## Research Article
## Food Security Information System Digital Simulation

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**Abstract:** The study built a simulation model for the study of food security information system relay protection. MATLAB-based simulation technology can support the analysis and design of food security information systems. As an example, the food security information system fault simulation, zero-sequence current protection simulation and transformer differential protection simulation are presented in this study. The case studies show that the simulation of food security information system relay protection is effective and feasible.

**Keywords:** Food security information system, relay protection, simulation

### INTRODUCTION

Along with the rapid development of science and technology and the acceleration of globalization, food safety has growing impact on human society and tens of thousands of people every year have contracted infectious or non-infectious food-borne disease because they ate contaminated foods. Food security information System digital simulation can be divided into two types of simulation study and training simulation. Simulation Study includes a variety of power system stability and transient electromagnetic transient simulation software, integrated electromagnetic transient stability program, Such as electromagnetic transient software EMTP and widely used in domestic electric power department comprehensive stability program as well as the Mathwork company's newly minted MATLAB, etc. Training simulator including those belongs to the EMS dispatcher training simulator DTS, substation operator training simulator and power plant unit operation personnel training simulators. Some of DTS has function of studying simulation, so hardware and software are very large and complex, also the equipments are expensive (He, 2009).

Simulation studies can be divided into non-real-time simulation and testing of real-time simulation. Real-time simulation of Food security information System protection devices currently are used mainly for testing and adjusting the generator excitation system. With physical participation, thus we required simulation system in real time. Real-time simulation software must be finished within a practical step all state variables and state variables to solve the calculation and associated with the physical parameters of the transformation, power amplifier and connection.

From the training requirements of the system, taking MATLAB as a development platform, we used the system's powerful, suitable functions for the development of a number of food security information system protection simulation modules. We can construct a simulation model according to the required imitation really power topology structure, power flow calculation, short circuit Calculation, transient simulation calculation and relay protection testing and validation (Wang, 2009).

### MATERIALS AND METHODS

**Short-circuit calculation:** Conducting fault protection action, setting the calculation, you need to make short-circuit calculations (Deng, 2007). In order to meet the purpose of the faculty of short circuit calculation, system design short circuit calculation module. We can choose a variety of symmetrical and asymmetrical short-circuit calculations, such as single-phase shorted to ground, the two-phase short-circuit, two-phase ground short circuit, three-phase short circuit. Through the use of short-circuit calculation library provides a variety of computing module configured to calculate the required network positive, negative and zero sequence network, you can choose to calculate the short-circuit type, the results will form the curve or waveform display. The main principle of short circuit calculation is to use the simulation method of symmetrical components, Thevenin circuit principle and the principle of superposition. Positive sequence network by setting to zero the power and voltage source plus a constant, the current can be measured by using the Thevenin principle calculated positive sequence reactance. Similarly, the grid can be obtained negative sequence and zero sequence reactance and a
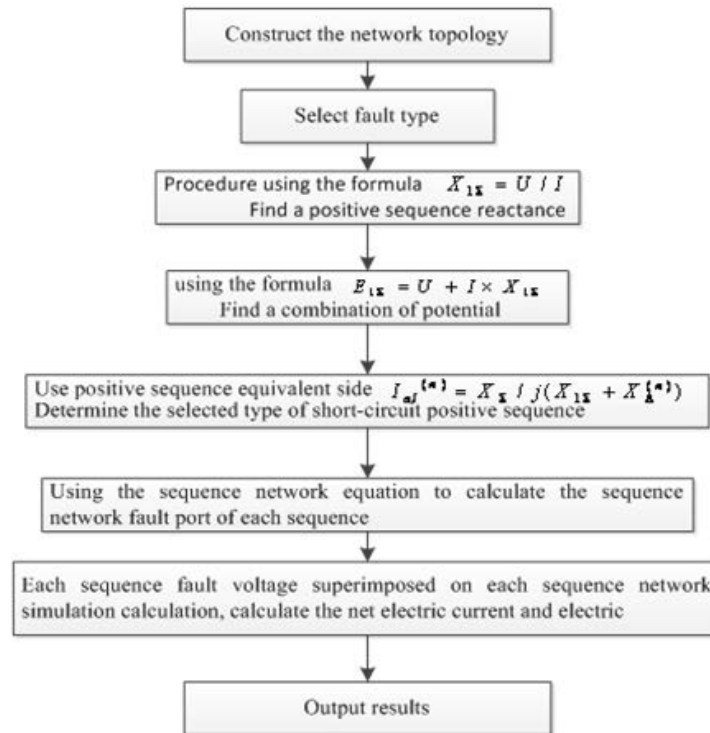
Fig. 1: Short circuit calculation flow chart

combination of potential. The process according to the selected fault types participants calculated short circuit terminal voltage of each program grid. Use the failed port voltage of each sequence grid superimposed on the point of failure, each sequence network voltage, current can be calculated. Flow chart to specific short-circuit calculation And used is as shown in Fig. 1.

