

Investigation of Electrical Properties and Development of Nano Modified Insulation in High Voltage Cable

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Abstract-A method of remote sensing of stress and monitoring of partial discharge (PD) in High Voltage (HV) cable system is discussed in this paper. A concept of monitoring and detection of High voltage stress high voltage cables is proposed. Monitoring of HV cables can be done by I2C protocol using embedded technology. To obtain efficient performance voltage stress can be measured at every one kilometer through master slave concept. The collected data will stored in master controller. PIC micro controller has been implemented as master. In case of any irregular voltage stress is detected across HV cable, necessary step will be done using step down transformer in input side and step up transformer in output side. Hence the balanced output in HV cables will be obtained.

1. Introduction

Partial release PD action can happen in XLPE links and this can prompt protection breakdown what's more, may eventually prompt link disappointment. Accordingly, PD location is an imperative condition observing device for link frameworks. Contrasted and links that are manufactured under controlled processing plant conditions, link joints are regularly introduced nearby in less good conditions. Deformities that produce PD are bound to exist inside link joints than in the link itself.

Customary electrical PD testing has been utilized for numerous years to assess link quality. Such tests are generally performed disconnected inside a very much screened research center utilizing globally concurred standard strategies. This approach ought to have the capacity to distinguish the admissible discharge amount managed for the test protest. Be that as it may, in numerous circumstances the motivation behind PD estimation is to detect any crumbling of the contraption amid its ordinary use, through on-line observing. For on-line observing, at the point when the weakening achieves a specific

dimension, alerts ought to be given so as to keep the event of breakdown.

Aside from issues in links and link accessories because of long haul maturing impacts, unconstrained issues or breakdown can happen. It is critical that on-line monitoring is additionally ready to identify recently emerging imperfections. A few on-line PD checking strategies for link frameworks, including the acoustic discharge sensors, inductive high frequency current transducers, and high recurrence capacitive couplers, have been examined broadly.

PD signals identified by capacitive couplers, which are generally introduced near the link joints, should be transmitted to the estimating hardware for information obtaining, preparing and further examination. The easiest methodology for PD flag transmission is by means of electrical coaxial links. In any case, there are burdens with these methods for signal transmission. A link passage might be a few kilometers long and have many link joints, for PD on-line monitoring, the estimating gear must be put outside the link burrow.

At the point when halfway releases happen in a distant link joint, the release signals recognized by the capacitive couplers may need to travel a huge separation prior to estimation. This could result in flag attenuation and therefore decline the PD identification sensitivity. What's more, electrical obstruction can be extreme under typical working conditions, and commotion will be coupled into the long sensor lead to be caught by the measuring hardware. This will additionally diminish the location affectability and in a few circumstances commotion may thoroughly cover the genuine PD flag.

High frequencies of release signals are quickly weakened on a HV link line. Sensors must be set close to the release source to acquire great affectability. The most straightforward and least

expensive route for PD flag transmission is through electrical coaxial links. Be that as it may, PD signals identified by sensors close to the link joints inside the link passage may need to transmit over a critical remove (perhaps a few kilometers) to the estimating gear at the substation,. This could result in extremely huge flag weakening and subsequently decline the estimation affectability. Electrical obstruction is anything but difficult to be coupled into the sensor lead and later caught by the estimating gear and further decline the identification affectability. Electrical clamor is critical at substations and in a few circumstances may absolutely cover the genuine PD signals. Hence in our work High voltage cable stress level has been identified using I2C protocol through embedded technology.

2. Literature survey

H. van Jaarsveldt and R. Gouws (2014) presents The motivation behind this paper is to talk about condition checking (CM) of medium voltage electrical links by methods for halfway release (PD) estimations. Electrical links are presented to a assortment of operational and natural stressors. The stressors will prompt the debasement of the link's protection material and eventually to link disappointment [1]. The untimely disappointment of links can cause power outages and will significantly affect the wellbeing of such a system. It is in this way pivotal to always screen the state of electrical links. The initial segment of this paper is focussed on essential hypothesis ideas seeing CM of electrical links and in addition PD. The deduction of numerical models for the recreation of PD is likewise talked about. The recreation of release action is because of a solitary void inside the protection material of medium voltage cross-connected polyethylene (XLPE) links. A nonintrusive CM strategy was intended for the identification of PD action inside links. The CM strategy was utilized to gauge and break down reasonable PD information.

