

STUDY OF COORDINATION OF PROTECTION SYSTEMS ON LA 3 FEEDERS USING OVER CURRENT RELAY (OCR) AT PT PLN RAYON, LANGSA CITY

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Abstract

relay that works based on an increase in current that exceeds a certain safety value and a certain period of time. The main function of this overcurrent relay is to sense the presence of overcurrent and then give the command to the circuit breaker (PMT) to open. The working principle of the Over Current Relay (OCR) is a relay that works against excess current, it will work if the flowing current exceeds the setting value (I_{set}) or protection that works due to a short circuit between the phases. Basically, an overcurrent relay is a device that detects the amount of current flowing through a network with the help of a current transformer. The price or amount that is allowed to pass is called the setting.

Keywords: *Distribution System, Potential Transformer, Circuit Breaker, Over Current Relay (OCR)*

INTRODUCTION

Electrical energy is the main energy used in almost all aspects of life. In the distribution of electrical energy, continuity of good service to consumers is required. This will affect the reliability of the system and cause blackouts if the reliability of the system is not good. High system reliability is supported by a good protection system. A good overcurrent protection system must be able to carry out perfect coordination so that only the disturbed sections are released from the system. (Ramadhan. Rize Taufiq.2010)

One of the problems that exist at PT PLN Rayon Kota Langsa is that short circuit disturbances often occur in the 20 kV network, namely between phases (3 phases or 2 phases) or phase to ground short circuit disturbances (2 phases or 1 phase to ground) and the delay in working the Over Current Relay relay when a short circuit occurs, if the protection coordination is not good it can cause widespread blackouts which are called blackouts. In addition, if there is a disturbance in the LA3 feeder, the incoming LS6 security device will also work. It is necessary to do research to analyze the causes of poor coordination between safety equipment. In feeders, PMT trips often occur even though the relay setting current has not been exceeded, according to field surveys through field operators there are several possible causes for this to occur including: changes in relay characteristics, changes in line impedance, changes in load characteristics, transformer reactance, or due to inaccurate short circuit current analysis at the initial setting. In this study the problem raised is to re-analyze the short circuit current in each feeder to reset the protection relay in order to increase reliability. That way the continuity of the supply of electric power to consumers can be guaranteed. In this study the problem raised is to re-analyze the short circuit current in each feeder to reset the protection relay in order to increase reliability. That way the continuity of the supply of electric power to consumers can be guaranteed. In this study the problem raised is to re-analyze the short circuit current

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in each feeder to reset the protection relay in order to increase reliability. That way the continuity of the supply of electric power to consumers can be guaranteed.

LITERATURE REVIEWS

Distribution System

The distribution system is part of the electric power system which functions to channel and distribute electricity from the supply center (substation) to load centers/groups (distribution substation) and consumers.

Current(current) Transformer (change)

Current(current) Transformer (transformer) is equipment that changes the amount of current from large to small or vice versa according to the required needs. For large-power electric power systems, a CT is needed to change the nominal current value of the system to be smaller so that it can be read by protection or metering equipment.



Figure 2.1 Current Transformer

(Source: Ari Sulistiono. 2009. Basic Theory of the Current Transformer)

Potential Transformer

Potential Transformer is used to reduce the system voltage with a certain transformation ratio. Potential Transformer is an instrument transformer that functions to convert high voltage to low voltage so that it can be measured with a volt meter.



WWW.GFUVE.COM

Figure 2.2 Potential transformer

(Source: <https://guangfuhui.en.made-inchina.com/product/1KpngLIuqYRb/China-20kv-Epoxy-Resin-Instrument-Potential-Transformer-Vt.html>)

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Power Disconnect

Power Breaker is a device attached to a substation that functions to connect and disconnect load currents or fault currents.



Figure 2.3 20 KV Cubicle Power Circuit Breaker

(Source: Prayoga Setiajie. Maintenance of PMT Outgoing Cubicles at GI Sayung)

Protection Relay

Protection Relay is an important part in an electric power system. This equipment is needed when the system is experiencing disturbances or abnormal conditions. Protection Relay is needed to initiate disconnection and isolate the faulted area and keep the unfaulted area able to carry out its function.

Over Current Relay(OCR)

Over Current Relay(OCR) or better known as an overcurrent relay is a relay that works based on an increase in current that exceeds a certain safety value within a certain period of time, so that this relay can be used as an overcurrent protection pattern.

OCR Stream Settings

The OCR relay settings on the primary side and the secondary side of the transformer are first calculated In.

Ground Fault Relays(GFR)

Ground Fault Relays(GFR), which is better known as a ground relay, basically has the same working principle as an overcurrent relay (OCR) but has differences in its uses.

Disturbance

Interference is an abnormality (interference) in the electric power system which results in the flow of unbalanced currents in a three-phase system.

RESULTS AND DISCUSSION

Short circuit studies are carried out to determine the magnitude of the current flowing through the electric power system at various distances after the fault changes according to time until it reaches a steady state. (Yelfianhar, 2009).

During fault conditions, a protection system is required to detect, eliminate and isolate the fault. This can be done at various faults (three-phase symmetrical, phase-to-

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phase, two-phase-to-ground, one-phase-to-ground, and three-phase-to-ground). Such a large short circuit current is very dangerous for the equipment, so to protect the equipment from damage due to short circuit, the electrical connection on the affected part needs to be disconnected with a circuit breaker (CB).

