



The Intellectual Automated Substation

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ABSTRACT

The article is devoted to the study and introduction of modern technologies in electro-technical branch of the industry for the purpose of increasing reliability of electric supply. Applying the latest technical developments marketed in automatic breakers Compact NS and Master pact of the company "Schneider Electric", for modernization distributing device 0,4 kV applied transformer substation is offered in it .

Keywords: *Schneider Electric, Compact NS , Master-pact, SCADA, the programmed logic controller , reliability of electrical supply,cases the low-voltage transformer,four wire electric network TN-C, recommended IEC three-phase five-wire network TN-S, microcontacts OF, SDE, PF, CH, Modbus, SCADA, Batibus.*

INTRODUCTION

Introduction of systems of automation and dispatching management on the modern digital techniques radical raises in the image quality and reliability of processes of manufacture, transfer and distribution electric power [1]. As a result of equipment of power objects by systems automations , microprocessor means emergency-preventive automatics and relay protection reach essential economic benefit at the expense of optimization of modes of transfer and distribution of energy, prevention of emergencies and minimization of a damage in case of their occurrence [1,2,3] .

At present the begun transition in abroad to the next generation of microprocessor (digital) device of relay

protection and automatics (DRPA) with integration within the limits of a uniform complex functions of relay protection, measurement processor complexes which have received wide applied and commercial account electric power, regulation and management of electrical installation it is directed on maintenance of increase of reliability of electrical supply of consumers and conformity to modern safety requirements on IEC [2]. Frequent relay protection terminals carry out function of controllers of the bottom level of the automated management systems (AMS), providing complex protection of management of substations at modern level. In this case they provide management in a place or from remote control offices, control of position of the primary equipment, measurement, the alarm system, record and transfer of oscillograms. Besides, the AMS information system allows to make to the user record/change date with use the pass word, to receive reports and to conduct archive of events, to execute conditions of diagnostics of the primary equipment and etc.[4]. Wide use in electrical installations of consumers of servers of control systems of real time (SCADA) provides [2,4]:

- teleinformation reception/transfer in any reports;
- reception / data transmission of the daily dispatching sheet (DS);
- processing of the arriving information, formation date bases (DB) of real time (DBRT), to condense;
- management of a dispatching board (digital devices, symbols, mnemonic schemes, information displays);
- the cyclic copying DBRT on files-servers of a local network (LN) and etc.

As it is marked in [1-3], in the report 34-108 CIGRE are answered to Dews of a combination of traditional control facilities, relay protection and automatics (DRPA) with the new microprocessor complexes which have received wide application in the world. Creation is thus provided: microprocessor systems of registration of emergency events, gathering and data processing about work RPA; systems of communications of new complexes with computer "kernel" of the integrated monitoring system and management, and also systems of display of the information on workplaces of operation personnel and the personnel of services RPA.

Distinctive feature developed by us distributing device -DD-0,4 kV for complete transformer substation (CTS) is the modern design, an openness for AMS for the account of presence of ports and the applications of the software that allows to realize flexible technical and economic solving for an electrical supply of consumers of any category. The device carries out functions local or remote control, relay are sewn up, alarm systems, automatics, registration, control of harmonics in a voltages curve (in cells of input from a reserve source), diagnostics automatic breakers, and also necessary blocking various blockings CTS. The switching centre- DD-0,4 kV CTS gathers from low-voltage cases of type Cases low-voltage transformer (CLVT). For assemblage of sections of tires DD-0,4 kV CTS separate CLVT, two party service, rigidly fasten among themselves the folding connections.

In cells CLVT in the main chain following devices are established:

- in cells of departing joining - automatic breakers (AB) manufactures Schneider Electric Compact NS 400 N on 400 A to roll out executions with the electric drive;
- in section and cells of input from the transformer - automatic breakers manufactures Schneider Electric Master pact NT 16 H1 on 1600 A to roll out execution with the electric drive;
- in cells of input from a reserve source - automatic breakers of manufacture Schneider Electric Master pact NT 10 H1 on 1000 A to roll out execution with the electric drive;
- a source of an uninterrupted food (UPS) (UPS NetPro 19) capacity 1кVt.) with time of support of capacity of consumers not less 5 minutes.