**Transient simulation calculation:** Currently, the program can be used to calculate the electromagnetic transient has EMTP, PSASP and MATLAB, etc., (Chen, 2009). In PSASP, participants need to design and define the various system components and control devices in a similar way to fill in the data. Due to the lack of good graphical input interface, the participants in the use of easy to feel Kuzao boring, thus losing interest in learning. Although the EMTP provides a powerful electromagnetic transient calculation function, but because of one of the modules and algorithms lack a good opening, making it difficult for secondary development on this basis. In MATLAB, the power system model can be built directly in the SIMULINK environment, take advantage of the superiority of its powerful simulation platform and mapping environment. While more importantly, MATLAB provides a rich toolbox of resources, as well as a large number of modules that can easily take advantage of these resources to achieve a variety of complex control methods, such as fuzzy control methods. In addition, because of all the library functions MATLABM files so that users can directly edit, add, etc., while most of the library modules for users to view, modify and therefore,
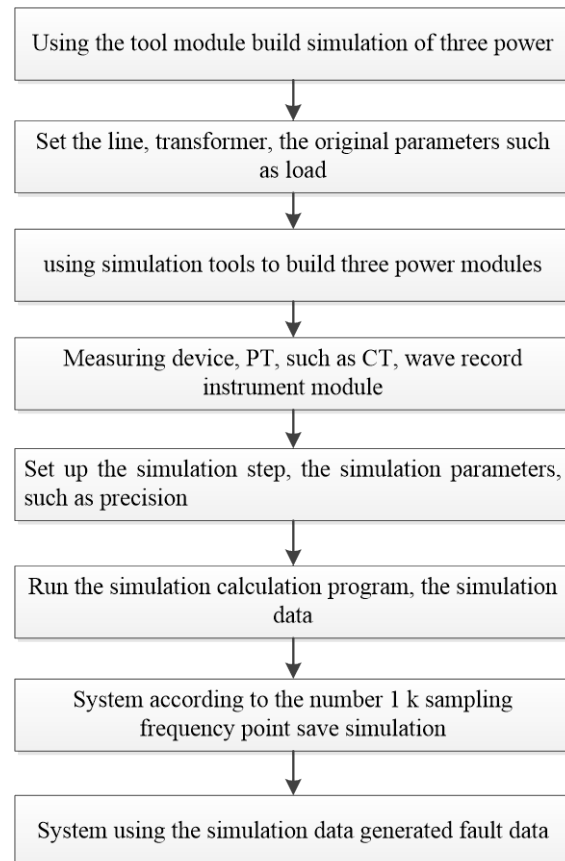


Fig. 2: Flow chart of the transient simulation

MATLAB has a good opening for this platform the secondary development. Students use MATLAB as well as the training modules provided by the system, based on the principle of the protection required for the simulation module can be designed and constructed simulation modules required to build network topology emulation. The system can be simulated line fault types: single-phase ground short circuit, two-phase short-circuit, two-phase ground short circuit, three-phase and three-phase short circuit, shorted to ground. Students can set the location of the fault occurs at any time occurrence can be set arbitrarily complex fault re-set various transitional faults and tripping circuit protection, protection grade trip and other accidents. The main work flow transient simulation shown in Fig. 2.

**Static test:** The food security information system tester device itself can be a variety of functions and various static tests, are: power direction relay test, voltage, current relay test, DC relay testing, AC operating time test, the impedance characteristics of the test, the entire set of tests, harmonic wave superposition test. Through the static test we can learn to use the tester to understand the methods of traditional relay trials.

## RESULTS AND DISCUSSION

**Dynamic test:** By using fault recorder recorded data file or the results generated by the transient simulation data generated in accordance with COMTRADE format file, use the tester's failure to reproduce the dynamic function tests. COMTRADE format is a common security information system transient data format standard IEEE proposed in 1991, it developed primarily to address a variety of digital fault recorder and a variety of computer testing device data sharing issues. According to COMTRADE standard requirements, a complete data records are usually composed of three documents, namely the header file (Header File), configuration files (Configuration File) and data files (Data File), all the files are stored in ASCII format.

**Header file (XXX. HDR):** The document is read the information recorded on the user data of the data file created. Therefore, the failure to reproduce only achieve functional point of view, the document also does not need to generate. If in order to facilitate the generated document management fault transient simulation, we can also edit the file generated by word processing software.

**Configuration file (XXX. CFG):** The file is read and interpret the data as a computer program recorded in the data file the necessary information, thus the contents of the configuration file has a fixed pre-defined format, so that the computer program can be easily read the information, but also for the storage format ASCII format.

**A data file (XXX. DAT):** The actual data file contains the data records, in accordance with the sampling order, arranged in rows to record data in each sampling time n path, including analog and digital and serial number for each sampling time in microseconds and labeled time record. Each record data length with 6 digits, the file type to ASCII format. After participants finished performing transient simulation, failure to reproduce the data generated by selecting a menu item automatically take advantage of the transient simulation results generated by the program's failure to reproduce the configuration file and the data file.

**Protection setting calculations and check the correctness of a given value:** After the use of the system to calculate the trend, short circuit calculations, transient simulation module for a particular power system simulation, combined with appropriate protective value calculation method to determine the line to protect the value in a variety of operating modes. Using a variety of fault transient simulation wave forms generated by the experimental verification value (Liu, 2007). Can be further verified by experiment with the given value of the correctness of the tuning investigated between protection is correct.

**A specific example:** Test conditions are certain lines in the system (total length 33.6 km) 3 km at the end of the first set occurred A phase single phase, in order to simplify, only put distance protection. Data generated by calculating the transient calculation, transfer data to a power amplifier, waveform playback function calls the accident tester inversion. Test results: 21 msec protection action jump fault phase, 1055 msec after fault reclosing coincide with success. Test Rating: protective action is correct, consistent data wave forms, consistent print reports and initial setup. Description of test data is correct.

## CONCLUSION

The food security information system model can be set up directly under the Simulation environment, which give full play to the superiority of its simulation platform and then using MATLAB toolbox abundant resources, can be easily controlled in a variety of complex security system simulation method, MALTLAB the calculations based on the basic circuit theory and differential equations solved above, the electromagnetic and electric mechanical processes synchronous calculation process, which makes the simulation very careful, may reflect subtle changes. Therefore, protection simulation system based on

MATLAB development platform can be built on any system simulation, after all, a new relay transient testing methods.

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