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Application Note

DECS-250E: A Cost Effective Solution for Aging Three-SCR SSEs

Small, statically excited generators that were originally commissioned in the 1970-1990's normally used analog voltage regulators and numerous supporting devices located within the equipment cubicle and on the cubicle door. The static voltage regulator power stage typically used in these systems was a three-SCR rectifier bridge. Usually, the ac power source for this type of rectifier bridge was provided by a power potential transformer (PPT) that was connected to the generator output. The Basler Electric SSE Shunt Static Exciter (Figure 1) was used in these applications. The SSE was introduced in the early 1970's and its reliability made it extremely popular for several decades.

Figure 1. Basler Electric SSE Cubicle

As these analog static exciters age, system performance can degrade and components can potentially fail, requiring troubleshooting and repairs. Because of the number of additional supporting devices in these systems, the interconnections can be quite complex and increase the difficulty and time involved in troubleshooting. With the passage of time and the movement toward digital technology, components in these analog exciters become obsolete and more difficult to obtain for repairs. These difficulties can lead an operator to investigate options for a new excitation system retrofit or replacement.

When exploring options for retrofit or complete replacement of a Basler SSE system, the DECS-250E Digital Excitation System (Figure 2) emerges as the superior solution. The integrated design of the DECS-250E houses an advanced digital voltage regulator and a three-SCR power rectifier bridge in a compact enclosure. Three power rectifier bridge options provide a current rating of 50 Adc, 100 Adc, or 200 Adc. These power rectifier bridge options cover the majority of the output range of the SSE's three-SCR rectifier bridges which ranged from 36 Adc to 200 Adc and 63 Vdc to 250 Vdc. Higher current rated SSE's were also provided, but the DECS-250E is not compatible for these applications. Contact Basler Electric for available options.

Figure 2. DECS-250E

When replacing an SSE with the DECS-250E, both the SSE control chassis and SSE rectifier chassis can be removed, along with all other nonessential components. These components may include certain control relays, excitation limiters, motor-operated potentiometers or reference adjusters, VAR/power factor controllers, or loss-of-field relays. In exchange, the DECS-250E can be mounted on the back panel of the cubicle with new mounting provisions. See Figure 3. In addition, a

Figure 3. DECS-250E Mounted in an Enclosure

new cubicle door may be more appropriate to address unneeded equipment that was originally located there. The DECS-250E utilizes proven technology consistent with other Basler products. A wide variety of integrated features and functions dramatically surpass what was offered in the SSE. Below is a partial list of the features and functions the DECS-250E provides.

Control Functions

- Automatic voltage regulation
- Field current regulation
- Field voltage regulation
- Var/power factor control
- Automatic setpoint tracking in all regulation modes to ensure "bumpless" transfers
- External setpoint tracking for redundant applications
- Integrated dynamic system analyzer for generator and excitation system frequency response testing
- Soft start
- Real-time monitoring (chart recorder)
- Oscillography
- Sequence of events recording
- Trending

Protection Functions and Limiters

- Overexcitation protection/limiting
- Generator overvoltage protection/limiting
- Generator undervoltage protection/limiting
- Loss of sensing protection
- Loss of excitation protection
- Field overcurrent protection
- Field overvoltage protection
- Rectifier bridge overtemperature/pole slip protection

Communication

- RS-232 for external setpoint tracking
- CAN bus
- RS-485 with Modbus® RTU
- Ethernet 100Base-T
- Optional PROFIBUS

Table 1 illustrates the capabilities advantage of the digital-technology DECS-250E over the analog-technology SSE.

Model:	DECS-250E	SSE
Features		
Paralleling Provisions	Yes	Yes
V/Hz Limiting	Yes	Yes
Power Factor Control	Yes	No*
Var Control	Yes	No*
Internal Autotracking	Yes	No
External Autotracking	Yes	No
Overexcitation Limiting (OEL) Online and Offline	Yes	No*
Stator Current Limiter (SCL)	Yes	No
Underexcitation Limiter (UEL)	5 Point Plottable	No*
Var Limiter	Yes	No
Manual Excitation Control	FCR & FVR	Yes
Automatic Synchronizing	Optional	No*
IRIG-B for Time Synchronization	Yes	No
Generator Protection		
Loss of Sensing	Yes	No*
Generator Overvoltage	Yes	No*
Generator Undervoltage	Yes	No*
Generator Overfrequency	Yes	No*
Generator Underfrequency	Yes	No*
Generator Reverse Power	Yes	No*
Generator Reverse Vars	Yes	No*
Sync-Check	Yes	No*
Field Overvoltage	Yes	No*
Field Overcurrent	Yes	No*
Overexcitation (V/Hz)	Yes	No*
Specifications		
Sensing Input Range	90-660Vac	108-660Vac
Sensing Inputs	Gen and Bus	Gen
Single-Phase and Three-Phase	Gen 3 ph & Bus 3 ph	Gen 1 & 3 ph
Paralleling CT Input	1A or 5A	5A
CT Inputs	4	1
Regulation Accuracy	0.25%	0.50%
Power Input Voltage	72-352Vac	80-320V
Contact Inputs	12	0
Contact Outputs	9	0
PC Software		
Auto Tuning	Yes	No
Integrated Programmable Logic Controller	Yes	No
Real Time Monitor	Yes	No
Oscillography	Yes	No
Sequence of Events Recording	Yes	No
Communications		
USB	Yes	No
CAN Bus Communication	Yes	No
RS-485 Communication	Yes	No
Ethernet Communication with Modbus TCP	Yes	No

