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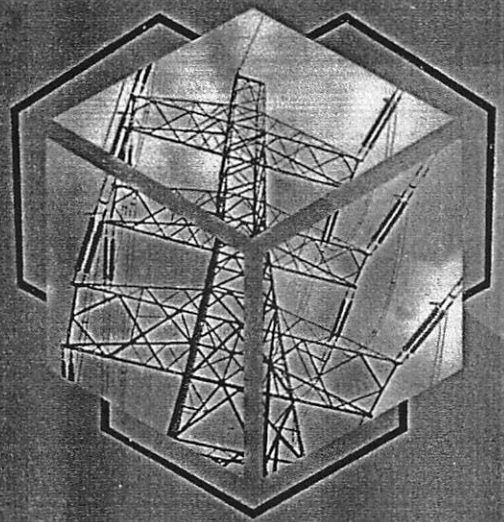

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Category numberCFP17M88-ART; Code 133086

Study on tracking time of epoxy resin insulating material under artificial accelerated aging (Conference Paper)

Syakur, A.[a] ✉, Hermawan[a], Sutanto, H.[b] ✉

[a]Department of Electrical Engineering, Diponegoro University, Semarang, 50271, Indonesia
[b]Department of Physics, Diponegoro University, Semarang, 50271, Indonesia

Abstract

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An insulator installation in tropical climate and high rainfall areas could cause a problem. Humidity and rain take an essential role in filling insulator wet surface which produces contaminant and leakage current flowing on it. Besides, continuous ultraviolet radiation will accelerate the aging and degradation process on the insulator surface which also make electrical current easy to flow. This research discussed the effects of ultraviolet radiation and fly ash addition as a filler material toward contact angle, tracking time, and the average leakage current value of high voltage insulation of epoxy resin materials. This research was done on a laboratory scale using epoxy resin polymer materials (DGEBA and MPDA) mixed with silicone rubber and fly ash with filler composition variation of 20%, 30%, and 40%. Samples were flowed by rainwater contaminant with conductivity of 196 μS/cm, NH4Cl with resistivity of 3,95 ± 0,05 Ωm and it also were already given ultraviolet radiation in 0, 24, 48, 72, and 96 hours. Leakage current values was obtained by conducting several tests using Inclined-Plane Tracking method (IEC standard 587 : 1984) and high voltage injection of 3.5 kV. The results indicated that filler material composition of epoxy resin and ultraviolet radiation completely affected the contact angle magnitude, the average of leakage current value, and the tracking time needed. From the whole parameter measured, the data of before and after treatments of ultraviolet radiation showed that RTV23 sample was the best sample compared to RTV22 and RTV24. © 2017 IEEE.

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Date : **Tuesday, October 3rd, 2017**
Venue : Agung Room (1st Floor, Inna Grand Bali Beach Hotel)
Moderator : Dr. Ir. Umar Khayam (ITB, Indonesia)

IN-1

09.00 – 09.30
Ir. Amir Rosidin, MM.
PT. PLN (Persero)
"High Voltage Engineering and Power Systems Challenge in Indonesia Power Network"

IN-2

09.30 – 10.15
Prof. Masayuki Hikita
Kyushu Institute of Technology, Japan
"High Voltage Electrical Insulation in Next Generation Power Module"

IN-3

10.45 – 11.30
Dr. Nurhidajat Sisworahardjo
University of Tennessee at Chattanooga, USA
"Data Analytics-Based Anomaly Detection in Smart Distribution Network"

IN-4

11.30 – 12.00
Mr. Kazuhiro Akima
PT. Honda R&D Indonesia
Honda Electric Vehicle Technology

IN-5

12.00 – 12.45
Prof. Ahmed Abu Siada
Curtin University, Australia
"Review of Flexible AC Transmission Systems; Enabling Technologies for Future Smart Grids"

Date : **Wednesday, October 4th, 2017**
Venue : Agung Room (1st Floor, Inna Grand Bali Beach Hotel)
Moderator : Dr. Ir. Sigit Puji Santosa, MSME (ITB, Indonesia)

