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TIME CONSTANT OF THE APERIODIC COMPONENT OF THREE PHASE SHORT-CIRCUIT ANALYSIS

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The time constant of the aperiodic component short-circuit - electromagnetic time constant that characterizes the decay rate of the aperiodic component of short circuit current. This value is important for the choosing a variety of equipment in power plants and substations, relay protection.

Therefore, there is need precise values of the this time constant for different points in any section of circuit with short-circuit. There are tables in reference book with the values of this time constant for the different versions of the devices, but they are may be invalid. In this paper will be analyzed short-circuit mode at the power station and will be defined damping time constant for the sources compared with the reference data.

Calculation of parameters of a short-circuit is performed using GTCURR programm for the power scheme shown in Fig.1.

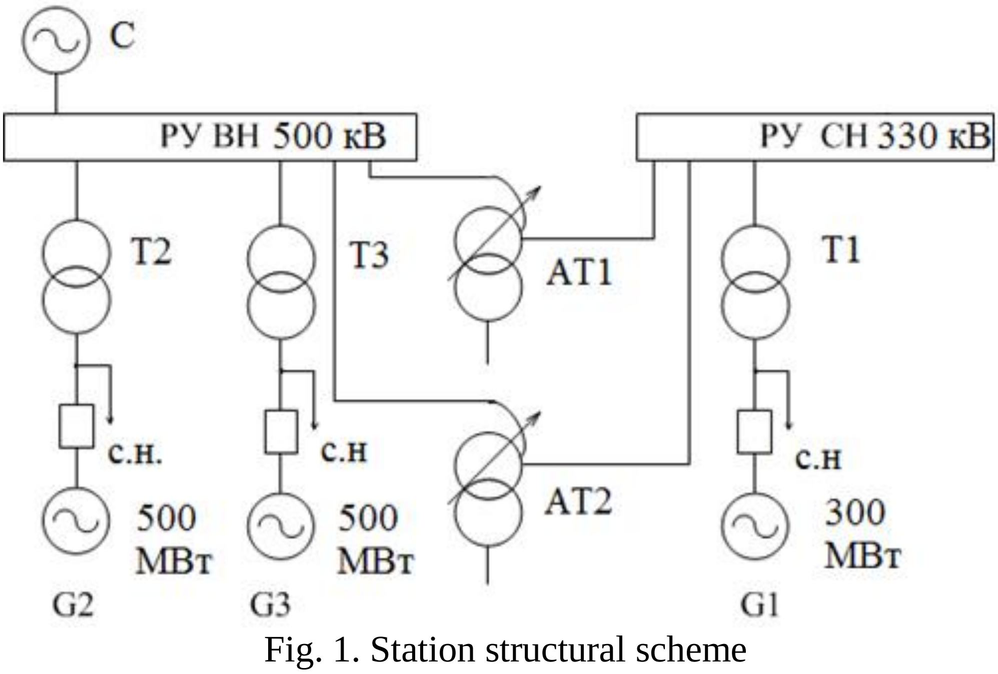

Fig. 1. Station structural scheme

GTCURR programm is intended for calculation the currents of the three-phase short circuit with elements such as "system", "line", "transformer", "generator", "reactor", "asynchronous motor", "synchronous motor", "synchronous compensator" and "generalized load" to the selection and testing of electrical conductors and power stations, substations and electrical networks.

Mapping in GTCURR carried out in two stages: the drawing of the working elements and connections on the workspace and enter the parameters of these elements. Circuit in Figure 1, implemented in GTCURR, presented in Figure 2.

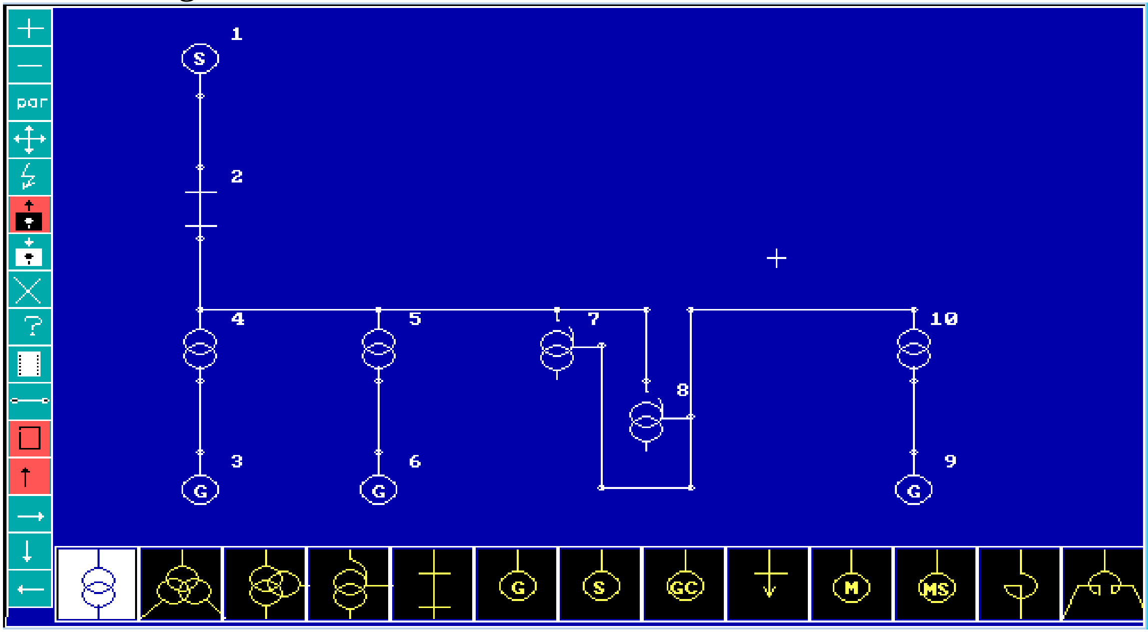

Fig. 2. GTRURR station structural scheme

The calculation of the three-phase short-circuit in some points indicated in Figure 3 conducted for certain equipment: system, line, transformer, generator.

