

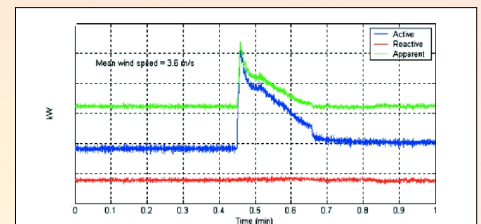
POWER QUALITY EVALUATION OF GRID-CONNECTED WIND TURBINES

Most wind energy applications concern grid connected wind turbines feeding all the energy produced into a big electricity network. For grid connected wind turbines the term "**Power Quality**" describes all characteristics of the power produced by a wind turbine that may have an effect on the stability of the network or may influence other neighbouring consumers. The most important parameters of power quality for a wind turbine are voltage drops, flicker, and harmonic distortions. **Voltage drops** occur when switching on an asynchronous wind turbine generator. The term "**flicker**" applies to low frequency voltage variations due to turbulent or stochastic aerodynamic torque variations on the wind turbine rotor. Flicker may be responsible for annoying fluctuations of the intensity of light produced by light bulbs in neighbouring areas. **Harmonic distortions** are seen only in variable speed wind turbines, where the inverters used produce non-perfectly sinusoidal current waveforms.



The Laboratory for Wind Turbine Testing (LWTT) of CRES performs complete power quality evaluation for any size and type of wind turbine. THALIS, an integrated power quality measurement system developed by CRES in co-operation with SYMMETRON Electronics, can perform all power quality related measurements required by **IEC standards and MEASNET procedures**. Special features:

- Unattended operation enabled by capture matrix triggering of data storage
- Easy and quick installation
- Simultaneous measurements of three voltages and currents along with reference wind speed-direction.
- On-site calculation of harmonics and flicker for preliminary Assessment



Power quality analysis of wind turbines installed in **weak grids** is also an area where CRES has acquired considerable experience through recent research and development projects in small isolated grids of the Greek Islands. LWTT has issued several power quality test reports for type certification purposes of wind turbine prototypes.

LWTT is accredited by the **DAP** (Deutsches Akkreditierungssystem Pruefwesen) according to **DIN-EN ISO/IEC 17025:2000**. The accreditation scope includes Power Quality measurements of grid connected wind turbines.

