

Application Note

16 Reasons to Replace Rotating Exciters with Digital Static Exciters

Replacing rotating exciters with static exciters makes good economic sense. How many reasons can you think of to justify replacement of your rotating exciter?



DECS-2100 - exciter control system for main field applications

1. Your updated generators require more field excitation than the existing rotating exciter can provide.
2. Your rotating exciter has shorted windings.
3. Increased maintenance is affecting the reliability of your GE Amplidyne, Westinghouse Rototrol, or Allis Chalmers Regulex and pilot exciters.
4. Carbon dust from commutator brush wear is causing stator overheating.
5. You have safety concerns about asbestos insulation in rotary exciters.
6. You are experiencing belt problems associated with separately connected rotating exciters.
7. You have commutator problems such as sparking or dielectric breakdown caused by carbon dust between the commutator segments.
8. Your commutators are worn and require replacement.
9. Your commutator brushes need frequent maintenance, or they are difficult to maintain properly.
10. You can't find parts for obsolete electromechanical voltage regulators and associated devices.
11. DC field breakers are causing operating problems, and replacement is expensive, with long delivery times.
12. You want to interface your exciter with automated supervisory controls to streamline your unit startup sequence and automatic synchronizing procedures.
13. You need fast system voltage response to improve relay coordination time and to avoid nuisance tripping.
14. You want to increase your operating efficiency and increase unit output by reducing the energy used for excitation.

15. You don't have enough trained maintenance personnel to maintain your old rotating/electromechanical excitation system.
16. You need the data recording capability and software tools available with digital exciter/regulators to simplify troubleshooting and to perform the periodic generator response testing required for NERC certification.

Plus, for steam and gas turbines:

1. You can reduce alignment time on multiple bearing machines. For example, replacing the rotating exciter with a static system eliminates two bearings on a cylindrical rotor shaft.
2. You can eliminate the bearing wear caused by direct-mounted rotating exciter vibration.
3. You can eliminate the operating problems often associated with speed reduction gears used to drive rotating exciters.

Replacement of the Pilot Exciter and/or Voltage Regulator Only

It may not be necessary to replace the rotating exciter to eliminate operating problems with older equipment. If the pilot exciter or voltage regulator is the focus of concern, both can be replaced with a new digital voltage regulator system.

Features for Better Generator System Control

Digital excitation control provides significant improvements in generator performance, including improved transient and dynamic stability. Modern digital controllers also incorporate a range of features and functions that makes it possible to achieve a higher level of control of the generator system.

These features apply to all new digital voltage regulator and main field exciter systems.

Today's new excitation systems provide all the functions required to control and regulate the generator output voltage. The separate functional devices included in older analog systems, such as motor operated potentiometers, limiters and many protective devices, are digitally integrated into a central controller, making it easy to enable or disable functions, to adjust settings, to monitor performance, and troubleshoot the system.

(please see reverse)

These include:

1. Both Off-line and On-line over excitation limiters. Off line OELs prevent generator overvoltage before synchronization by limiting the field current. The online OEL protects the field winding from thermal overload.
2. Autotracking facilitates safe transfers between the automatic voltage regulator, manual control, and redundant controllers, where applicable, without operator intervention.
3. Voltage matching can be software-enabled to automatically match the generator voltage to the bus voltage while compensating for bus and generator PT mismatch.
4. New digital controllers have programmable generator voltage soft start to build voltage to rated output in a preset time without voltage overshoot operating in auto, eliminating the need to start up in manual.
5. Modern digital controllers incorporate Under-Excitation Limiters (UEL) that are ready for operation immediately after entering five points from the generator capability curve into the settings file. The UEL replaces the underexcited reactive ampere limiter (URAL) in many old analog voltage regulators, which required painstaking efforts to set several potentiometers to achieve the correct circular characteristic for a specific machine.
6. New digital controllers are available with a two quadrant control rectifier to provide both positive and negative field forcing for enhanced generator performance.
7. Modern digital controllers include internal loss of sensing protection to facilitate an automatic transfer to manual control if sensing voltage is lost for reliable, uninterrupted operation of the generator in critical situations.
8. Digital control systems allow the operator to select from multiple operating modes, depending on operating conditions: voltage regulation, VAR regulation, power factor regulation, field current regulation (FCR), or field voltage regulation (FVR).
9. Digital control systems incorporate generator protection and annunciation functions for critical parameters, including microprocessor watchdog timer, field over- voltage, field overcurrent, generator overvoltage, generator undervoltage, loss of field, and rotor field temperature.
10. For critical applications, digital systems can be supplied with a redundant controller to keep the system operating in the event of a fault of the primary controller. The redundant controller tracks the primary controller and provides 100% backup to the manual regulator, limiters, and protective functions.
11. Modern digital systems can provide better than $\pm 0.1\%$ voltage regulation accuracy.
12. Digital controllers provide a HMI (Human Machine Interface) panel for touch control and system monitoring/generator metering.
13. Digital controllers incorporate a Volts per Hertz Ratio limiter/regulator to prevent damage to the generator or to other magnetic devices on the generator bus during startup.

14. Digital controllers include provisions for reactive droop compensation or line drop compensation for operational flexibility as well as network reactive load sharing for multiple generators on a common bus connected to a utility interconnection.



DECS-450 Cubicle - dual voltage regulator exciter

15. Digital controllers include provisions for digital communication via a USB port or Ethernet for commissioning. BESTCOMSPUs® (DECS-450, DECS-250) operating software is used for setup and calibration of the exciter. A RS-485 or RJ-45 Ethernet port (both Modbus®) is provided for remote control and monitoring of the system. BESTspace™ is provided with BESTCOMSPUs for default commissioning monitoring screens to speed startup.
16. Oscillography and sequence of events reports provide time stamped records of events and facilitate downloading critical machine and system parameters to help analyze system problems.
17. Digital controllers provide fast transient performance for improved voltage response to system disturbances.
18. Digital controllers include provisions for dual PID setting groups to optimize performance with or without a power system stabilizer.
19. Integrated Power System Stabilizer (PSS2A), Type: Integral of Accelerating Power with two setting groups.
20. Dynamic System Analyzer for use to perform generator frequency response, includes a Phase Plot Compensator for assisting power system stabilizer tuning evaluation of the Lead/Lag filters.
21. Real Time Chart Recorder via BESTCOMSPUs® and BESTCOMSPUs Pro operating software depending upon product selection.
22. Auto Tuning to quickly determine voltage regulator gains.
23. Auto Synchronizing (Device 25A) option.

Today's newer digital excitation systems improve generator performance, reduce maintenance costs, raise operator efficiency, and streamline operator interface with all of the integrated features now available to users. Go online now to www.basler.com and contact one of our regional application specialists for assistance in optimizing your next digital upgrade solution.