In cell RPA of the section breakers are established various microprocessor blocks of relay protection, or program- med logic controllers (PLC) at will of the customer, for example S7-300 (the manufactures Siemens). On fig. 1 basic one-linear scheme CTS with it is developed us DD-0,4 kV.

In DD-0,4 kV the following algorithm of automatics CTS is realized (fig. 1):

- on the section breakers (SB) it is executed automatic input of a reserve food (AIRBF) - a normal mode - both introduction breakers from transformers are included, SB it is disconnected.

On voltage disappearance on one of inputs (voltage control is carried out directly on tires CTS) - through the set endurance of time the breakers is disconnected corresponding introduction.

Upon switching-off of input, absence of voltage on the disconnected section of tires and voltage presence on the second section, joins SB. At switching-off of the introduction breakers on currents protection the signal on a start-up interdiction is given of AIRBF.

The algorithm of start of a reserve source (is carried out by the independent automatical Diesel power station (ADPS):

In a starting position both introduction breakers from a transformers one of the introduction breakers is included, the generating switch in van ADPS is disconnected.

At voltage disappearance on two sections CTS (voltage control it is made directly on tires) the signal on start ADPS is formed, at occurrence of voltage from ADPS, both introduction breakers are disconnected CTS, upon their switching-off the signal is formed on inclusions generating breakers are ADPS.

- For realization of automatic and manual return transition to a food Automatic return transition», having two position: "Auto" and «The manual.».

Algorithm of return transition.

At voltage occurrence on one of inputs, with set date time (1-30 minutes), are formed a signal normal to stopping ADPS. Thus is disconnected generating breakers ADPS, upon its switching-off, presence voltage on input to the introduction switch of one of

section of tires (ST), to the absence fact voltage on ST, to the fact of the disconnected condition of the introduction switch adjacent section without endurance of time the switch of that joins introduction ST on which input there was voltage. At voltage occurrence on other input, with set date time (1-30 minutes), upon presence of voltage to the introduction switch of this ST, the included condition of the introduction switch and voltage presence on adjacent ST, it is disconnected SB and the switch of the second joins introduction Input. Thus scheme AIRB comes back in a starting position.

The choice of a priority of inclusion of the introduction breaker is carried out with set date time on inclusion. At voltage occurrence simultaneously on both inputs - by the first input with smaller date time joins.

One more feature developed DD-0,4 kV is that taps «The automatic breakers - a departing cable to consumers» are deduced in the bottom part of a case. On the ends tires (each all taps and the ends are marked (a phase, № the cells, a departing feeder). For safety of attendants cases CLVT are divided into the isolated compartments: the tires a compartment, compartment with breakers, compartment of relay protection and automatics. In the tires a compartment

the equipment of the main chains settles down: the power the tires departing to consumers and a reserve source power cables and transformers of a current.

Power automatic switches and switches of chains of management are established in corresponding cells.

In cells of input from the transformer (cell № 1 in a case №1 and cell № 2 in a case №5) under a compartment for power switches it is allocated the special sector for installation of a source of an uninterrupted food (UPS) (UPS NetPro 19 capacity of 1 kVt.) with time of support of capacity of consumers not less minutes.

In is the requirement on maintenance of speed of switching-off of the damages connected with influence on the person. In a compartment of relay protection are established: the interface relays of the alarm system, blocking and automatics, PLC, devices of control and the account of the electric power and other. Cells inside CLVT are separated from each other metal a partitions. For carrying out of repair work and maintenance service the power to roll out executions automatic breakers are established in cells on not-mobile the chassis fixed in working position bolt connection supported on the basis of a cell.