IN-6

08.30 – 09.15
Dr. Muhammad Aziz
Tokyo Institute of Technology, Japan
"Extended Utilization of Electric Vehicles in Electrical Grid Services"

IN-7

09.15 – 10.00
Prof. Mohammad Masoum
Curtin University, Australia
"Coordination of Plug-In Electric Vehicle Charging in Smart Grid: Challenges and Opportunities"

IN-8

10.15 – 11.00
Prof. Guan-Jun Zhang
Xi'an Jiaotong University, China
"Separation of Multiple Partial Discharge Sources in Power Transformer"

IN-9

11.00 – 11.45
Prof. Yanuarsyah Haroen
Bandung Institute of Technology, Indonesia
"Past, present and future in Indonesian Public Mass Transportation. Perspective - Traction Control Systems"

IN-10

11.45 – 12.30
Dr. Robert Saers
ABB Corporate Research, Sweden
"Digitalization of Electric Power System"

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TABLE OF CONTENTS

			Converter Dahono-1	Rachmildha	
80	TS12-2	86	Power Quality Monitoring of Single-Wire-Earth-Return Distribution Feeders	Ruihao Song*, Shibo Lu, Tharmakulasingam Sirojan, B. T. Phung, and Eliathamby Ambikairajah	404
81	TS12-3	149	Implementation of Wireless Temperature, Humidity, Lighting and Active Power Online Monitoring Using PLC for Early Stage of Miniature Energy Savings	Waluyo*, Nandang Taryana, Hendi Handian R., Andre Widura, and Arsyad Ramadhan D.	410
82	TS12-4	58	Wide-Area Frequency Security Event Detection	Chao-Yuan Lai*, Chih-Wen Liu and Chia-Cheng Cao	414
83	TS12-5	63	Requirement Framework of Smart Grid Software Architecture	Ramesh Ananthavijayan, S.Prabhakar Karthikeyan, I.Jacob Raglend, J.Belwin Edward*, and K.Sathish Kumar	418
84	TS12-6	177	Electric Field Analysis of 150 kV Compact Transmission Line	Umar Khayam*, Reynaldi Prasetyo, Syarif Hidayat	424
85	TS12-7	172	Dynamic System Monitoring and Control of Sumatera Power System Using PMU based on DFR	Dhany Harmeidy Barus and Eko Yudo Pramono*	428
86	TS12-8	163	POME to Biogass – Study of Potency of POME in Nangroe Aceh Darusallam (NAD) Province	Fandy Marpaung*, Atmonobudi Soebagio, and Qamaruzzaman	436
87	TS13-1	74	Partial Discharge Investigation on Palm Oil Using Needle – Plane Electrode Configuration and Electric Field Distribution Using ANSYS Maxwell	N. A. M. Amin*, M. T. Ishak, M. H. A. Hamid and M. S. Abd Rahman	440
88	TS13-2	9	Structural Changes Analysis of Transformer Insulation Paper in Natural Ester with Fourier Transform Infrared Spectroscopy (FTIR) and Energy Dispersive X-ray Spectroscopy (EDS)	Abi Munajad*, Cahyo Subroto and Suwarno	446
89	TS13-3	84	Modelling partial discharges in an insulation material at very low frequency	H.V.P. Nguyen*, B. T. Phung. and S. Morsalin	451
90	TS13-4	10	Leakage Current Characteristics Study on Electrical Equivalent Circuit of Field-Aged RTV Silicone Rubber Coated and Noncoated Insulators in a Coastal Area	Rachmawati*, Dini Fauziah, Heldi Alfiadi and Suwarno	455
91	TS13-5	55	Partial Discharge Measurements in XLPE Cables with Misplaced Grading System Under Different Applied Voltage Frequencies	Arief Setyowibowo*, Suwarno, Andrea Cavallini and Gian Carlo Montanari	460
92	TS13-6	168	Comparison of Peak to Peak Voltage and Number of Partial Discharge Detected by HFCT and Loop Antenna in Metal Enclosed High Voltage Equipment	Deni Tri Laksono* and Umar Khayam	466
93	TS13-7	76	Justification for Circuit Breaker Refreshment Program in PLN Trans-JBTB based on Technical Condition and Impact Criteria	M. R. Pahlevi*, W. F. Praditama, Daniel B. L.	472
94	TS14-1	175	Lightning Protection for Electric Railway in Indonesia Telecommunication and Signalling System	Reynaldo Zoro*, Ruslam R. Pakki, and Roni Komar	476
95	TS14-2	69	The Ground Potential Profile on the Earth Surface of 3 Vertical Rods of Grounding Systems	Bambang Anggoro*	479
96	TS14-3	96	Simulating Calculations of Transient Voltages and Insulation Coordination on 500 kV AC XLPE Submarine Cable Line	Shijin Tian, Xuezhong Liu*, Hao Liu, Shaohua Wang and Dahong Fu	484
97	TS14-4	98	Observed Preliminary Breakdown Pulses of Intracloud Discharges	Primas Emeraldi* and Ariadi Hazmi	488
98	TS14-5	154	Design and Testing PCB Rogowski-coil Current Sensor For High Current Application	Ary P. Nurmansah* and Syarif Hidayat	493

