DOI: https://doi.org/10.15407/techned2019.02.054

MICROPROCESSOR SELECTIVE PROTECTION FROM THE PHASE TO THE EARTH FAULT IN ELECTRIC NETWORKS WITH PETERSEN COIL IN NEUTRAL

Journal	Tekhnichna elektrodynamika
Publisher	Institute of Electrodynamics National Academy of Science of Ukraine
ISSN	1607-7970 (print), 2218-1903 (online)
Issue	No 2, 2019 (March/April)
Pages	54 – 62

Authors
V.F. Syvokobylenko, V.A. Lysenko

Donetsk National Technical University,
sq. Shibankova, 2, Pokrovsk, Donetsk region, 85300, Ukraine,
e-mail: svf1934@gmail.com; viktor.lysenko@donntu.edu

Abstract

Selective ground-fault protection for compensated modes is developed, in which traditional protection due to the influence of Petersen's coil does not provide their selective action. Digital narrowband frequency filters are used, which isolates and amplifies components with a central frequency selected from the range of 150–300 Hz from the voltages and currents of the zero sequence of the network. The results of mathematical modeling have established that at such frequencies the Petersen coil practically does not reduce the capacitive current in the damaged connection when closing to the ground, as is the case at a frequency of 50 Hz. Transmitting functions of the voltage and current filters differ in order to ensure a phase shift of 90 degrees between their output signals. To eliminate the self-excitation of the filters, they are executed in the function of the amplitude of the voltage of the zero sequence. The source protection body reacts to the direction of reactive power, which is defined as the product of the output signals of current and voltage filters. To exclude the representation of the discrete signal to the source organ, the protection is performed by a dual channel. In this case, to each input signal are connected two filters of different types, the output signals which after the cross-multiplication are sad and submit to the bipolar source that fixes the circuit both in the protection zone and out of

the area for self-diagnosis. The efficiency of the developed protection is confirmed by the results of mathematical modeling, tests on the laboratory stand and the correctness of the action when supplying the natural signals recorded with the help of digital recorders when closing the ground in real networks. References 10, figures 6, table 1.

Key words: compensated network, ground fault, selective protection, time-consuming filter, current, voltage, zero sequence, reactive power.

Received: 29.01.2018
Accepted: 26.12.2018
Published: 19.02.2019

1. Fedoseev A.M. Relay protection of electric power systems. Network Relay Protection. Moskva: Enerhoatomizdat. 1984. 520 p. (Rus)
2. Nazarychev A.N., Puhachev A.A., Tytenkov S.S. Combined neutralgrounding in 6–35 kV grids. Myths and reality. *Novosty ElektroTekhnyky* 2016. No 3(99). (Rus)
3. Hengxu Ha, Sankara Subramanian. Transient earth fault detection on compensated earthed system, *22th Intern. Conf. and Exhibition on Electricity Distribution CIRED- 2013*, Stockholm, 10-13 June 2013. Paper No 0119.
4. Altonen J., Wahlroos A., Vähäkuopus S. Application of multi-frequency admittance-based fault passage indication in practical compensated mv-network 2017. *24th Intern. Conf. and Exhibition CIRED -2017*
. Glasgow, 12-15 June 2017. Paper 0967.
5. URL: https://new.abb.com/medium-voltage
6. URL: https://w3.siemens.com
7. Pitot F., Venkataraman K., Vassilevsky N., Teon C.P. Wattmetric earth fault protection – innovation for compensated distribution networks. *23rd Intern. Conf. on Electricity Distribution CIRED -2015* , Lyon. 15-18 June 2015.

Vol. 1. Paper 0963. Pp. 1.1,1-5.
 8. Syvokobylenko V.F., Lebedev V.K., Serdiukov R.P. Development of Mathematical Model for the Analysis of Transients in Power Stations Auxiliaries at Phase-to-Ground Faults. *Naukovi pratsi DonNTU, seriia Elektrotekhnika i enerhetyka*
. 2011. No 10(180). Pp. 153-161. (Rus)
 9. Toader D., Haragus St., Blaj C., Numeric Simulation of Faults in Electrical Network. Proc. of the *10th WSEAS Intern. Conf. on Fuzzy System*. Prague. March, 2009. Pp. 128-135.
 10. URL: http/www.st.com/web/en/home.html

PDF