OLTC TRANSFORMER DATA RECORDER AND FAULT PREDICTOR MODEL USING INTERNET OF THINGS

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Abstract – *This project proposes an on load tap changing transformer fault prediction by switching time duration and measuring transformer efficiency level. This arcing energy is estimated for each operation and used as an indication of OLTC failure. By this definition, whenever the estimated arcing energy exceeds a predefined value for a tap-changing event, it shows a failure in OLTC operation. Transformer efficiency is calculated with the help of voltage and current sensors both primary and secondary side OLTC transformer. PIC micro controller is used to attain good sampling and quantization results. This processor keeps on uploading every tap changer information and other sensory details to website. Internet of things highly recommended for this data logging. According to the sensory data, arc time duration and other parameters related to the OLTC failure our proposed model predictive controller will estimate the OLTC lifetime. GSM communication was proposed to send instant message whenever fault happens in OLTC. The outcomes are experimented with different fault failures in the operation of OLTC can be detected by the proposed method in a timely manner.*

Key Words: Onload Tap Changing Transformer, Internet Of Things, Global System Monitoring, Distribution Grid System, Health Index.

1. INTRODUCTION

Power assumes a significant function in our life. Each snapshot of our life relies on power. Power has a few parts and hardware helping human to move and manage the dissemination as indicated by use. The most urgent gear of transmission and conveyance of electric force is transformer.

In power frameworks, an electrical gear appropriation transformer legitimately disseminates capacity to the low-voltage clients and its activity condition is a significant model of the whole organization activity. Most of these gadgets have been in administration for a long time in various (electrical, mechanical and natural) conditions. They are the fundamental parts and establish an enormous bit of capital venture. Activity of circulation transformer under appraised condition(according to determination in their nameplate) ensures their long assistance life .However, their life is essentially diminished in the event that they are exposed to over-burdening, warming, low or high voltage/current bringing about surprising disappointments and loss of flexibly to countless clients subsequently affecting framework dependability.

Irregularity in circulation transformer is went with variety in various boundaries like Winding temperature, Oil temperatures, Ambient temperature, Load current, Oil stream (siphon engine), Moisture and broke down gas in oil, LTC checking, Oil level, Bushing condition. Over-burdening, oil temperature, load current and insufficient cooling of transformers are the significant reasons for disappointment in circulation transformer. At the point when a transformer falls flat, an unfavorable impact happens in the progression of transmission and appropriation frameworks bringing about increment of intensity framework cost and decline of dependability in electric conveyance. As transformer is a blend of numerous parts, this all parts must be checked routinely to keep up the transformer in immaculate working conditions. The checking gadgets or frameworks which are by and by utilized for observing dissemination transformer have a few issues and insufficiencies. As indicated by the above necessities, we need a circulation transformer constant checking framework to screen all

fundamental boundaries activity, and send to the observing focus in time. It prompts internet observing of fundamental useful boundaries of conveyance transformers which will give essential data about the wellbeing of dispersion transformers. This will help and guide the utilities to ideally utilize the transformers and save this hardware in activity for a more extended period. A web based checking framework is utilized to gather and examine temperature information after some time. THMS will assist with distinguishing or perceive sudden circumstances before any genuine disappointment which prompts a more noteworthy dependability and huge cost reserve funds. Far and wide utilization of versatile organizations and GSM modems, have made them an alluring alternative both for voice media and wide territory network applications.

Remaining Section The principle point of our proposed framework is real-time data of transformer with web categorized under Internet of Things (IOT). Other than that it notes that applications of IOT over electrical monitoring and controlling system and also discussed inclusion of some addition wireless implementations.

1.1. DISADVANTAGES OF CONVENTION MONITORING SYSTEM

- ✓ In rural area GSM communication network speed is low so we can't install this into all over the places.
- ✓ Basic parameters only monitored and checked continuously.
- ✓ Prediction transformer fault it's not possible in GSM communication it informs only fault after occurred.

2. OBJECTIVES

- ✓ Our aim is to develop an IoT based remote monitoring system for multiple distribution transformers of an area, so that life expectancy of distribution transformer can increase with regular maintenance which could help companies to reimburse their capital investment on transformers.
- ✓ Remote monitoring is based on health index calculations of transformers based on parameters like current, voltage and winding temperature.

3. SYSTEM IMPLEMENTATION

Entire block shown in fig1 is divided into four parts. These are data collection, data processing, communication and the control part with required power supply unit.

