A TEST SIGNAL GENERATOR OF TELEMETRY AND TELEACTION

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Modern power system is one of the most complex engineering systems ever created by man. This is due to a large amount of equipment and automatic devices, continuously operating and impact on each other through the common modes in the power system. The management of such systems requires a fairly complex equipment and software systems that allow to cope with this task. One of these complexes is SCADA-system (Supervisory Control And Data Acquisition), designed for the collection, processing, storing information about mode parameters of grid.

A feature of modern SCADA-systems are working in real-time, large amounts of incoming information, the availability of monitoring the validity of the data, the presence of a sufficiently large volume of automatic software modules intended for operational monitoring and control of power systems, and centralized storage of data [1].

As with all complex technical systems, SCADA-system is constantly being improved, there are new abilities and properties of their operation, which may lead to unpredictable consequences. Therefore, before introducing a new version of the SCADA-system in operation in the energy plants it runs quite a long phase of testing and of working capacity verification. This test is a test connected SCADA-system to real telecommunication data obtained by regular channels, and control of the occurrence of error situations. But this test does not guarantee the absence of errors in all modes of the power system, these regimes simply cannot occur during testing.

Another possible test tool can be any calculation programs that, given the scenarios reproduce the most typical normal and emergency modes in the power system. However, in this case, cannot be played possible emergency situations associated with the loss of data during transmission via communication channels, such invalid data or lack of them for a certain period of time.

In contrast to the existing methods of testing SCADA-systems are encouraged to use a specialized automated system (test signal generator), which takes into account all the properties and features coming to the SCADA information, such as parameters of validity and time stamps, and the possibility of the loss of information or delay in receive it. In modern development environments (for example, Microsoft Visual Studio) is a direct analogy of this method of testing complex programs - Unit test.

The main tasks of the automated testing software module include:

1. Setting teleinformation values for given pre-developed scenarios. This approach allows you to create and complement the different situations in the power regime.
2. The regulation time to send data to the SCADA-system. Guarantee time for sending information allows more accurate determine the properties and temporal region of the reaction SCADA-systems to the received information.

3. Creating abnormal situations when transmitting information such as uncertainty of attributes of transmitted data or delayed transmission, this is also specified in the script.
4. Automatic control of the reaction SCADA-systems to the received information. Predetermined volume of coming into the SCADA-system information and its quality, which is set in the script, can accurately predict the results of the automated software modules SCADA-systems and the demands on their time characteristics. Therefore, differences in the expected data and real data, which are derived from the modules SCADA-system, indicate a presence of errors.
5. Interface of test signal generator is represented in Figure 1.