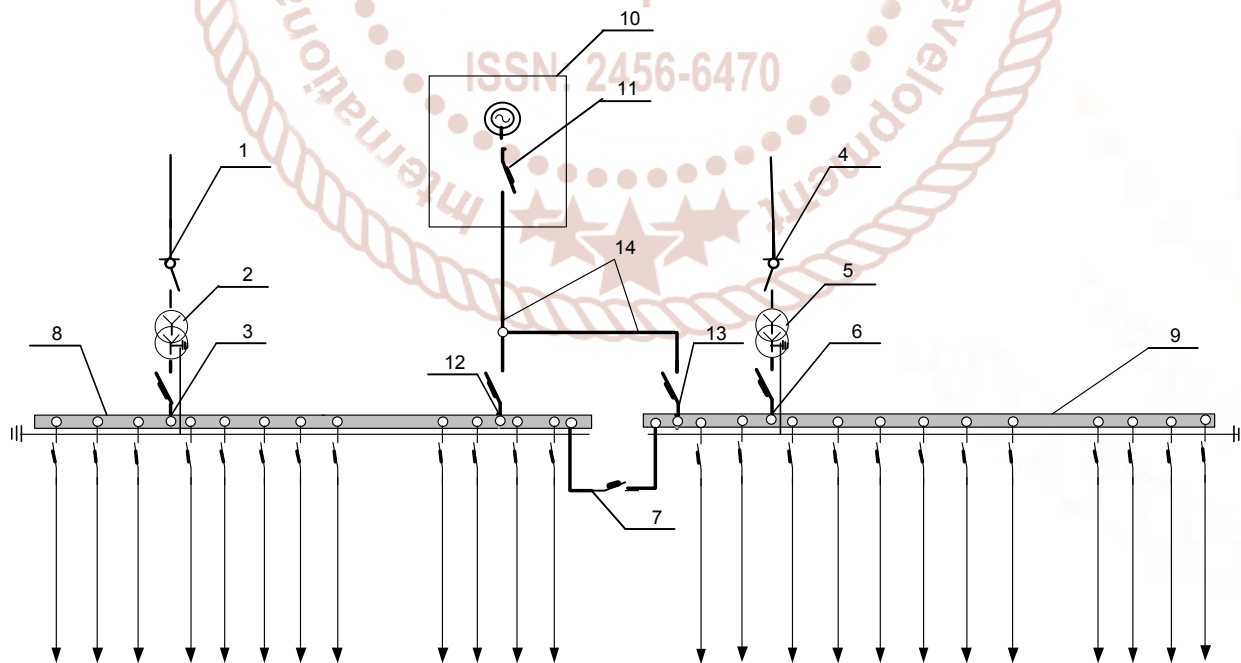


Fig-1: One-linear the principle scheme CTS.

Symbols are accepted, on the scheme the following : 1 high-voltage input- 1 from the closed distributing device of voltage 6-10 kV ; 2- the transformer №1 of

voltage 6-10 /0.4 kV, capacity 1000 kVA; 3- input- 1 0.4 kV from transformer $I_n = 1600$ A; 4- high-voltage input- 2 from transformer $I_n = 1600$ A; 5-the

transformer №2 of voltage 6-10 /0.4 кV, capacity 1000 кVA; 6- input- 2 0.4 кV from transformer $I_n = 1600$ A; 7- section automatic breakers $I_n = 1600$ A ; 8- section of tires № 1; 9- Section of tires № 2; 10- automatic diesel power station (ADPS) rated current of $I_n = 1250$ A; 11- automatic breakers the generating of ADPS; 12- input- 1 0.4 кV from the ADPS; 13- input- 2 0.4 кV from the ADPS; 14- bunch of power cables 4x (КБВШВ - 3x150+1x50).

CLVT on the back party has two doors: top – closing access in compartment of modular tires and bottom closes a zone of departing power cables and bottom closes a zone of departing power cables.

For possibility of control over a power consumption, management electrical Consumption, accumulation of the information on loadings of sections of tires CTS, integration of automatic switch Master pact NT H1 into scheduling systems uses additional function of data transmission (communication Bus) COM, realized in section, cells of input from the transformer and from a reserve source, AB Master pact NT [5]. For these to roll out devices additional function of data transmission is provided (fig. 2)

The module of communication established in the device, delivered together with group of contacts (micro- contacts OF, SDE, PF, CH) and the complete set of communication with electromagnets of management XF and MX

- the module of communication established in the chassis, delivered together with group of contacts (contacts CE,CD, CT).

