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PROTECTION OF TRANSFORMER UNDER SEVERAL FAULT CONDITION USING NUMERICAL RELAY

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ABSTRACT

This paper represents the protection for transformer using different time characteristics. To design and develop a numerical relay which automatically response to the over and under voltage based on different time characteristics. It is a type of protective relay which operates when the line parameters exceed a preset value. This project is an attempt to design and fabricate a multi-functional protective relay using PIC micro controller. Protection system for transformer which automatically respond to the over flux based on the definite minimum time(DMT) and inverse definite minimum time(IDMT) characteristics and over current based on the standard inverse(SI), very inverse(VI) and extreme inverse(EI) characteristics. Over-current relays must de-energize the faulted line as fast and accurate as possible to protect the system from the hazardous effects of the fault. The relay acts based on the program inbuilt to each characteristic. To improve dependability as well as security concept using IOT technique when the fault occurred.

Keywords : Overflux; Overcurrent; Definite Minimum Time (DMT); Inverse Definite Minimum Time (IDMT); Standard Inverse (SI); Very Inverse (VI); Extreme Inverse (EI)

1. INTRODUCTION

The main purpose of power systems is to generate, transmit, and distribute electric energy to users without interruptions and in safe manner. Hence, power systems are divided in generation, transformation, transmission and distribution subsystems. All these subsystems are composed of costly components and machines. Power Systems suffer from various faults, many of which result into sudden rise in current damaging the subsystem components subsequently. Therefore, over current protection is of vital importance. An over current relay can be used which monitors current and operates when current magnitude exceeds a preset value. It is important that a relay should detect all fault conditions and also, it must not trip due to spurious signals generated during power system transients. The Over flux protection is also vital and the relay should all detect fault condition based on over fluxing occurred in the system. The transformer is said to have face over fluxing problem and bad effects towards its operation and life. Specification for electrical power transformer does not stipulate the short time permissible over excitation, though in a roundabout way it does indicate the maximum over fluxing in transformer shall not exceed 110%. Over excitation of transformer in transmission and distribution can cause by over voltages in the network. The magnetic flux density is, therefore, proportional to the quotient of voltage and frequency (V/F). Over fluxing can, therefore occur either due to increase in voltage or decrease in frequency of both. The over fluxing may be also an external fault but it can lead to internal one. The severity of the fault due to over flux and over current in the external can lead to the internal fault. The paper focuses on implementation of over flux relay Inverse Definite Minimum Time (IDMT) characteristics, Definite Minimum Time (DMT) characteristics and also implementation of over current relay Standard Inverse (SI),Very Inverse (VI), Extreme Inverse (EI) characteristics..

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2. BLOCK DIAGRAM

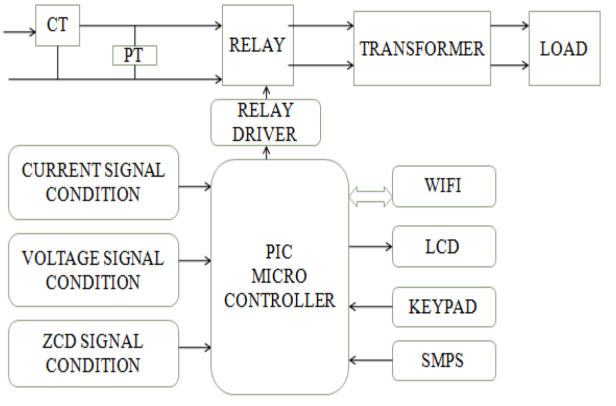

Fig 1.1 block diagram of protection of transformer under several fault condition using numerical relay

3. SIMULATION RESULT

A. OVER FLUX PROTECTION FOR DMT

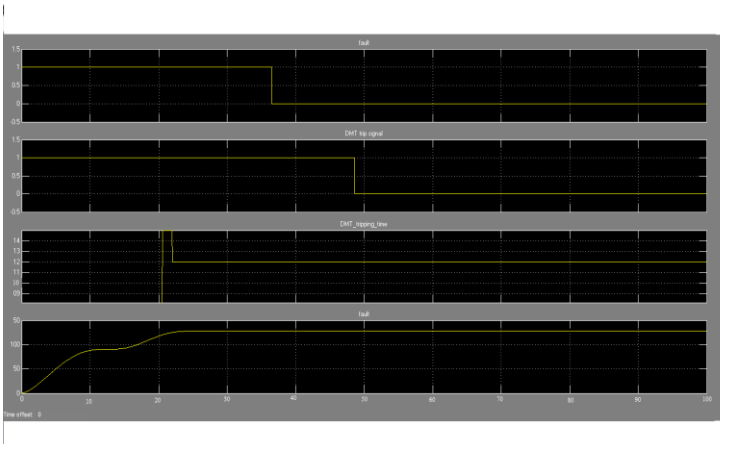

Fig 1.2 Over Flux Protection for DMT

When the V/F exceeds 120% and then the definite minimum time relay operates due to the change in the source voltage which is calculated approximately 12920V. Therefore the tripping time is calculated with the help of the equation which is mentioned earlier.