Ravish P.Y. Mehairjan et.al (2014), describes partial Discharge (PD) exercises in links and switchgears give a sign of powerless spots in protection frameworks. The business drivers for completing resource condition appraisals, for example, PD estimations on system resources differ from the kind of power arrange (high voltage, HV or medium voltage, MV), the area in the matrix and reason for the benefits and the system proprietor's operational and upkeep process necessities. In MV dissemination organizes, the utilization of (intermittent) online PD checking is bit by bit increasing more intrigue around the world. The

principle purpose behind this is the capacity to recognize conceivable dangers with the advantages in-benefit, enabling the resources for be surveyed under ordinary working condition. This paper introduces the ongoing knowledge of the use of an ease online handheld PD screening estimation in a wide-region MV arrange (ring organized MV conveyance arrange, which is radially worked and comprises of various medium/low voltage (MV/LV) optional substations and middle of the road link circuits). Inside and out, the handheld PD screening prompted the identification of potential resources with a high danger of disappointment, which would some way or another not be known to the utility. Such a wide-zone approach of handheld PD screening innovation has given the advantage directors a quick and minimal effort strategy to quantify PD action and evaluate potential high hazard resources.

Y. Tian, P. L. Lewin et.al (2004), discusses a strategy for the remote examination and observing of fractional release (PD) action utilizing an optical system is portrayed. The system utilizes a LiNbO₃ modulator to adjust the power of the transmitted laser light roughly relative to the voltage connected over the modulator. The laser light is transmitted along an optical fiber and estimated remotely by a fast optical beneficiary. A capacitive coupler has been utilized to identify halfway release action and go about as the modulator's info voltage source. The electro-optic modulator is detached and doesnot require a power supply at the site of the PD location sensor. The framework has the extra focal points of being safe to electromagnetic impedance, having next to no flag transmission weakening, with great affectability, conservative size, as well as being helpful to utilize and safe.

Xiang Dong et.al (2017) presents Cross-fortified metal sheath association is connected in separated single-center power links to lessen or wipe out the voltages which are actuated in the sheath over long separations. In any case, cross-fortified links present an open door and a test for on-line estimation and finding of link conditions. In this paper, a philosophy to distinguish link sheath blames through investigation of the sheath framework flows in a cross-fortified link framework is exhibited. Right off the bat, a numerical model is built up to reenact the sheath flows in cross-fortified link frameworks. Furthermore, examinations of a few issues, which happen as often as possible with genuine outcomes, are introduced based on current estimation at the connection link. Recreations of ordinary and blame conditions are given to decide the plausibility of

blame analysis. A contextual analysis utilizing field information from a link burrow in China considering the ordinary condition is exhibited to check the numerical model. Results in ordinary condition indicate great consistency with field information with mistake under 5%. Reenactment aftereffects of blame conditions demonstrate that investigation of readings from 6 current sensors can recognize diverse blame sorts and blame positions utilizing the technique proposed.

N. H. Ahmed and N. N. Srinivas (2000) describes an on-line PD (halfway release) location method appropriate to control links. The strategy can be connected to both wire screen and strong protected links. In wire screen protected links, PD parts with frequencies $t \ 10 \text{ MHz}$ can be distinguished at separations over 150 m from the source. PD action with levels as low as 20 pC can be recognized inside 100 m. Be that as it may, on account of strong protected links, PD dimensions of 350 pC can be estimated inside 60 m in the recurrence go $t50 \text{ MHz}$. This technique likewise can be used to check link extras for example, grafts and terminations. PD beats with frequencies to - 300 MHz can be estimated close to the joints and terminations. The appropriateness and the affectability of the VHF strategy were checked against two other elective PD recognizing strategies (beat stage analyzer and fast advanced oscilloscope) by performing PD estimations in standard air hole and imperfections incited in Ern-protected link under research center controlled conditions. The appropriateness furthermore, affectability of the VHF strategy were in the same class as the two elective PD recognition procedures.