** Available as an external device.*

Table 1. SSE and DECS-250E Capabilities Comparison

An additional benefit to upgrading from an SSE to the DECS-250E is realized in BESTCOMS*Plus*®. This PC software connects with the DECS-250E and enables access to all DECS-250E settings along with features such as auto tuning, oscillography, real-time monitoring, and BESTlogic™*Plus*.

The auto tuning feature of BESTCOMS*Plus* uses a proprietary algorithm to perform step response testing and determine preliminary gain values for the application.

The DECS-250E is optionally equipped with an Automatic Synchronizing function. The Auto Sync monitors the frequency of the generator and the frequency of the bus and provides raise/lower commands via relay contacts to the governor. When the two are in sync, the DECS-250E sends a signal to close the breaker connecting the generator with the bus.

An integrated oscillography function records up to six parameters using the COMTRADE file format. Oscillography records are stored in nonvolatile memory and are retained even when DECS-250E control power is lost.

The real-time monitor (Figure 4) records live system data without the need for external recording equipment. Simultaneous measurement of up to six variables within the DECS-250E can be performed with the ability to adjust the resolution as needed.

BESTlogic*Plus* (Figure 5) is used to program all DECS-250E contact inputs and outputs. Intuitive logic schemes provide simple and flexible programming of DECS-250E functions.

As with the SSE, the DECS-250E is also compatible with statically excited synchronous motors and generators up to 200 Adc continuous.