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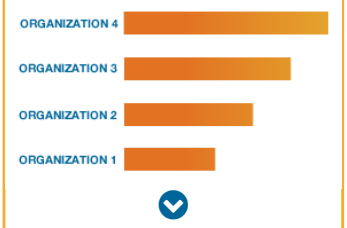

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Contents

Polymer materials have been widely used in the distribution and transmission line for their good dielectric properties, light weight and compact, when compared to the porcelain or glass insulators [1]–[3]. However, polymer outdoor insulator shows degradation due to climate stresses such as ultraviolet in sunlight, moisture, temperature, humidity and other contaminants so that surface discharge, tracking, and erosion can occur, and degradation may reduce the performance. Actually, this reduction is result from chemical and physical changes taking place on the surface of polymer [4].

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Partial Discharge (PD) is one of symptom that occur due to defect on the high voltage insulation system. PD measurement is needed to monitor the condition of equipment and avoid the failure. This paper deals with PD measurement by using Transient Earth Voltage (TEV) sensor. Applying a given voltage around 2 to 6 kV to artificial defects placed in a metal box produces PD. PD occurring inside the metal box would emits electromagnetic (EM) wave in wide frequency that propagates and leaks to the outside exciting the surface current on the metal wall and then producing transient earth voltage (TEV) as a result of current and impedance of the material. TEV sensor is mounted on the surface of the metal box to detect TEV signal representing PD inside. Then, TEV signals can be measured by an oscilloscope to obtain partial discharge pattern. The results revealed that each defect has own characteristic that differs from each other. PD with larger magnitude generated higher of TEV signal. Based on experimental results, PD measurements using TEV sensors, can be further developed, not only for measuring PD magnitude, but also can obtain a phase resolved PD pattern. Therefore, it can be used to estimate the type of PD that occurs in the equipment.

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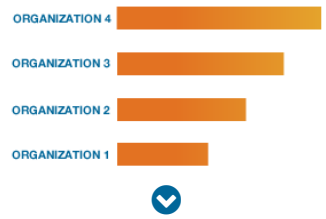

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Contents

Partial discharges (PDs) are small electrical sparks that can occur in insulation systems in high-voltage equipment continuously occurring PD in electric equipment and power grid will result in very dangerous situation [1]. Recently, PD measurements have become a popular

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diagnosis because PD measurement is represents the actual condition of the equipment.

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Gas insulated switchgear (GIS) is an electromechanical device that involves the combination of electrical switches, circuit breakers, fuses, current and capacitive voltage transformers that is widely used in transmission and distribution of electrical energy [1], [2] because of its focal points of high unwavering quality and execution, compact in

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dimensions, high reliability and performance, non-explosive, long lifespan (about 40–50 years), low maintenance requirements during its whole lifetime, outstanding compatibility with the environment and ability to interrupt fault current in power system network, and also its operation is noiseless and well insulated against external interference (weather) [3]–[6].