The results of the calculation are tables of values for the decay time constant current sources, i.e. for currents on elements of C (1), G1 (9), G2 (3), G3 (6) for three-phase fault in different points of the circuit.

There are tables with the recommended values of time constant of the aperiodic component of three phase short-circuit in educational literature [1] --Figure 4.

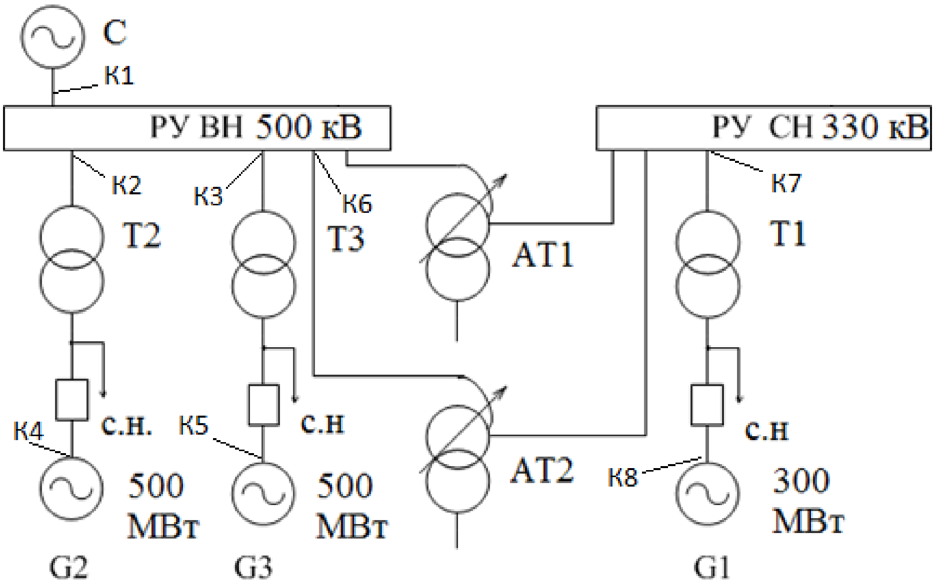

Fig. 3. Station structural scheme with marked points of three-phase short-circuit

Элементы или части энергосистемы	$T_а$, с	$k_у$
Турбогенераторы мощностью, МВт:		
12–60	0,16–0,25	1,94–1,955
100–1000	0,4–0,54	1,975–1,98
Блоки, состоящие из турбогенератора мощностью 60 МВт и трансформатора (на стороне ВН), при номинальном напряжении генератора, кВ		
6,3	0,2	1,95
10	0,15	1,935
Блоки, состоящие из турбогенератора и повышающего трансформатора, при мощности генераторов, МВт		
100–200	0,26	1,965
300	0,32	1,97
500	0,35	1,973
800	0,3	1,967
Система, связанная со сборными шинами, где рассматривается КЗ, воздушными линиями напряжением, кВ		
35	0,02	1,608
110–150	0,02–0,03	1,608–1,717
220–330	0,03–0,04	1,717–1,78
500–750	0,06–0,08	1,85–1,895
Система, связанная со сборными шинами 6–10 кВ, где рассматривается КЗ, через трансформаторы мощностью, МВ·А в единице		
80 и выше	0,06–0,15	1,85–1,935
32–80	0,05–0,1	1,82–1,904
5,6–32	0,02–0,05	1,6–1,82
Ветви, защищенные реактором с номинальным током, А		
1000 и выше	0,23	1,956
630 и ниже	0,1	1,904
Распределительные сети напряжением 6–10 кВ	0,01	1,369

Fig. 4. Tabulated values of decay time constant

The received results were compared to values, recommended for use for an equipment choice [1].

The analysis showed that recommended values are valid only for the generators, in case of short circuit on their conclusions, which means that use of recommended values for other points of short circuits is illegal.

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AUTOMATIC TRANSFER SWITCH

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The aim of the present paper is to give information about automatic transfer switches (ATS) which are the best solutions when interruption of power during is not acceptable. They can be used in different environments, ranging from residential, agricultural and light commercial applications to the critical power needs of healthcare, financial and data center facilities. A transfer switch is an electrical switch that switches a load between two sources. Some transfer switches are manual, in that an operator affects the transfer by throwing a switch, while others are automatic and switch when they sense one of the sources has lost or gained power.

Automatic transfer switch devices are designed for power recovery by automatic switching of backup source, providing the protection for continuous power, when the main source fails.

These devices are powered from two or more independent and mutually supportive power supplies. A break in the power load of the consumer when one of the sources fails is only permitted on the automatic switch to backup power with a further full automatic restoration scheme to the emergency supply regime.

The automatic transfer switch device can connect a separate power source (generator, battery), or turn on the switch that separates the network, and is used in critical or life safety applications where a "no break" transfer is desired and when the power break may be only 0.3 - 0.8 seconds.