

Excitation Control For BEL Power Lab Generator

Team *Three Phase*:

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Project Needs

- A static exciter
- Exciter should support a continuous operating mode
- Exciter should be capable of fast field forcing
- Fast field forcing should be held for a period of 3 to 4 seconds

Background

An exciter is a hardware control system that:

- Measures a generator's AC output
- Uses measurements and control logic to correct the AC output to desired ratings
 - Done by adjusting generator's field current
- Has no moving parts (property of static exciter)
- Uses controlled switches to convert $3\phi V_{AC}$ to an output in V_{DC}
- Switches can be IGBT, MOSFETS, Thyristors or Diodes.
- A DC/DC converter can be used on the exciter

Deliverables

- An exciter
- Any test procedures with their results
- A manual
 - Operating procedures
 - Startup Procedures
 - Tutorial on the commissioning software
- Demonstrate a fault correction test to our client

Design Options

- Build
 - To design all components and connect them to meet the clients needs
- Assemble
 - To purchase all components and assemble into a product that meets the clients needs
- Buy
 - To purchase a product that meets the clients needs

Specifications

The specifications in this table must be met in order to satisfy the clients needs.

Output	$< 6 A_{DC}$ $< 70 V_{DC}$
Input	$\approx 220 V_{AC}$ Nominal
VR Accuracy	$\pm 0.50\%$
Dimensions	18" x 27" x 32"
Short Term Overload	$< 300 V_{DC}$ $< 24 A_{DC}$ 3 to 4 seconds
Interface	HMI, USB, Ethernet
Operating Temperature	$\approx 25^{\circ}C$
Commissioning Software	Must be included

Decisions Made

- Chose the “Buy” option
- Identified important specifications
- Must be upgradable with Power system stabilizer option

Product Options

- Basler DECS – 200
- Basler DECS – 250
- Basler DECS – 250N
- ABB Unitrol – 1020



Basler DECS-200

Output	$< 15 A_{DC}$ $< 125 V_{DC}$
Input	$56-277 V_{AC}$
VR Accuracy	$\pm 0.25\%$
Dimensions	8.08" x 7.32" x 12"
Short Term Overload	$< 300 V_{DC}$ $< 30 A_{DC}$ 10 seconds
Interface	RS232, RS485 Modbus, HMI
Operating Temperature	- 40°C to 60°C
Commissioning Software	BESTCOMSPlus PC Software



Basler DECS-250



Output	< 15 A _{DC} <125 V _{DC}
Input	56-277 V _{AC}
VR Accuracy	± 0.25%
Dimensions	8.08" x 8.62" x 12"
Short Term Overload	< 300 V _{DC} < 30 A _{DC} 10 seconds
Interface	RS232, RS485 Modbus, HMI, USB, Ethernet
Operating Temperature	- 40°C to 60°C
Commissioning Software	BESTCOMSPlus PC Software

Basler DECS-250N

Output	$< 20 A_{DC}$ $< 125 V_{DC}$
Input	$100-528 V_{AC}$
VR Accuracy	$\pm 0.25\%$
Dimensions	6.26" x 12" x 8.62"
Short Term Overload	$< 40 A_{DC}$ 10 seconds $< 30 A_{DC}$ 120 seconds
Interface	RS232, RS485 Modbus, HMI, USB, Ethernet
Operating Temperature	- 40°C to 70°C
Commissioning Software	BESTCOMSPlus PC Software



ABB Unitrol - 1020

Output	Up to 20 A _{DC}
Input	9 to 300 V _{AC}
VR Accuracy	± 0.10%
Dimensions	6.69" x 11.89"x 6.69"
Short Term Overload	< 30 A _{DC} 10 seconds
Interface	RS485, CAN bus, HMI, Ethernet
Operating Temperature	- 40°C to 70°C
Commissioning Software	CMT1000 PC Software



Additional Options

- Power System Stabilizer
 - Provides supplementary damping for low-frequency, local-mode oscillations and power system oscillations
- Autotracking
 - A second exciter can provide backup excitation control
- Synchronizer
 - Acts to align the voltage, phase angle, and frequency of the generator with the bus

Projected Costs

Product	Cost
Exciter	\$4,500.00 to \$5,800.00
Poster	\$40.00
Cart	\$89.35
Cable	\$30.00
Banana Plugs	\$16.00
Budget Remaining	\$24.00 to \$1,324.00