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Abstract:
Nowadays Distribution networks are growing in complex due to the increase in power demand, variation in load and different kinds of load. So these leads to degradation of quality power to the consumers. The efficient Operation of Distribution networks can be achieved by reconfiguring the network for reducing the line losses and for improving the system reliability. IHSA (Improved Harmony Search Algorithm) provides a better solution as it looks for optimal positions in the distribution system to switch on/off tie lines for optimal power flow and thus reduces the distribution power losses. These tie line switches can be used as emergency service restoration after a fault in the feeder. Autonomously controlling the sectionalizing switches in the distribution feeder makes possible to perform emergency service restoration in a shorter time.

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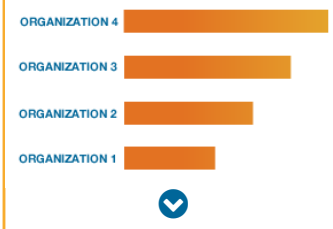

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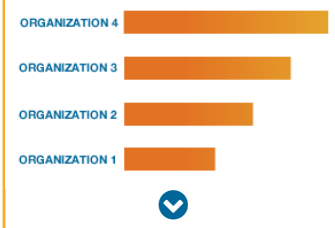

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Partial shading on a photovoltaic (PV) string will lead to PV characteristic, exhibiting multiple peaks. Conventional methods such as P&O method may not track the Global Maximum Point (GMP). Researchers have utilized meta heuristic approaches to track the GMP. Recently Simulated Annealing (SA) method has also been adapted for Maximum Power Point Tracking (MPPT) because of its simplicity and effectiveness to locate the region which is near global maximum. However, it's tracking time to obtain GMP is excessively long. In this paper, we combine SA method with a Modified INC method to improve tracking time of the SA. The modified INC method employs an adaptive step size to increase the tracking speed and accuracy of the conventional INC. To validate the performance of the proposed algorithm, experimental verifications are conducted. Both results indicate that the proposed algorithm can perform as well as SA in term of the tracking efficiency but it only requires very short tracking time. On average, the tracking time of the proposed method is two times shorter than the SA method.

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Maximum power point tracker is an indispensable part in a photovoltaic system to extract maximum power available to supply the load. However due to mismatch issues, for example, dust, shading, thermal gradients, and non-uniform solar irradiance, the shaded cells in a module become reverse biased and behave as a load, leading to the hot spot problem. To avoid this, bypass diodes are used to conduct the current generated by the non-shaded cells within a module. However, the connection of bypass diodes will change the uniform current-voltage (I-V) and power-voltage (P-V) characteristics of the module, resulting in multiple peaks. To maximize the efficiency of the module, it is necessary to track the global maximum point (GMP).

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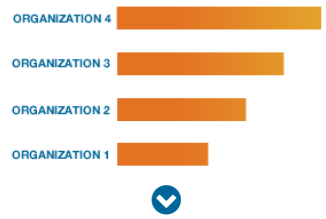

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It is costly to have a conventional three phase electricity supply system to service sparsely-populated rural areas. As a solution, the single wire earth return (SWER) network is widely used which has only one overhead conductor delivering power and the ground is used for the return path. This paper presents an on-line monitoring system, currently under development, to provide real-time power quality information of the SWER lines. The system comprises pole-mounted monitoring units distributed along the SWER feeder and relies on its own independent wireless communications platform for data transmission and control.

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It is costly to have a conventional three phase electricity supply system to service sparsely-populated rural areas or remote communities. As a solution, the single wire earth return (SWER) system was proposed by Lloyd Mandeno. Although he termed it “Earth Working Single Wire Line”, it was often called “Mandeno's Clothesline” [1]. The SWER system requires only one single overhead conductor; the returning current flow through the earth stake back to the main isolation transformer [2]. Nowadays, more than 200, 000 km of SWER network has been developed and installed in Australia and New Zealand for delivering power in rural areas. With the increasing demand for safe and stable operation of the network, a proper solution needs to be carried out to guarantee the stability of the SWER supply network. Currently, there is no real-time information of the SWER lines for fault detection and power quality monitoring.

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