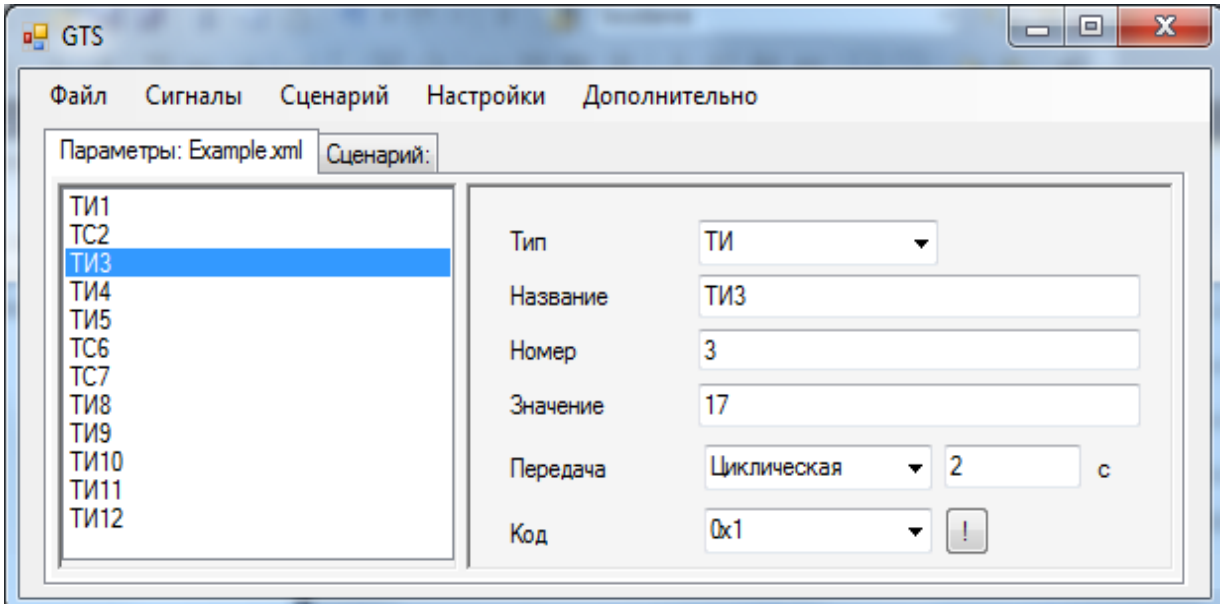

Fig. 1. Interface of test signal generator of telemetry and teleaction

Test signal generator of telemetry and teleaction has several advantages:

- The program and testing SCADA system can work independently from the actual grid. For the tests do not need to obtain information from the operating power facilities;
- Convenient change of quantity of setting values and their conversion algorithms;
- Provide friendly and intuitive interface to select telecommunication data channels and test algorithms.

All this allows service personnel to reduce the time for testing and increases the efficiency of testing.

The program has two editors, allowing to make and modify information about the various attributes of the test. One of them is the editor of parameters, which specifies the properties of signals such as:

- Type of signal;
- Name;
- Signal number;
- Value;
- Transmission rules: cyclical, on change, according to a schedule;

- Signal sending code: invalidation, manual entry, and others.

These properties allow you to set the initial parameters of the signals required for the test run.

The second editor - the script editor is designed to generate algorithms of changes of signal values over time. It implements four main functions:

- Assigning a value to a variable (for example: TI1.Value = 5);
- Mathematical operations: addition, subtraction, multiplication, division. The first two operations are possible both with multiple telemetry (TI1.Value = TI2.Value + TI3.Value), and with telemetry and constants (TI1.Value = TI2.Value + 10);
- Pause (s.ms). That stops the script to the a specified time;
- Sin (argument), Cos (argument). Returns the value of a sine or cosine of the argument expressed in radians.

The program read and writes parameters of signals and operating scenarios in files with XML format. This format is widely used to create and store files, application settings, and implementation of different databases [2].

Algorithm of work of program is shown in Figure 3.

