A SYSTEM APPROACH ON POWER DISTRIBUTION SUPERVISORY CONTROL

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SUMMARY

The electrical energy distribution networks need remote control systems that are centralized and integrated as far as the functions they can develop are concerned. The need for a thinking unit at the line head for managing a Supervisory Control System is unavoidable. The thinking unit (microprocessor) moreover, allows a communication network to be built up which uses the line without voltage, with a variable number of transmitter-receiver stations attached to the equipped centres, as discussed in this paper.

This paper considers a strategy and the execution of a Supervisory Control System which adopts a dynamic polling structure and which is believed to be more attractive and economical than that adopted by rigid network structures.

The following paragraphs discuss the configuration of the Distribution Network, the aims that the Supervisory Control System must fulfill, the system functions and a transmission system description.

CONFIGURATION OF THE NETWORK

The Supervisory Control System considered in this paper takes into account a distribution network configuration in which there is an operating voltage of 25 kV outside the primary station or sub-station walls. The Network is meshed (except in some isolated cases of tally rural areas where operation, both overhead and underground lines, is radial).

Figure 1 shows elements which usually make up the type of Network into which the Supervisory System is introduced.

Also worth mentioning are the T-R blocks which will allow the exchange of information between the line Head and the equipped Centres under the management of a microprocessor.

AIMS

The main aims of the Supervisory Control System are

-Fault location. It is understood that a fault has been located when the equipped Centres closest to it are known.

-Fault isolation. It is understood that a fault has been isolated when the open-close sub-systems have been activated in such a way that they prevent the passage of energy to the section in which the fault lies.

-Renewal of service. This is understood to mean the actions to be taken by means of the open-close elements with a view to establishing service on the Network, except on the section affected by the fault.

-Centralised recording of all actions taken on the Network.

-Open-ended, that is, that the system allows variations in the Network without the need for modifying its own structure.

SYSTEM FUNCTIONS

When a fault occurs, the part of the system associated with the section of the Network on which it occurred, enters into operation.

The line head microprocessor interrogates in a preset order, the equipped Centres (T-R) dependent on it, so as to find out whether they have "seen" or "not seen" the fault current.

From Figure 1 it can be seen that if after an affirmative response a negative response is given, this means that the equipped Centres by which the fault is bounded have been located and the aim of location has been fulfilled.

Following this, the line Head (T-R) informs the two equipped Centres mentioned above with regard to which open-close devices must be actuated in order to isolate the fault and informs the nearest isolator to carry out the necessary isolation and renewal of service.

TRANSMISSION SYSTEM DESCRIPTION

Figure 2 shows the line head T-R block diagram. The Interface sub-system with the microprocessor is asynchronous and operates under program control. On the "transmission mode" the MUX gathers the information according to the format shown in Figure 4. Then the digital signal associated with the burst (32 bits) modulates a carrier in amplitude (225 Hz). The resulting signal is amplified and adapted to line with the aim of supplying the line 80 V.A.

The carrier and the clock signals are ge-
nerated by an independent, quartz-crystal synthesiser. On the reception mode the line signal is equalised on the receiver and then passes through an envelope detector from which information is obtained for controlling the phase of the synthesiser and detecting the digital signal associated with the burst received.

Figure 3 shows the T-R block diagram of an equipped Centre. It can be seen that the only difference with regard to the diagram given in Figure 2 is the Control Unit sub-system, whose functions are

In Transmission mode, connection of the signal associated with the information of "seen" or "not seen" fault current.

In Reception mode, generation of control signals.

Figure 4 illustrates the data transfer format which is made up of 32 bits distributed as follows

- 13 bits for SYNC and adjustment of the Automatic Gain Control.
- 6 bits for identification of a station of destination.
- 6 bits for identification of the source station.
- 5 bits for information.

REFERENCES