3. PROPOSED SYSTEM

3.1. Existing method

Partial discharge (PD) faults in power links have been recognized through disconnected examination strategies. Persistent on-line observing frameworks are being introduced with the point of lessening sudden disappointments. This investigation presents take a shot at the examination and treatment of gained information, from the perspective of advantage the board and the PD exercises saw in an on-line link checking frameworks. At first, a survey of on-line against disconnected link PD observing is detested, as far as their setups and their individual points of interest and impediments. The examination at that point shows the creators' involvement of applying wavelet based denoising systems both the discrete wavelet transform (DWT) and the second

generation wavelet transform (SGWT) to PD information de-noising.

Disadvantages:

- A lack of effective power cable monitoring
- Failing to address pre-existing faults and for poor maintenance

3.2. Proposed system

The proposed system is used to monitoring and detection of High voltage stress in MV or HV high voltage cables. To implement the system we use a Hall sensor, step-up & step down transformer, and PIC micro controller. Every one kilometer sensor (slaves) is placed to measure the voltage stress level. Thus conversely provide the information about the HV cables. The data can be stored in master controller. Here we are using PIC micro controller as a master. In case any abnormal voltage stress across the HV cable, the correction can be done in input side by using step-down transformer. In output side can be controlled by step up transformer. So we get the balanced output in the HV cables.

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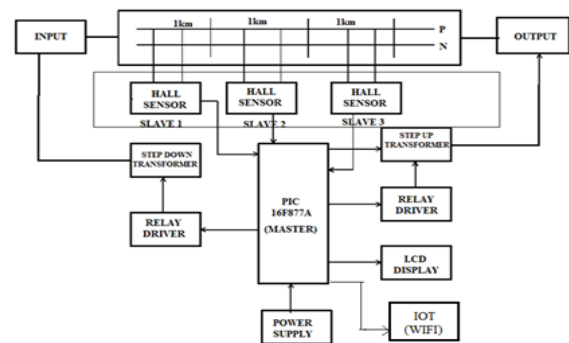


Figure 1. Block Diagram

3.3. I2C bus specification

I2C transport is well known on the grounds that it is easy to use, there can be more than one ace, just upper transport speed is characterized and just two wires with draw up resistors are expected to associate relatively boundless number of I2C gadgets. I2C can utilize significantly slower microcontrollers with broadly useful I/O pins since they just need to create right Start and Stop conditions notwithstanding capacities for perusing and composing a byte.

Each slave gadget has a one of a kind location. Exchange from and to ace gadget is sequential and it is part into 8-bit bundles. All these straightforward prerequisites make it extremely easy to execute I2C interface even with modest microcontrollers that have no uncommon I2C equipment controller. It just needs 2 free I/O pins and couple of straightforward i2C schedules to send and get directions.