Each established device has the address which is appropriated to it by means of the keyboard of the block of control and management Micrologic (Modbus) or remotely (Batibus). Thus at creation automated management systems of the enterprise it is possible from Information operating system of top level , for example from mini enterprise COMPUTER scheduling office , management (or through PLC, or passing it) established on feeding substations AV, to transfer in top level of the data of measurement, the alarm system, automatics, registration, control of harmonics in a pressure curve, and also other necessary information, for example condition AB of switches in various joining CTS, voltage presence on inputs and sections of tires CTS etc.

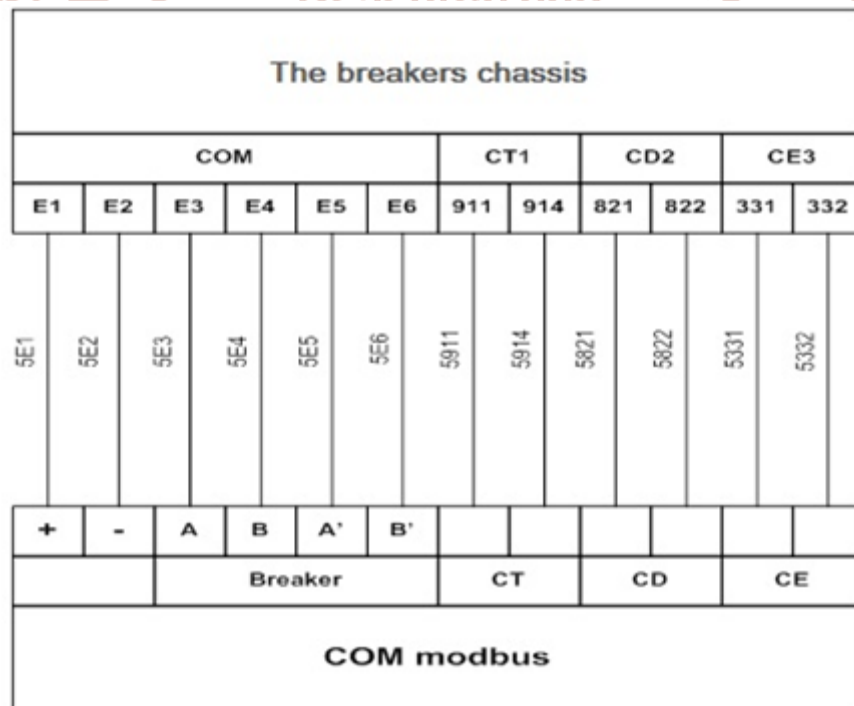


Fig. 2. The scheme of connection of additional function of data transmission COM .

Conclusion

1. With a view of creation of the automated control systems by industrial power supply, in particular an electrical supply, workings out more perfection methods of optimization of power modes, increases adequacy and security of electrical supplies etc. it is necessary to expand use sphere in of electrical installations consumers of servers of control systems of real time (SCADA).

2. DD-0,4 kV CTS, equipped with PLC, automatic breakers the manufactures Schneider Electric Master pact with block of the control and management Micrologic A/P/H can carry out function of bottom level automated management systems of electric power, complex protection of management of substations at modern level. In this case they provide automatic control in a place or with the removed control offices, control of position primary installations, measurements, the alarm system, record and transfer of oscillograms etc.

3. In development of the theory and perfection of methodology of designing of systems electrical supplies industrial company the important place occupies the account in such workings out available in present time in electrical installations of consumers and introduced in practice of operation of modern devices DRPA, micro-processor systems of registration of emergency events, gathering and data processing about work DRPA; systems of communications of new complexes with computer "kernel" of the integrated monitoring system and management, and also systems of display of the information on workplaces of operation personnel and a personnel of services RPA

4. And necessary for such workings out conformity to modern safety requirements on IEC, IEE is important. At reconstruction maintained, and also designing of new electric networks it is necessary to aspire to pass on three-phase five-wire network TN-S recommended to CIGRE, IEC.

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