Wind Power Plants

Double-Fed Induction Generator (DFIG)

This equipment set is designed for investigating modern wind power plants incorporating double-fed induction generators. The wind can be emulated realistically by means of a servo machine test stand and WindSim software. A PC can be connected for convenient operation and visualisation during the experiments. The associated multimedia course titled "Interactive Lab Assistant" imparts theory besides supporting experiment procedures and evaluation of measurement data.

Sample experiment "Wind power plant" EWG 1

Training contents

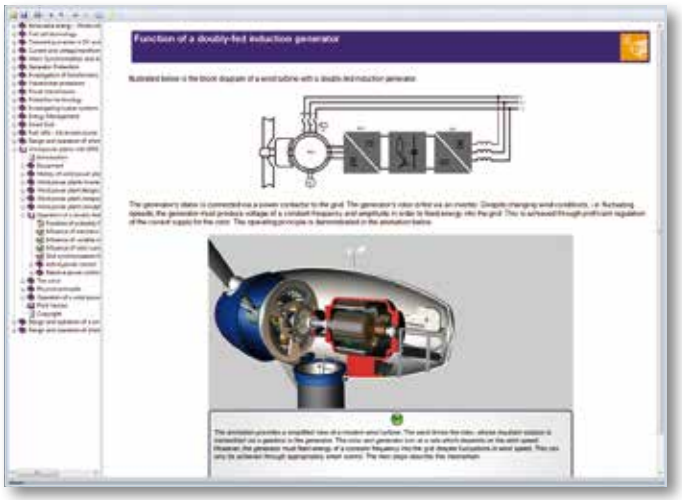
- Understanding the design and operation of modern wind power plants
- Exploring physical fundamentals from "wind to shaft"
- Learning about different wind power plant concepts
- Setting up and operating a double-fed asynchronous wind generator
- Operating the generator at varying wind force levels as well as adjustable output voltages and frequencies
- Determining optimum operating points under changing wind conditions
- Investigating responses to "fault ride-through" grid mal-functions

Wind Power Plants

Fresh Wind in the Laboratory

Interactive Lab Assistant

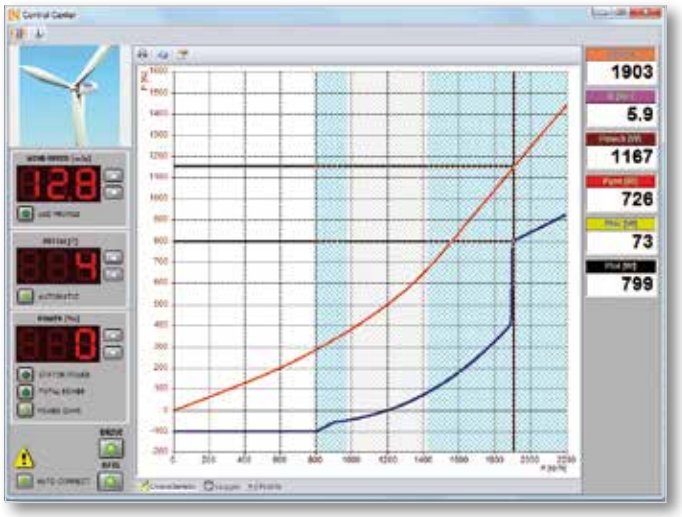
- Step-by-step instructions in multimedia format
- Explanation of physical principles using easily comprehensible animations
- Quiz and assessment tools for testing progress made during the course
- PC-supported evaluation of measurement data
- The following virtual instruments can be be started directly from the experiment instruction pages: Control Centre, DFIG Control, Synchroniser, Power Control, Status Control, Speed Control, FRT Monitor, Vector View, Oscilloscope and other measuring instruments

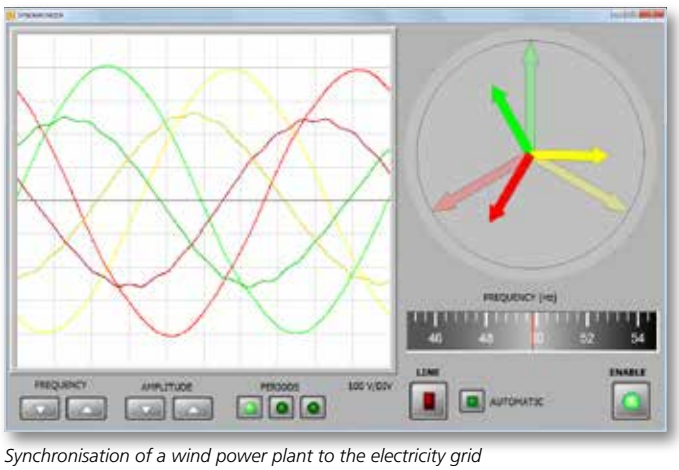


Wind emulator

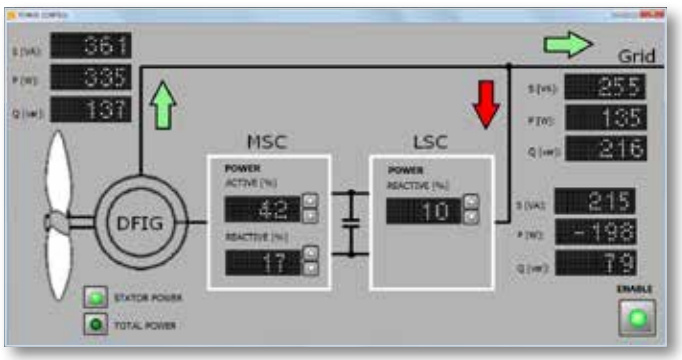
Wind and airfoil geometry serve to drive the generators at a real wind power plant. In the laboratory, this task is performed instead with the help of a servo machine test stand and WindSim software. This permits precise laboratory simulation of conditions prevailing at a real wind power plant.