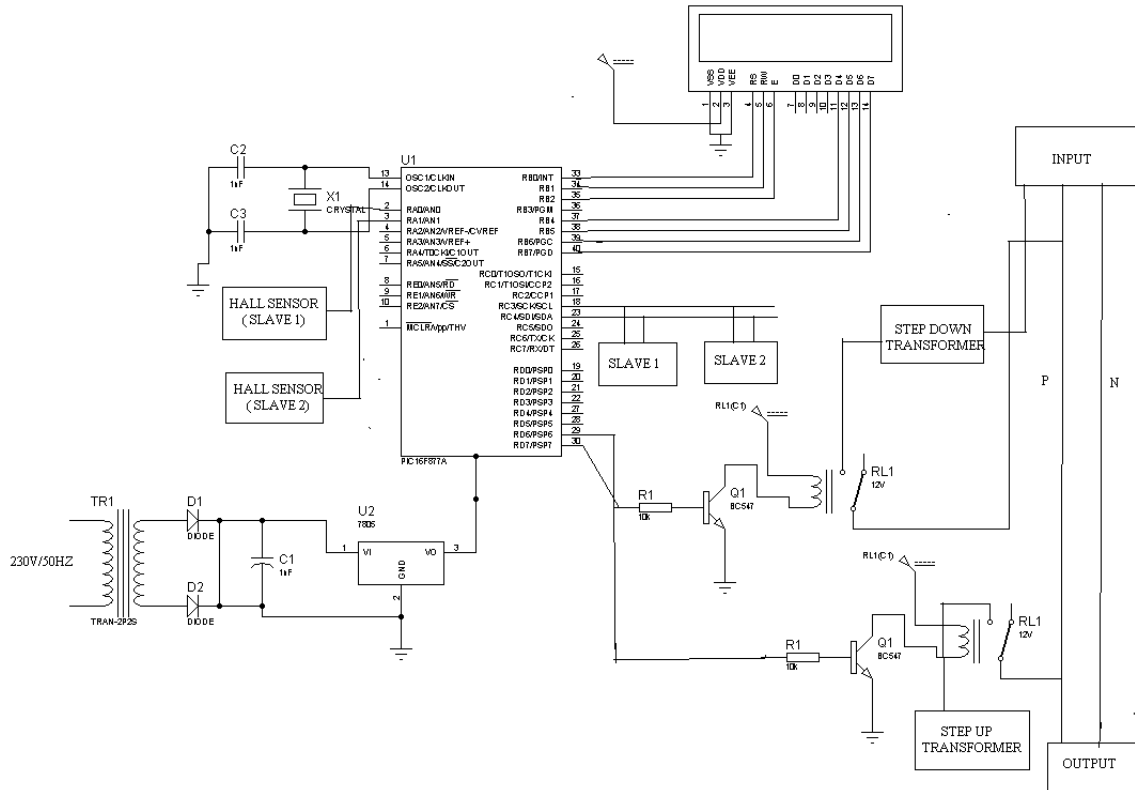


Figure 2. Circuit Diagram

I2C transport is utilized by many coordinated circuits and is easy to actualize. Any microcontroller can speak with I2C gadgets regardless of whether it has no unique I2C interface. I2C determinations are flexible – I2C transport can speak with moderate gadgets and can likewise utilize fast modes to exchange a lot of information. In view of numerous preferences, I2C transport will stay as a standout amongst the most mainstream sequential interfaces to associate incorporated circuits on the board.

3.4. PIC microcontroller

PIC microcontrollers (Programmable Interface Controllers), are electronic circuits that can be customized to convey out a tremendous scope of assignments. They can be modified to be clocks or to control a creation line and considerably more. They are found in most electronic gadgets, for example, caution frameworks, PC control frameworks, telephones, in truth any electronic gadget. Numerous kinds of PIC microcontrollers exist, in spite of the fact that the best are likely found in the GENIE extend of programmable microcontrollers. These are modified and reproduced by Circuit Wizard

programming. PIC Microcontrollers are generally shabby and can be purchased as pre-fabricated circuits or as packs that can be amassed by the client.

4. Result and discussion

S.No	OPERATION	INPUT VOLTAGE	OUTPUT VOLTAGE (V)	VOLTAGE IN HV CABLE (V)
1	WITH RATED LOAD	230.5	230.5	230.5
2	WITH EXCESS LOAD	228.2	212.4	228.2

5. Conclusion

Monitoring and detection of voltage stress in MV cables can be done by embedded technology. I2C protocol was implemented successfully in this system. Master and slave operations are controlled by PIC microcontroller. Abnormal voltage stress across the HV cable has been corrected by using step up and step down transformer.

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