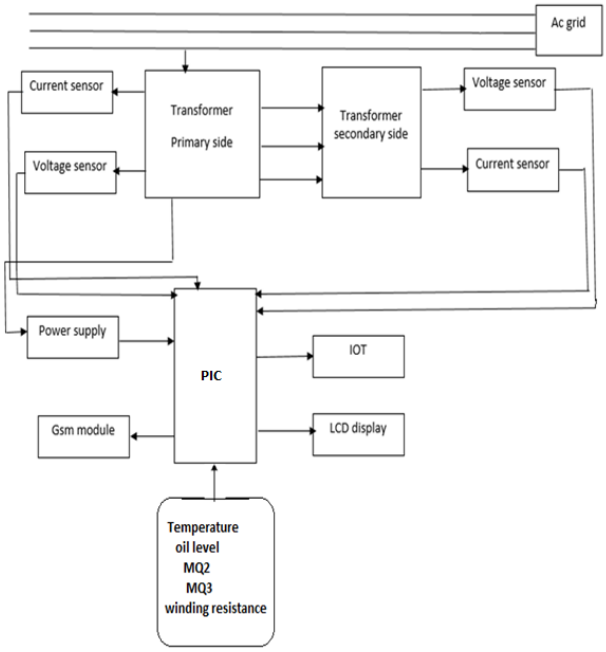

Fig1. Proposed System Implementation

The parts of the square graph estimates different continuous boundaries related with the appropriation transformer. The data certainly guarantees the best possible wellbeing observing of business transformers that lead the utilities to better utilization of their transformers and save the advantage in activity for quite a while. Four sensors, for example, level sensor, gas sensor, temperature sensor, and current sensor were included. A force flexibly is utilized to work microcontroller. When the information's are detected that can be perused from the LCD show and simultaneously these qualities are sent to the IOT module through the UART cable and the IOT module sends the information to the client on given IP address according to program. This data adequately bolsters the transformer to keep away from its unexpected disappointment. For any unusual conditions in the heap side we can control by turning off the hand-off and if the temperature level over the limit esteem, the cooling framework naturally will be ON until the temperature esteem re-visitation of the edge esteem.

3.1. WORK PROCESS OF THE PROPOSED SYSTEM

Work process of framework is finished in following advances:

a) Collect sensor based information

b) Deploy information to cloud and information perception

c) Predict lifetime of OLTC transformer

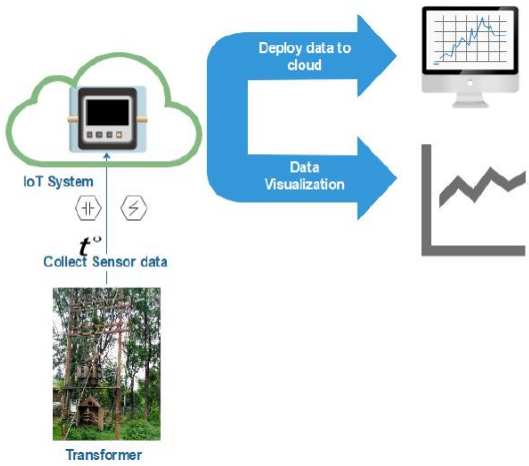

Fig 2. WorkFlow Diagram

4. RESULT AND DISCUSSIONS

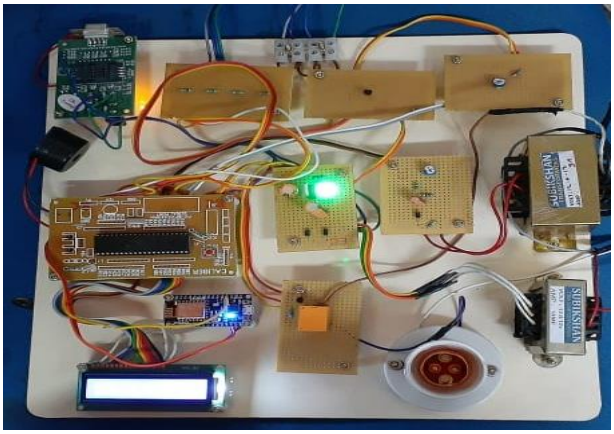

Fig 3. Hardware Prototype

In this arrangement a high appraising transformer (i.e.) 3A is the primary checking transformer which is associated with the sensor plans like LM35 temperature sensor, CT, PT, and the AB switch unit. The PIC16F877A miniature regulator is the preparing unit of the transformer insurance. The GSM SIM 800 module is utilized for the correspondence medium between the client and the equipment arrangement. The Node Mcu unit will be utilized for the IOT correspondence medium, the clients cell phone is the organization supplier for the Node Mcu unit.

