

PROCEEDINGS

JOINT CONVENTION BANDUNG (JCB) 2021

November 23rd – 25th 2021

Temperature Monitoring Operation for Medium Voltage Switchgear by Using Thermal Sensor and Partial Discharge Aler by using Radio Frequency at CPP Gundih Pertamina EP Cepu Field

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Abstract

CPP Gundih is one of the Central Processing Plant which operated in Pertamina EP Asset 4 – Field Cepu. Electrical power supplied by Gas Turbine Generator (GTG) which distribute by using Medium Voltage Switchgear. During operation, operator or technician cannot measure temperature operation inside switchgear. Temperature inside switchgear should be known for analyze, is there any abnormal for each installation which have potency for failure operation.

If we use Temperature Gun, we cannot measure data of temperature because thickness of panel is thick. By using Temperature Sensor directly on the circuit breaker arms, cable connection bus bar, we can measure temperature operation during Medium Voltage operation with real time condition and directly.

Other side, if there are abnormal condition especially about Partial Discharge condition. Partial Discharge is an electrical discharge or spark that bridges a small portion of the insulation between two conducting electrodes. Partial Discharge can happen at any point in the insulation system, where the electric field strength exceeds the breakdown strength of that portion of the insulating material. Partial Discharge can occur across the surface of insulating material (mainly due to contaminants or irregularities), within gas bubbles in liquid insulation, in voids within solid insulation or around an electrode in gas (corona activity). By using Ultra High Frequency (UHF) antennas, we can measure the wave of Partial Discharge effect and monitor by graphic chart for real time condition. After get the data, we can analyze and can prevent un-planned shut down by Partial Discharge Effect. So, we can do Predictive Maintenance and eliminate failure potency at CPP Gundih.

Introduction

Pertamina EP Asset 4 have three location Central Processing Plant (CPP), two at Donggi – Matindok and one at Gundih, Cepu. CPP Gundih has been operated since 2012 which built by IKPT. Power distribution at CPP Gundih is generated by Gas Turbine Generator (GTG). For distribution, CPP Gundih have Medium Voltage (MV) Switchgear and Low Voltage (LV) Switchgear. During operation, Operation & Maintenance can not measure temperature condition or abnormal condition inside Switchgear Cubicle. The reason why we should measure temperature is to know the condition of bus bar and during operation, the voltage operation is too high which can impact the heating of material inside of Switchgear. That's why, we developed a system which can measure the operation condition of Switchgear by using Thermal Sensor.

Data and Method

This system was created and held during Turn Around CPP Gundih, at September 2019, during all operation was shut down. This activity was started from prepare all the Thermal Sensor and tested for communication operation.



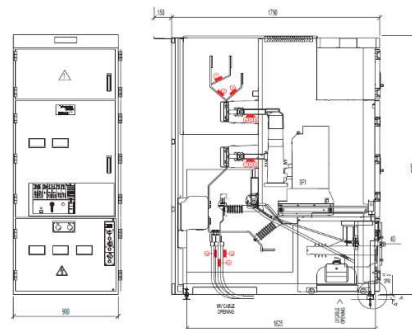
Picture 1.1 Thermal Sensor

And continue for marking each area which the sensor would be installed by Thermal Sensor. Before check or marked the area, make sure the power of switchgear was clear.

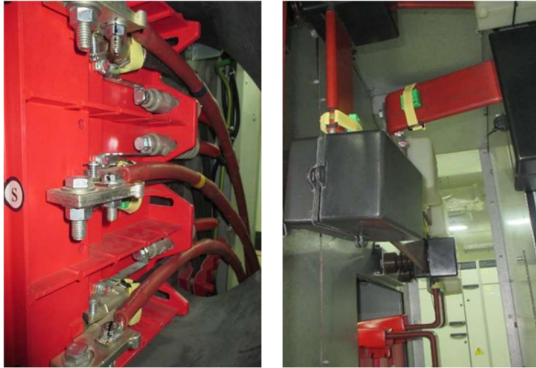


Picture 1.2 Object Location

At CPP Gundih, there area five area for Switchgear Cluster. There are SWGR-4100, SWGR-4101, SWGR-4111, SWGR-4112, & SWGR-4113.

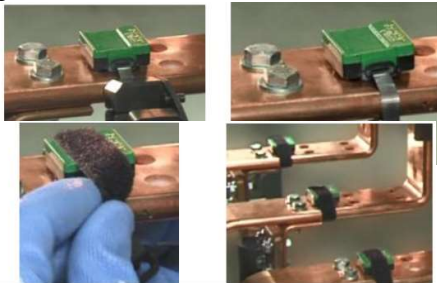


Picture 1.3 Marking Area for MC Set



Picture 1.4 Installation on Bus Bar

All the sensor was installed at marking areas, inside the Switchgear.



Picture 1.5 Method of Sensor Installation

After all the sensor was installed, every sensor should be tested to communicate with small router, to check is there any failed communication during send the data.



Picture 1.6 Communication Device

All data was sent to server and displayed at LCD Display which already developed by team and can know each area. Before sending to HMI, all data collect in PLC to generate at HMI display.



Picture 1.7 PLC Device



Picture 1.8 HMI Device

Result and Discussion

By using this thermal sensor, Temperature Parameter can measured directly with real time condition. With this data, Operation can know if there are some abnormal condition, especially if there are Partial Discharge.

Others, all the data are displayed at LCD and Connected to SCADA Server. Using this device, we can know every data trending if there are some abnormal.

Pengukuran Temperatur pada Koneksi Kabel (°C)		
Sensor 1	Sensor 2	Sensor 3
27	27	28
27	27	28
27	27	29
28	29	27
28	28	28
27	29	29

Pengukuran Temperatur pada Busbar (°C)		
Sensor 4	Sensor 5	Sensor 6
35	35	36
35	35	36
35	34	36
36	35	36
35	36	36
35	36	35

Pengukuran Temperatur pada Contact face (°C)		
Sensor 7	Sensor 8	Sensor 9
37	35	36
36	35	36
36	37	36
37	37	36
36	36	37
35	35	36

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Conclusions

With this data, we can do Predictive Maintenance and continue with Preventive Maintenance.

So, failure operation from electrical can minimize and Loss Production Opportunities potency can be eliminated.

References

Schneider Electric

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