[ENE02]
Artificial neural network based arcing fault detection algorithm for underground distribution cable

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Arcing faults can cause substantial damage if they are not detected and isolated promptly. Detection of arcing faults has always been a difficult issue. Those faults tend to be of high fault resistance and hence the fault current is well below maximum load limit and its detection is not possible through the use of overcurrent relays. In the case of overhead lines, the gas generated through arcing is dispersed rapidly. But in the case of underground cables, the generated gas could travel along cable duct and could result in explosion at manhole location, which is dangerous to personnel. The damage can be reduced if arcing faults are detected before they develop into major faults. In this paper, an arcing fault detection algorithm using feed-forward neural network is presented. Arcing faults data are collected through simulation. The simulation involved the modeling of a simple underground distribution system and two TNB underground distribution systems using Power System Aided Design / ElectroMagnetic Transient for Direct Current (PSCAD/EMTDC) program. The algorithm performed well in recognizing arcing faults current patterns. More effective evaluation of neural network approach to the arcing faults detection will require actual field data. More training patterns, which include the current patterns of nonlinear loads that mimic fault conditions, would enhance the network reliability.