The force flexibly for the whole parts was made starting from the stride transformer with the controlled dc power gracefully unit. On the off chance that any issue happened in the transformer the PIC regulator will identifies the shortcoming with the assistance of sensor and the insurance plan will control the transformer unit and hint will went to the client with enlisted versatile number by the GSM modem. The temperature and ct and pt sensor will distinguishes the shortcoming conditions if any strange condition the security unit will trips the fundamental transformer flexibly at the hour of stumbling condition the AB switch will be in typical state on the off chance that it bombs this insinuation additionally went to the concerned individual alongside the signal notice for the insurance reason.

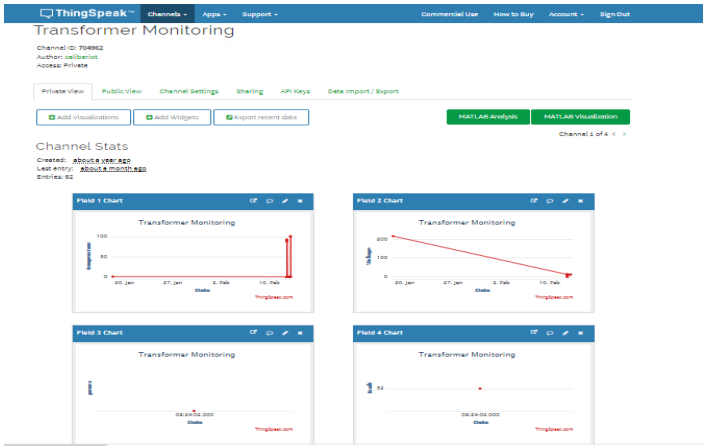

Fig4. Thingspeak Result

The IOT based answer for checking and controlling of dispersion transformers is very simple and successful contrasted with manual observing technique. Consistent checking of Distribution transformer, ideal alarms to amend the anomaly assuming any, there by broadening the lifetime of conveyance transformers This investigation will help in cost minimization by diminishing the workforce in support And ongoing burden observing and control will assist with improving framework effectiveness. This data set will be a helpful wellspring of data on the utility transformers.

Online boundaries of transformer are given as appeared in figure 4, field diagram 1 showcases temperature varieties, field 2 presentation voltage varieties while field 3 presentations current varieties.

1 Voltage	2 Current	3 Temp
56	0.6000	34
55	0.6200	35
57	0.6100	35.4000
56	0.6300	37
57	0.6400	36
58	0.6500	36.7000
56	0.6000	34
55	0.6200	35
57	0.6100	35.4000
56	0.6300	37
57	0.6400	36
58	0.6500	36.7000

Figure 5. Boundaries Measured

Figure 5 appeared beneath speaks to all deliberate boundaries transferred by customer into cloud worker, while figure 24 presentations wellbeing list determined by across the board worker.

1	2	3
0.2000	0.2000	0.2000

Figure 6. Health Index

4.1. ADVANTAGES

- ✓ Detect of the shortcomings progressively dependent on current, voltage, temperature and interior motion.
- ✓ Increase framework unwavering quality and steadiness by the checking framework.
- ✓ The framework forestalls shortcomings and misfortunes of the influence flexibly which fundamentally benefits utility customers.
- ✓ Overcurrent, over temperature is forestalled utilizing this strategy.
- ✓ Android based checking framework.
- ✓ GSM based portable notice.

4.2. APPLICATIONS

- ✓ On Load Tap Changing Transformer Monitoring
- ✓ Smart Grid Automation
- ✓ Industrial Power transformer Automation

5. CONCLUSION

In the midst of up-to-the-minute technology it is possible to monitor a large number of parameters of distributed transformer at a relatively high cost. The IOT based solution for monitoring and controlling of distribution transformers is quite easy and effective compared to manual monitoring method. Continuous monitoring of Distribution transformer, timely alerts to rectify the abnormality if any, there by extending the lifetime of distribution transformers This study will help in cost minimization by reducing the workforce in maintenance. And real-time load monitoring and control will help to improve system efficiency. This database will be a useful source of information on the utility transformers. AB switch open without permission informed officer using IOT Line voltage stress & power transformer winding stress for premier & sectary controlling & monitoring used IOT.

This project was proposed for test reenactment after effects of OLTC controlling transformer. OLTC hypothesis, activity and model application with Steel Mill are likewise depicted in this paper. At the present time and for years to come, the best possible usage of the vacuum exchanging innovation in OLTCs gives the best equation of value, unwavering quality and economy feasible towards a support free structure. The vacuum exchanging innovation completely disposes of the requirement for an on-line filtration framework and offers diminished down-times with expanded accessibility of the transformer and rearranged upkeep coordinations. All these together convert into significant investment funds for the end-client.

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