



**ARAB ACADEMY FOR SCIENCE, TECHNOLOGY
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(AASTMT)**

**College of Engineering and Technology
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**Application of Fault Diagnosis for Power Transformer in an
Energy Control System**

By

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Abstract:

Although, an electrical power system has protection devices, it sometimes fails to function accurately due to its limited capabilities and at the same time, it cannot completely diagnose and/or predict faults. So, fault diagnosis technique should be implemented to overcome these problems. The thesis introduces a fault diagnosis technique for electrical power system to prevent sudden failure and do accurate and fast maintenance. Hence, the aim is to enhance ability of power system to function much better and reduce failure, outage and cost.

Fault diagnosis is proposed for power and distribution transformers which are the major important elements of power system especially for industrial applications. The proposed diagnosis is applied on one of utility transformers of MIDOR Refinery Company, which is located at Alexandria in Egypt. MIDOR contains all its medium voltage (MV) equipments feeders interconnected via Electric Control System (ECS).

ECS used is to monitor and control these equipments remotely through digital protection relay called SEPAM which monitors, controls and protects electrical equipments.

SEPAM relay fails to completely diagnosis faults and detect unexpected faults outside its protection algorithms.

The proposed transformer fault diagnosis depends on the integration of two parts: first part is Dissolved Gases Analysis (DGA) diagnosis which depends on DGA of transformer oil samples; second part is electrical signals analysis diagnosis of the same transformer. The two parts are designed based on artificial intelligent technique; the proposed DGA is designed based on fuzzy logic controller, while a combination between wavelet transform and neural network are used in signal analysis.

The simulation results proved that with the proposed fault diagnosis technique, the system can detect fault type and its location. Meanwhile, conventional protection fails to reveal that. DGA diagnosis detects type of faults as result and electrical signals diagnosis ensures fault presence and detects fault location.

Since the proposed fault diagnosis technique was built with MATLAB, it can be integrated into the ECS by connecting a new platform station, which contains MATLAB and proposed technique, to ECS software platform or it can be embedded within ECS software environment as sub-program, where ECS has all data needed to run the proposed technique except DGA raw data which is fed by user.