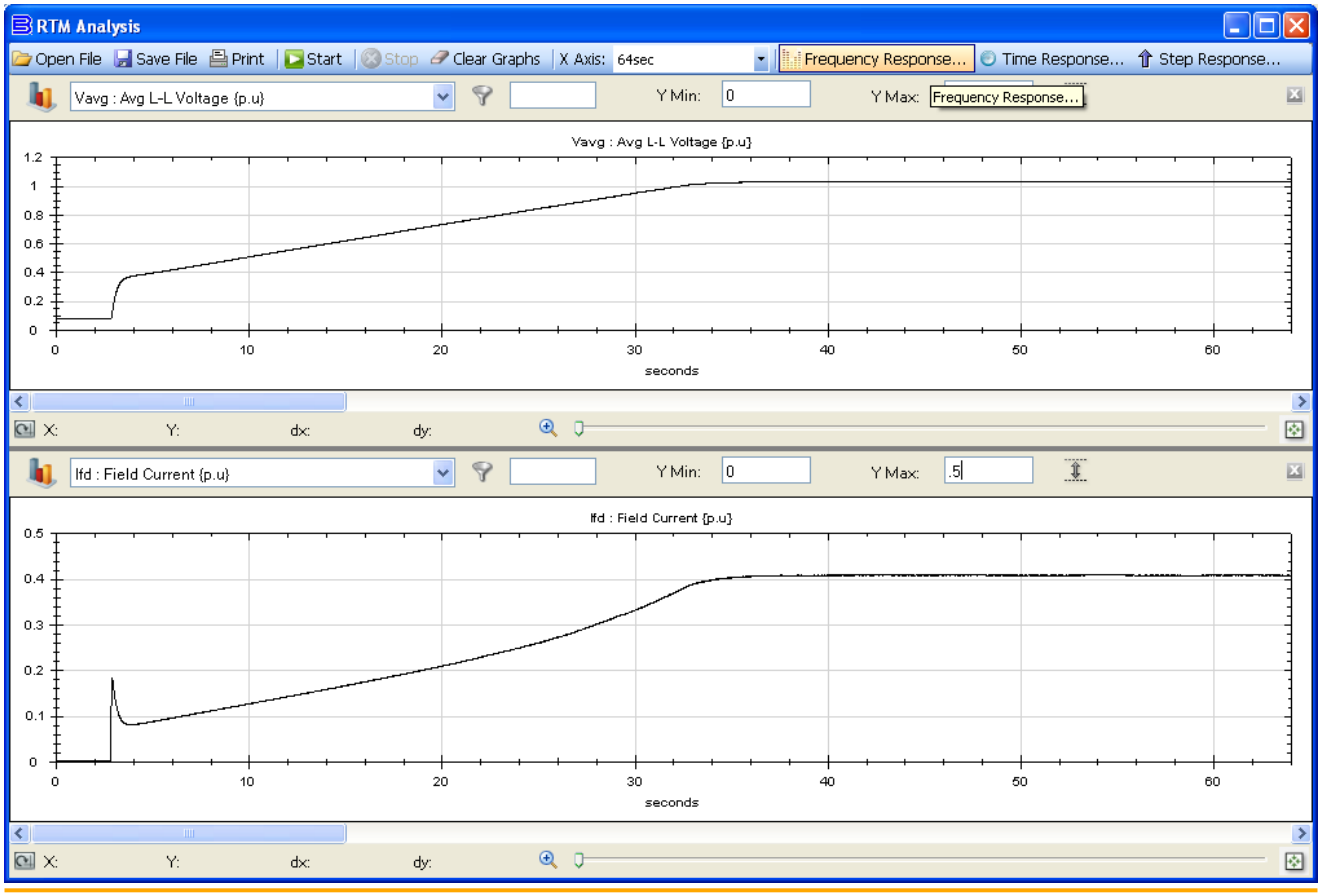

Figure 4. Real Time Monitoring Screen

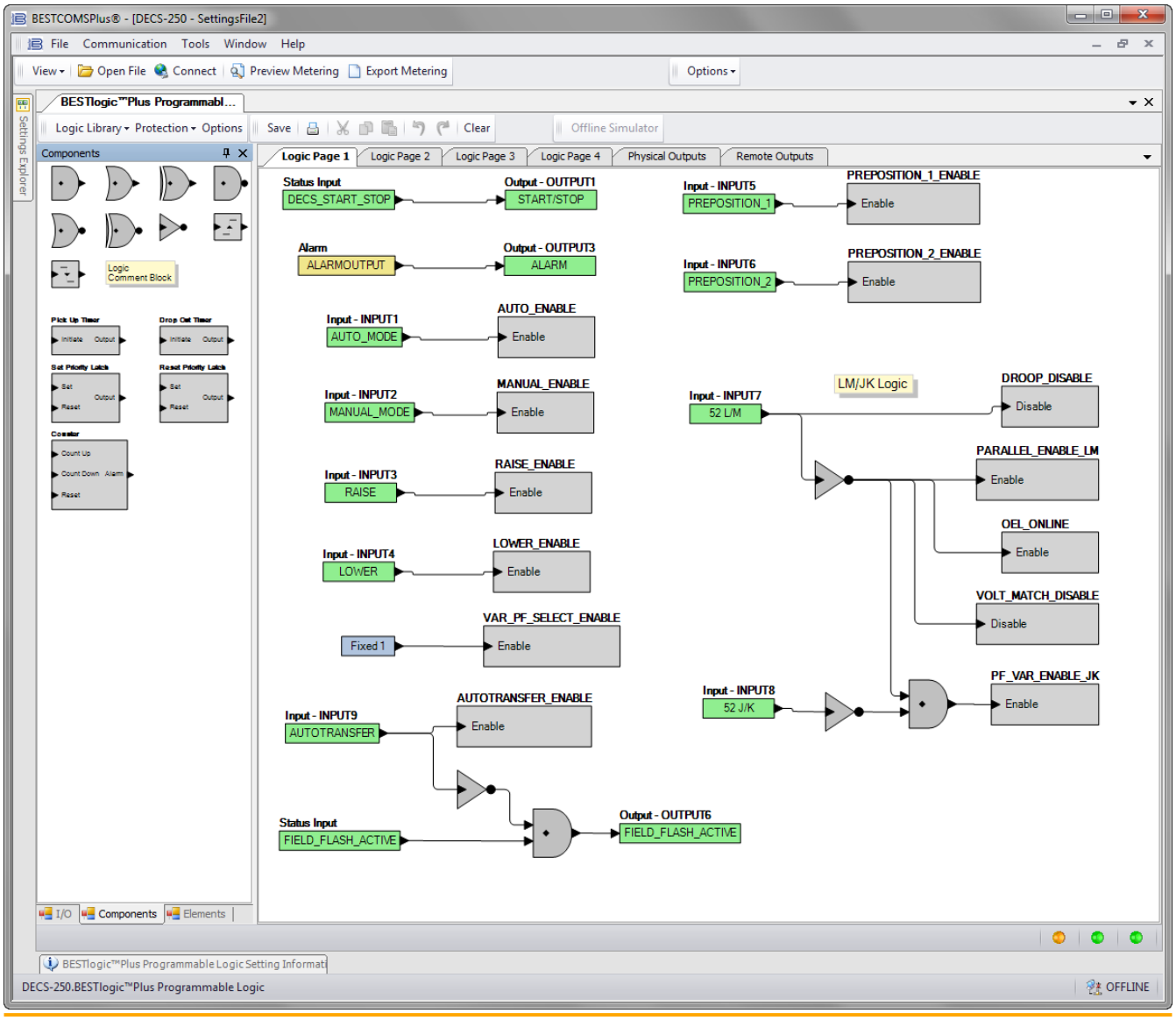

Figure 5. BESTlogic™*Plus* Screen

For more information

Basler Electric has a cost effective solution for aging three-SCR SSEs. The DECS-250E comes fully loaded and ready for use in a compact enclosure.

For more information about DECS-250E, including product bulletin and instruction manual, visit www.basler.com, contact your Application Engineer, or contact Technical Support at +1 618.654.2341.

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