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B. OVER FLUX PROTECTION FOR IDMT

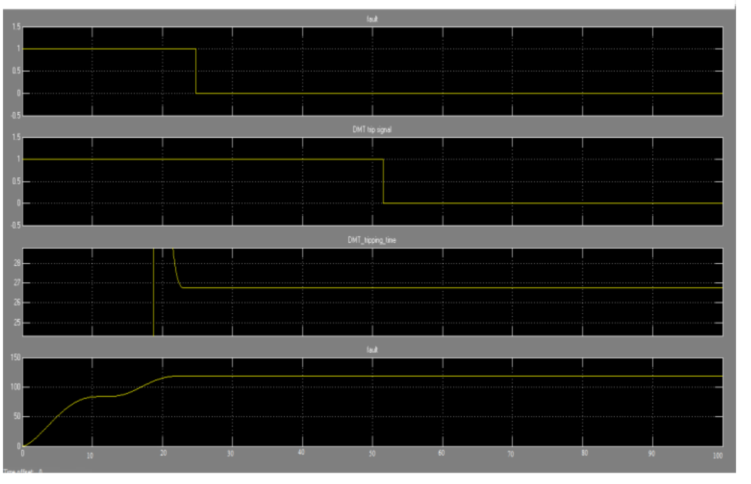


Fig 1.3 Over Flux Protection For IDMT

When the V/F exceeds 110% and then the inverse definite minimum time relay operates due to the change in the source voltage which is calculated approximately 11920V. Therefore the tripping time is calculated with the help of the equation which is mentioned earlier. The graphical representation of the inverse definite minimum time characteristics

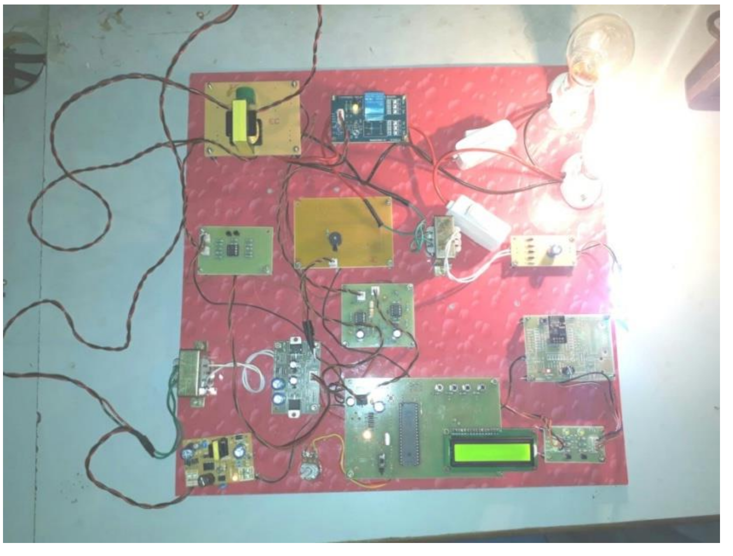
4. HARDWARE RESULT

Initial condition of hardware

In the initial condition, system will be in rest. When the Wi-Fi is set on the module and mobile .The system is interfaced with mobile

over Current Protection for Very Inverse Condition

Very inverse over current relays are particularly suitable if there is a substantial reduction of fault current as the distance from the power source The VI operating characteristic is such that the operating time is approximately doubled for reduction in current from 7 to4 times the relay current setting.



CONCLUSION

This paper presents the over current relay algorithm for transmission system for use with numerical relay embedded. The single line to ground fault and three phases to ground faults for duration 0.1 sec. are simulated. The algorithm designed for numerical relay responds properly for both the cases and the relay issue the trip command to the circuit breaker. The delay time will be calculated using DMT and IDMT according to level of over current .The fault will be monitored using Wi-Fi technique.

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