



TRANSFORMER EXPLOSION AND FIRE PROTECTION SYSTEM



Transformer fires are a cause of concern and liability for electric utilities. An explosion usually takes place before fire. This results in loss of life and damage to the neighbouring equipments apart from causing power outage.



Fire protection for power transformers has undergone a major transformation from conventional emulsifier for quenching the fire. Present day technology uses unique feature of depressurizing the transformer tank thereby preventing an explosion and fire. Not only is the transformer saved but can be put back into service within a short time.



The Indian Electricity Rule stipulates provision of Nitrogen fire Protection System as alternate to IS 3034 system.

The pressure buildup within the transformer under fault conditions is diagnosed with the help of combination of signals from Differential relay, Buchholtz oil surge relay or Rapid Pressure Rise Relay or Pressure Relief valve alongwith transformer isolation signal where upon a system activation signal is generated.



The system can be fitted on a new transformers as also retrofitted on an old transformers without modifications. The system can be operated in auto, remote electrical mode or manual mode thus ensuring reliability in the event of power failure.

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PRINCIPLE OF OPERATION

The system is simple in operation. There are two Automatic modes of operation namely Prevention mode and Extinguishing mode, apart from Remote electrical and Local Manual mode in case of power failure.

A. Prevention Mode :

It has an automatically operated drain valve connected to the transformer. Under fault conditions a command signal is sent to the drain valve to open which relieves the pressure by draining the oil inside the transformer during fault conditions. The command signal is a combination of positive feedback from electrical signal viz Differential relay, mechanical signal Buchholtz (oil surge) /Rapid Pressure Rise Relay/ Pressure Relief Valve alongwith transformer isolation signal to ensure no maloperation. A Nitrogen cylinder is connected to the transformer through a pipe running near the bottom of the transformer tank. After the drain valve operates the pressure is relieved. Nitrogen, which is a coolant, is released into the transformer which stirs the oil and reduces the temperature. Nitrogen being inert does not react with the oil.

B. Extinguishing mode :

In extinguishing mode the combination of signals used to generate the command signal are different in comparison to prevention mode. In case of Extinguishing mode fire detectors, Rapid Pressure Rise Relay or Buchholtz and Pressure relief valve signals alongwith transformer isolation signal activate the command signal.

C. Remote Electrical mode :

In case system does not receive the required signal(s), system can be operated Remote Electrical mode from control room.

D. Manual mode :

In the event of auxiliary DC power fails in the substation, the system can be operated manually.

ADVANTAGES :

- SCADA compatibility
- On-line testing facility
- DC monitoring
- Regulated gas release device

The above method being simple and fail safe is used the worldover on many transformers for protecting them from explosion and consequent fire.