ARCO *Applied Relay Coordinator for high-voltage substations*

Overview

Overcurrents and earth faults, where larger than intended currents are generated, are common problems in high voltage substations. Excess current can lead to overheating and the risk of fire or damage to equipment.

Relays are used to mitigate the risk of excess current. A high voltage station typically has dozens of such protective relays. The relays are generally mal-coordinated with respect to each other, due to a multitude of instructions and standards. This lack of optimisation leads to failures in the network and decreased efficiency.

A software tool has been developed to co-ordinate the relays in high voltage substations, thereby increasing efficiency and minimising failures in the network. The tool has been developed extensively for over a decade by a previous relay-engineer, now researcher in Adaptive Emergent Systems in Imperial College's Computer Science department.

Technology

An inventory-substation-based coordination-method has been developed by using Vb.net with a connection to a database. As short circuit calculation programs are readily available, a substation including all the overcurrent (O/C) and earth fault (E/F) relays plus distance relays are considered in this applied program. Special attention is paid to define a few relevant short circuit scenarios and different rules are developed based on this methodology to achieve optimal settings, and to cover instructions and standards. The resulted software program, **ARCO**, facilitates all the calculations of current relays for any high voltage substation with any configuration, offering detailed calculations.

ARCO is flexible in that it allows a user to define any kind of modelled relays in any position of the substation's protective diagram. According to the user's primary settings, ARCO considers all requirements and offers detailed and abstract trustful results.

ARCO can save significant engineer-hours, which are traditionally deployed to performing the coordination manually. The program allows an engineer to quickly update the relay settings according to a new network and/or relay configuration.

The previous version of this program, called 'OEMP' (Overcurrent and Earth fault Mechanization Program) has been used for over 10 years by a regional electric company, with good results. ARCO is an updated version of OEMP, and has been tailored to meet today's needs. Increased sophistication in power stations has led to the need for a new system, which is now available in ARCO.

Features

- Issues full details of calculations including the utilised flexible relations.
- Issues text, PDF, and graphical outputs, and warnings.
- Includes relay modelling in addition to substation modelling.
- Possible to define private and shared regions for calculations.
- Includes smart data checker.
- Can work as a single or multi-user application.
- Relay operating time vs. user-defined possible fault currents.

Benefits

- Flexible for any configuration
- Relay-engineer time-saving
- Improved efficiency and reduced faults through co-ordination

Alessandro Garcia
Technology Licensing Executive
e: alessandro.garcia@imperialinnovations.co.uk
t: +44 (0)20 3727 2059
w: www.imperialinnovations.co.uk
Technology reference number: 8376