwan, Dr. Ir. H. Antarissubhi, Suryani. 2021 "Analysis of Primary Distribution Network Power Loss of PT. Pln ULP Sengkang, South Sulawesi". Vertex Elektro, Vol.13, No.01, Year 2021 (February) p-ISSN. 1979-9772 e-ISSN. 2714-7487

[5] Aldila Fajar Rizkiana, Yuris Mulya Saputra. 2024 "Improvement of Voltage Drop and Power Loss by Reconfiguring the House Connection Network and Reconducting the Low Voltage Network at the MI-44-150-21 Distribution Substation of PT PLN ULP Magelang City". Journal of Electrical, Instrumentation, and Applied Electronics, Vol. 5, No. 1, April 2024

[6] Oktavianus Kati, Am Khafabin, Suparno. 2021 "Evaluation Study of Low Voltage Network Distribution (JTR) at JPR 047 Substation, Merak Feeder". Jurnal EL Sains Volume 3, Number 1, July 2021 E-ISSN: 2656-7075- P-ISSN: 2527-6336

[7] Harsen Nimpa, Heru Sutejo. 2018 "Development of Android-Based PLN Distribution Substation Measurement Information System" 2018 National Conference on Information Systems STMIK Atma Luhur Pangkalpinang, 8 – 9 March 2018

[8] Muhammad Irsyam, Missyamsu Algusri, Linggom Pandapotan Marpaung. 2023 "Analysis of Power Losses in Low Voltage Network of PT. Musimmas Batam" Sigma Teknika, Vol. 6, No.1 : 109-119 June 2023 E-ISSN 2599-0616 P ISSN 2614-5979.

[9] Aryza. S, Wibowo. P & Saputra. D (2022, July). ' Rancang Bangun Alat Pengontrolan Proses Pemanasan Produksi Biodiesel dari minyak jelantah berbasis Arduino mega. In prosiding seminar nasional social humaniora dan tekhnologi (PP. 121-127)

[10] Anisah, S., Fitri, R., Taro, Z., & Wijaya, R. F. (2022). Comparison of Lighting Efficiency (Led-CFL) based on Environmentally Friendly Technology. *Journal of Applied Engineering and Technological Science (JAETS)*, *4*(1), 568-577.

[11] Hamdani, H., Tharo, Z., Anisah, S., & Lubis, S. A. (2020, September). Rancang Bangun Inverter Gelombang Sinus Termodifikasi Pada Pembangkit Listrik Tenaga Surya Untuk Rumah Tinggal. In *Prosiding Seminar Nasional Teknik UISU (SEMNASTEK)* (Vol. 3, No. 1, pp. 156-162).