- Realistic emulation of wind and airfoil geometry
- Speed and torque are matched automatically to wind strength and pitch
- Independently adjustable pitch and wind strength
- Wind profiles can be specified
- Mechanical and electrical variables can be recorded





Synchronisation of a wind power plant to the electricity grid



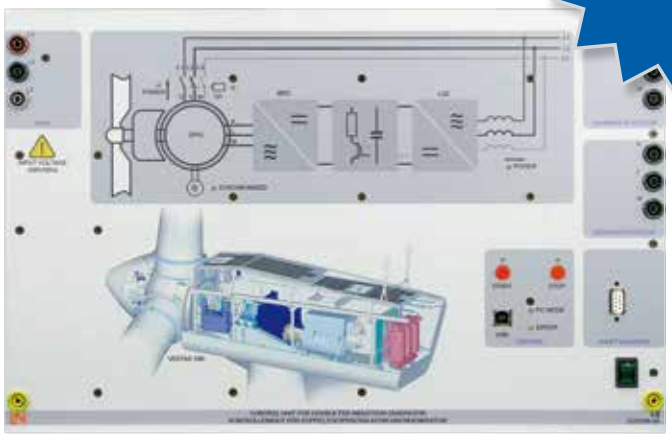
Power distribution and control of reactive power

Double-fed induction generator with control unit

- Control unit with two controlled inverters
- Generator control in sub-synchronous and super-synchronous modes
- Integrated power switch for connecting the generator to the network
- Automatic control of active and apparent power, frequency and voltage
- Manual and automatic synchronisation
- Measurement and display of all system variables
- Experiments on fault ride-through

"Double-fed induction generator"

"Fault ride-through"



"Control unit for double-fed induction generator"

Your benefits

- Theoretical knowledge and practical know-how are conveyed using the Interactive Lab Assistant
- Wind power and mechanical design of wind power plants can be emulated accurately and in detail using the servo machine test stand
- The microcontroller-operated control unit for the double-fed induction generator permits user-friendly operation and visualisation during experimentation
- State-of-the-art technology incorporating "Fault ride-through"
- Integration into energy technology systems

Small Wind Power Plants

Decentralised Electricity Supply

Small wind power plants with outputs ranging up to 5 kW are deployed today for decentralised electricity supply. These plants generate direct voltages. The energy can be stored in batteries via charge controllers. Inverters produce alternating voltages to supply electrical consumers in the grid.
The effects of wind power and the mechanical design of wind power plants can be emulated down to the last detail using the servo machine test stand and the WindSim software.

Sample experiment "Small wind power plant" EWG 2

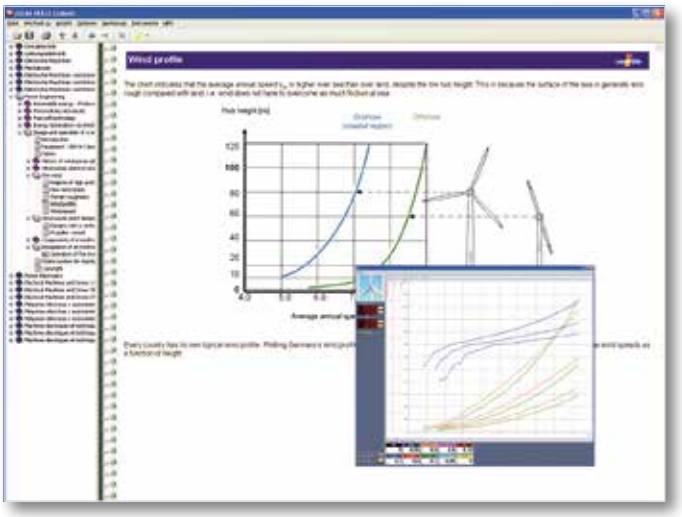
Training contents

- Understanding the design and operation of small, modern wind power plants
- Exploring physical fundamentals from "wind to shaft"
- Learning about different wind power plant concepts
- Setting up and operating a small wind power generator
- Operation at varying wind forces in storage mode
- Energy storage
- System optimisation
- Setting up an off-grid system for generating 230-V alternating voltage
- Investigating hybrid systems for autonomous power supply using wind power and photovoltaic systems

Convincing Product Characteristics

Interactive Lab Assistant

- Step-by-step instructions in multimedia format
- Explanation of physical principles using easily comprehensible animations
- Quiz and assessment tools for testing progress made during the course
- PC-supported evaluation of measurement data
- Virtual measuring instruments can be started directly from the experiment manual



Synchronous generator

- Wind power and mechanical design of wind power plants can be emulated accurately and in detail using the servo machine test stand
- The laboratory generator's response is identical to that of one forming part of a real system
- The small wind power plant is suitable for outdoor operation

Your benefits

- Theoretical knowledge and practical know-how are conveyed using the Interactive Lab Assistant
- Wind power and mechanical design of wind power plants can be emulated accurately and in detail using the servo machine test stand
- The laboratory generator's response is identical to that of one forming part of a real system
- The realistic, small wind power plant is suitable for outdoor operation and includes an integrable mast set