RTDS® News

Using the RTDS Simulator for the Analysis of Automatic Excitation Controllers

RTDS Celebrates 20 Years at the Top

Component Highlight: The MMC Support Unit

RTDS Technologies Celebrates 20 Years at the Top!

Since our inception in 1994, RTDS Technologies has become the industry standard for real time digital power system simulators. We can now proudly add that we have been the **world leader** in Real Time Power System Simulators for **20 years**, having celebrated our 20th anniversary on March 4, 2014.

The lead up to our 20th anniversary has been a particularly exciting time for RTDS Technologies. We have seen some phenomenal growth, achieving the sale of over 1000 racks of hardware and reaching 300 worldwide customers.

Celebrating 20 years in operation causes us to reflect on the qualities that have allowed us to remain the world leader in our field for such an extended period of time. We are committed to our customers and work to build strong relationships with them. We develop innovative hardware and software to address their simulation needs. We provide first rate technical support allowing our customers to make efficient use of the RTDS Simulator. We care about our customers and give them honest, sound advice. Our dedication to quality is second to none and it sets the standard for all of our products and services; a concept that is embraced by all of our employees. With these values at the core of RTDS Technologies, we will strive to remain the world leader for many years to come.

Using the RTDS® Simulator for the Analysis of Automatic Excitation Controllers: Development of Test Circuits
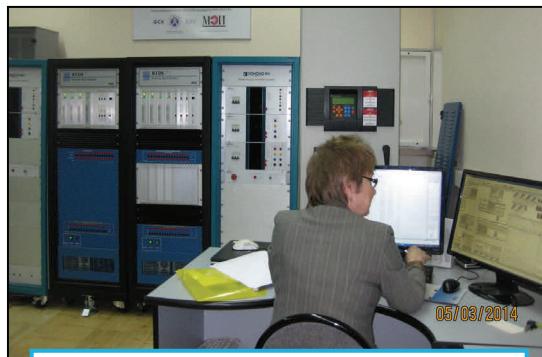
Guest Article from the Moscow Power Engineering Institute
J.L. Artsyshevsky, T.G. Klimova, National Research University "MPEI"
A.V. Zhukov, E.I. Satsuk, A.I. Rasscheplyaev, JSC "SO UPS"

The RTDS Simulation Lab at MPEI

The use of advanced digital modeling tools for technical systems and processes in power systems engineering significantly extends the capabilities of various studies. These tests ensure the stability of the operating parameters during repeated experiments, which is particularly important for the certification testing of Relay Protection and Automation (RPA). This article discusses the use of the combined hardware and software of a Real-Time Digital Simulator (RTDS) to test the operation of automatic excitation controllers for compliance with the JSC "SO UPS" standard [1].

The RSCAD software is used to create specific digital models to run on the RTDS Simulator hardware. The power systems circuit is drawn, and parameters of its elements are defined in the graphical user interface, Draft. The same editor also contains models to generate control signals as well as the circuits necessary to implement data processing algorithms. For the Automatic Excitation Controller (AEC) analysis, 6 circuit diagrams with 16 operating modes were developed as part of the Standard [1].

Control, monitoring and recording can be accomplished in RunTime to carry out all of the tests specified for certification according to the Standard [1]. Test reproduction and calculated emergency disturbances are made at the software level. Testing of synchronous generators AEC's is carried out by the simulated implementation of the following disturbances:

1) Disturbances with the following parameters:
   - A step change of the tested AEC by +5% of the rated value;
   - Single-phase short circuit (duration of 0.03s) at Bus 1;
   - A stepwise voltage change by connecting capacitance C3 to Bus 1;

2) Disturbances in accordance with the Guidelines on the stability of power systems [2] with the following parameters:
   - Duration of the short circuit is 0.12s;
   - Single-phase reclosing time is 1s;
   - Three-phase reclosing time is 2s;
   - Switch-off time of one phase caused by mis-operation of the breaker failure protection is 0.35s;

In order to connect the tested AEC to the RTDS Simulator, an interface controller was designed. This controller contains a model of thyristor converter, controlled by a standard 6 pulse output from the AEC. It also includes a circuit which converts the signal from the output of the thyristor converter into a digital signal to be connected to the RTDS Simulator.

All of the tests required by the JSC "SO UPS" Standard [1] were performed successfully using the RTDS Simulator. Being able to record and display all of the necessary parameters allows effective presentation of the results. In addition, it is possible to obtain the necessary numerical characteristics of the transient (transient time, damping constant, overshoot) by processing the results.

The RTDS Simulator provides the opportunity to model operating conditions of the generating equipment in power systems of varying complexity in order to verify the operation of the AEC. It also allows existing algorithm or programming faults in the AEC to be rectified. Using real time digital simulation, the AEC can be adjusted for a particular power generating facility.

BIBLIOGRAPHY

1. Standard of JSC "SO UPS" CTO 59012820.29.160.20.001-2012, approval date 03.04.2012. "Requirements to excitation systems and AUTOMATIC PD REGULATORS OF SYNCHRONOUS GENERATORS"
2. "Guidelines on the stability of power systems" (approved by the order of the Ministry of Energy of Russia 30.06.2003 № 277).

To read the full article, please visit our website at www.rtds.com

Component Highlight: The MMC Support Unit

RTDS Technologies' FPGA-based MMC Support Unit is now being used by 17 clients in 8 different countries worldwide. With over 130 units currently in operation, manufacturers have once again put their trust in RTDS Technologies to provide solutions for the most complex power systems applications.

Detailed testing of physical MMC converter control equipment has been successfully completed by numerous manufacturers including ABB, ALSTOM, HICO, LSIS, NR, RXPE, SIEMENS, and XJ. In addition to testing the performance of the physical controllers of a particular converter, a number of simulation studies have been performed to evaluate overall network response and control interaction with other LCC and/or MMC based systems electrically *near* the scheme in question. This is an important and challenging aspect to consider when adding new HVDC converters to existing networks that are in close proximity to other HVDC links.

The MMC Support Unit uses a well-proven representation of the converter valve which has been available in RSCAD for several years. The processor version of the MMC valve model has been used by a large number of RTDS clients since its introduction in 2009. The more recently released FPGA version was introduced to overcome the difficulties of interconnecting the physical firing pulse controls as the number of MMC sub-modules in the converter increases. With the FPGA version, the user is able to accommodate interconnection of controllers for converters with more than 500 sub-modules (levels) per converter arm or over 3000 sub-modules per HVDC terminal.

The successful application of the RTDS Simulator for modern MMC-based systems serves to reinforce that, as the undeniable world leader in real time digital simulation, RTDS Technologies is also leading the way in real time modelling of MMC-based technology.

Did you know?

RTDS Technologies recently welcome three new representatives to their team. With new representation in Chile, France and Germany, RTDS Technologies now has 24 worldwide representatives. Welcome to the team!

Please visit the Worldwide Representatives portion of the RTDS Technologies website for more details.

You can find us on:

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