Tentative Deadlines

November	
Purchase Exciter	21

December	
Snapshot II	05

January	
Connect Exciter	02

February	
Commission Exciter	02

March	
Test for requirements	02
Snapshot III	11

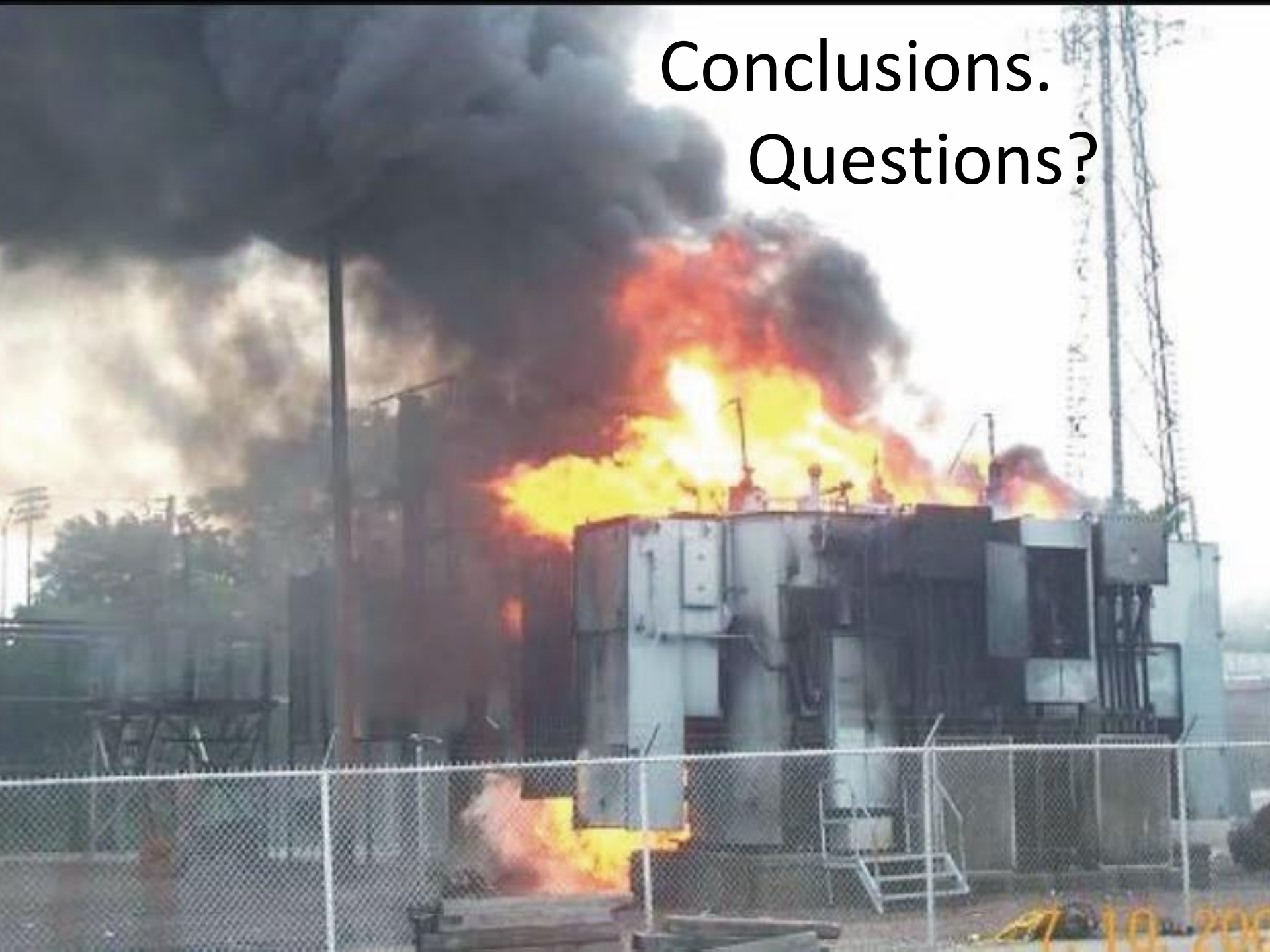
April	
Test for failure	02
Write test procedures	17

May	
Write User Manual	01
Engineering Design Expo	02

Potential Problems

Problem	Solution
Unitrol 1020 doesn't get donated	Go to bid process
Learning curve for commissioning software	Make connections with the company's technical support
Damage the exciter	Research warranty

Conclusions.
Questions?



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