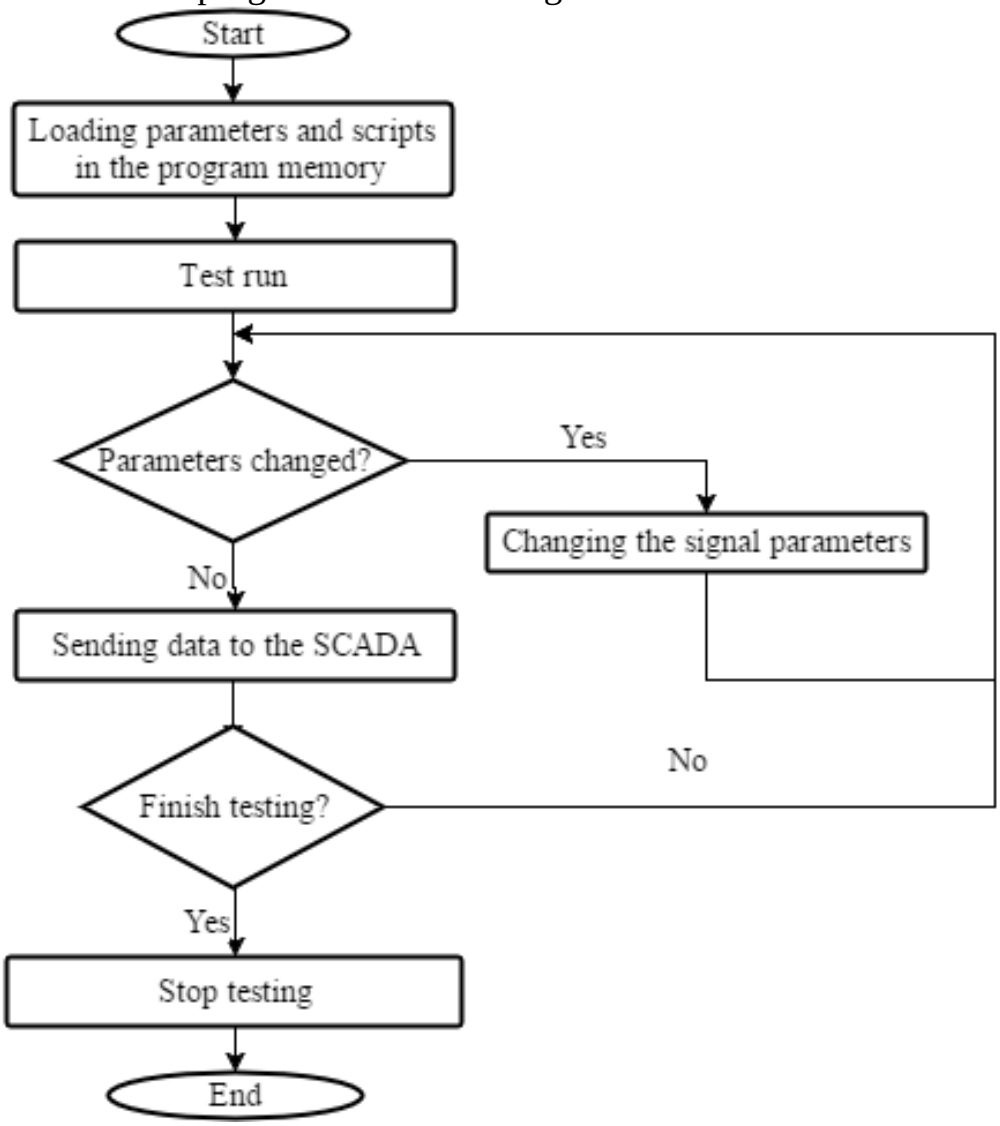

Fig.3. The algorithm of work of test signal generator

When you run the test program with a certain frequency automatically checks the changes in the attributes of the signals produced by the script and sends the data to the SCADA, according to a predetermined transmission rules. If any attribute has been changed, the test signal generator introduces new data in the signal parameters, and sends the updated data. This algorithm of the program is displayed in Figure 3.

For the convenience of the test is possible to run multiple parallel programs with its own set of parameters and scripts of their change. Each window can simulate the behavior of various power facilities.

Program test signal generator can also be used only to send the data to the SCADA-system. Monitoring of occurrence of error situations will be carried by operational staff. But, functions of automatic testing will not be used.

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ПРОЦЕСС ВЫПЛАВКИ ВЫСОКОУГЛЕРОДИСТОГО ФЕРРОХРОМА С ПРИМЕНЕНИЕМ В ШИХТЕ АГЛОМЕРАТА В УСЛОВИЯХ ЗАВОДА ФЕРРОСПЛАВОВ

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В последнее время наблюдается тенденция скопления мелкодисперсной фракции руды на металлургическом предприятии, которая не может быть использована непосредственно в производстве. Объем некондиционной руды занимает большие площади предприятия и ухудшает экологическую обстановку. Таким образом, решением утилизации и возврата мелкой фракции является технология окускования, одним из перспективных методов является агломерация. Но для увеличения производительности печи, при этом не увеличивая затраты на электроэнергию, необходимо оптимальное сбалансированное управление технологическим процессом выплавки высокоуглеродистого феррохро-