Feeder sequence impedance

The impedance values of the positive and negative lines are the same, ie $X1 = X2 = XL$, while the zero sequence impedance values are different. Line impedance can be calculated by the equation:

$$Z1 = Z2 = \% \text{ length} \times \text{feeder length (km)} \times Z1/Z\Omega$$

Where :

$Z1$ = positive sequence impedance (ohms)

$Z2$ = negative sequence impedance (ohms)

% long = length % feeder to be calculated

Feeder length = overall length of the cable conductor in the feeder

Network equivalent impedance

Calculation of the sum of the positive sequence impedances ($Z1$) and negative sequence impedance ($Z2$) can be calculated directly because from the source to the fault point the impedance is in the form of a series connection. So that the equivalent impedance can be calculated using the following formula:

- a. Positive sequence and negative sequence

$$Z1 + Z2$$

Where:

$Z1$ = equivalent impedance of positive sequence network (ohms)

$Z2$ = Equivalent impedance of negative sequence network (ohms)

- b. Zero sequence

$$Z0$$

Where :

$Z0$ = Zero sequence impedance (ohm)

Two Phase Short Circuit

A two-phase short circuit or what is commonly called a phase to phase short circuit is a condition where the phase to phase short circuit is connected to each other.

In phase-to-phase short-circuit faults, the line current does not contain a ground sequence component. zero because there is no fault connected to this two-phase short circuit fault can be shown in Figure 2.12 below.

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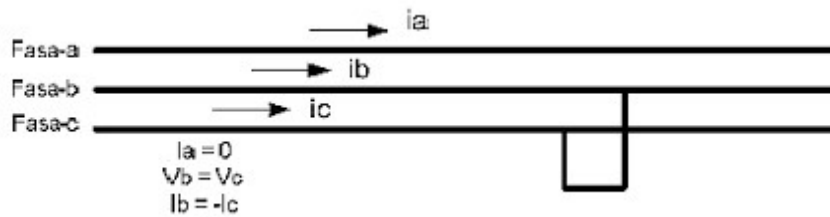


Figure 2.10 Two-phase short circuit fault

(Source, Journal of Farekh Huzair "Analysis of Short Circuit Faults for Determination of Breaking Capacity in Gambir Lama GIS, page 4).

Two Phase Short Circuit To Ground

Two-phase to ground fault occurs when two phases of the power system are short-circuited to ground. Two-phase to ground fault can be seen in Figure 2.13 below.

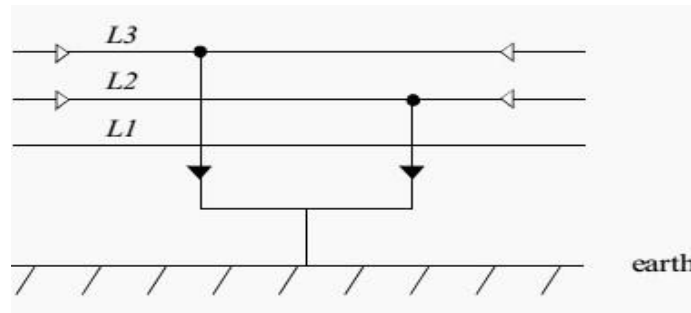


Figure 2.11 Two-phase short circuit fault to ground (Source, Journal of Edvard Csanyi "Main short circuit faults occurring in networks and machines" Page-1).

Three Phase Short Circuit

Three-phase short circuit faults are included in the classification of symmetrical faults, where the current and voltage of each phase remain balanced after the fault occurs. So that a system like this can be analyzed using only positive sequences. Three-phase short circuit fault can be seen in Figure 2.14 below.

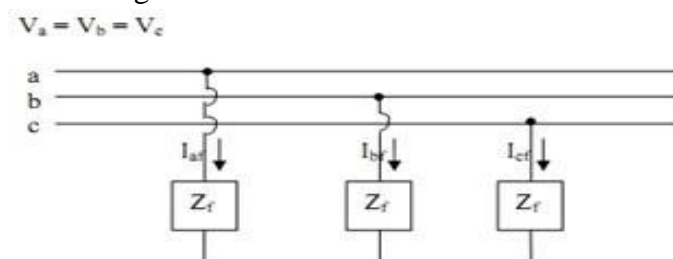


Figure 2.12 Three Phase Short Circuit Fault

(Source, Journal of Ikhwanul Kholis "Analysis of Short Circuit Disorders")

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CLOSING

After conducting research on the short circuit current of medium voltage overhead lines, the following conclusions can be drawn:

1. Over Current Relay (OCR) is a relay that works based on an increase in current that exceeds a certain safety value and a certain period of time. The main function of this overcurrent relay is to sense the presence of overcurrent and then give the command to the circuit breaker (PMT) to open. The working principle of the Over Current Relay (OCR) is a relay that works against excess current, it will work if the flowing current exceeds the setting value (Iset) or protection that works due to a short circuit between the phases. Basically, an overcurrent relay is a device that detects the amount of current flowing through a network with the help of a current transformer. The price or amount that is allowed to pass is called the setting.
2. This relay can be coordinated with the Ground Fault Relay (GFR) or other relays by providing a time delay which is actually the core of the relay setting as well as calculating the current setting.
3. The result of calculating the short circuit fault current is the three-phase short circuit current, which is 30.346 A

Two Phase Short Circuit Current is 26.25 A

Two Phase Short Circuit Current to Ground is 31.235 A

Single Phase Short Circuit Current To Ground is 50.0275 A

Full Load Current is 13.856 A, Primary Current is 14.5488 A, Secondary Current is 0.72744 A, Time Set is 80 A, Time Setting Inverse is 0.2 seconds..

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