



RTDS NEWS

May 2002



Putting the RTDS[®] Simulator through its paces and cooperating for new simulation developments.



Cooperating to Everyone's Benefit

It has been one year since Schweitzer Engineering Laboratories (SEL) took delivery of their RTDS Simulator. Since then it has been running non-stop! In fact, a second RTDS Simulator is now in production for SEL to serve their growing needs.

SEL uses the RTDS Simulator for several different aspects of their work -

- ❑ Protective relay design validation
- ❑ New algorithm investigation and validation
- ❑ Customer specific application testing

✓ *Protective relay design validation*

Protective relay design validation is the mainstream application for the RTDS Simulator in the relaying industry. Tests are performed to validate hardware implementation of the protection logic and algorithms, as well as the functionality of the unit. Typically, such tests are done with a single relay to rigorously verify all aspects of its operation.

Before acquiring a closed loop test system, SEL used an internally-developed playback simulator using off-line simulation and COMTRADE files. At that time, testing consisted of a multi-step process – setting up cases, generating waveforms using an off-line program, converting waveforms to

COMTRADE format, transferring files to playback system, generating open loop test waveforms, and finally manually evaluating test results.

The RTDS Simulator reduces this process to three basic steps - setting up cases, running a script file (includes testing of relays and preliminary evaluation of test results), and analyzing results. The time for set up and result analysis is reduced by about 50% when using the RTDS, but the real saving is in the time used to actually test the relay. For a quarter second shot (0.25 sec. simulation time), the playback system required 1½-2 min. for the COMTRADE file to be downloaded, the waveforms to be played back and for the results to be uploaded to the host computer. The same process on the RTDS Simulator is completed in 5-10 seconds, reducing the time required to perform the tests by approximately 10-12 times. This reduces typical test runs from days to hours. The time saved allows SEL to bring new products to the market quicker, while maintaining and enhancing a complete test program.

✓ *New algorithm investigation and validation*

New algorithm investigation and validation is part of the process of developing new relaying techniques. Since they do not exist from the outset as part of a physical relay, some or all of the logic and algorithms are simulated in software. Traditionally, programs such as MATLAB and MathCAD have



been used to represent the new equations. In this case, the power system waveforms from the RTDS (or another source) are saved as COMTRADE files and "played back" to MATLAB in non-real time. However, even with the increased simulation speed provided by the RTDS Simulator, the overall procedure is time consuming. Furthermore in this mode of testing, the relaying algorithms are not able to interact with the power system in closed loop (i.e. the simulation is only valid until a trip signal is issued).

To make this process more efficient and to allow full closed loop interaction, SEL has started using the RTDS Simulator to simulate the relaying algorithms and logic as well as the power system. With this method, SEL engineers are able to fully test the relaying algorithms under "service-like" conditions without having to create a hardware implementation. Only after the algorithms have been fully tested will the physical device be designed and built.

Although controls components that interact with the simulated power system have been available on the RTDS Simulator for a number of years, SEL and RTDS Technologies have been cooperating to make the library more complete for the implementation of relaying algorithms. The cooperation has already resulted in a number of new components and features such as:

- New digital filters components
- Clock triggered control components
- Complex number format and wires
- Complex math functions

✓ *Customer specific application tests*

Customer specific application testing is a service provided by SEL to their customers. It includes testing of protection panels, schemes or individual relays under realistic power system conditions.

An increasing number of requests from customers for testing services have prompted SEL to purchase a second RTDS Simulator.

The ongoing cooperation between SEL and RTDS Technologies is not only beneficial to our two companies, but also to all RTDS customers. The new features and components resulting from the cooperation are made available to everyone on maintenance and enhance the capabilities of the RTDS Simulator in general.

RTDS Technologies would like to thank SEL for their assistance in putting this article together.

We Welcome Your Feedback

Are there new features or components you would like to see made available for the RTDS Simulator?



Did you know ...

... **the FDAC is now available.** This Analogue Output Card provides 6 optically isolated 16 bit d/a channels. It is an alternative to the ODAC providing more channels per card and the ease of connecting to the 3PC via a fiber optic cable rather than a ribbon cable.

... **the DOPTO is now available.** This Digital Input and Output Card provides optical isolation for 24 digital input channels and 24 digital output channels. The DOPTO slides into a card slot, has rail mounted terminal blocks, and can be used with a MUX card. As a more convenient alternative to MUX card connections, the DOPTO can also be connected directly to the C processor of a 3PC via link port. The DOPTO can then pass signals to a 3PC where they can be digitally multiplexed using controls components.

... **multiplexing can be done with the controls compiler rather than changing MUX card connections.** All the channels from the front (low voltage digital interface) panel can be passed to one control processor and multiplexed using software.

... **a new generator model is available which includes the unit transformer therefore saving nodes!**

... **RTDS Technologies is developing a new graphical user interface called RSCAD.** RSCAD is Java based and will have the same look and feel as PSCAD, but will include a number of new features, such as single line diagram mode and case initialization (load flow). Look for more about RSCAD in our next RTDS News.

Upcoming Events

IEEE/PES Summer Meeting

Hospitality Suite July 21 to 25, 2002 in Chicago, USA



CIGRE 2002

Exhibition August 22 to 29, 2002 in Paris, France



ELECTRIMACS 2002

Exhibition August 18 to 21, 2002, Montreal, Canada

