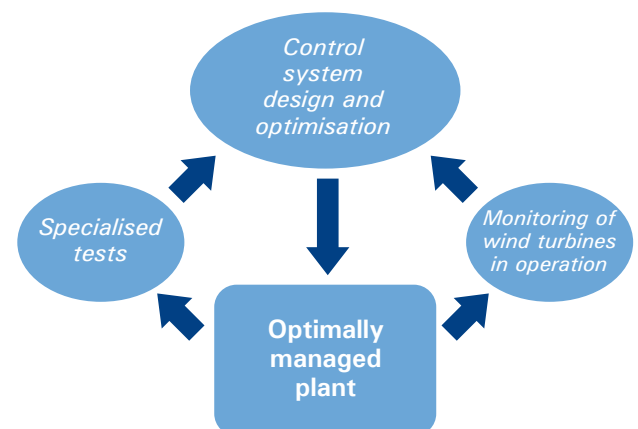
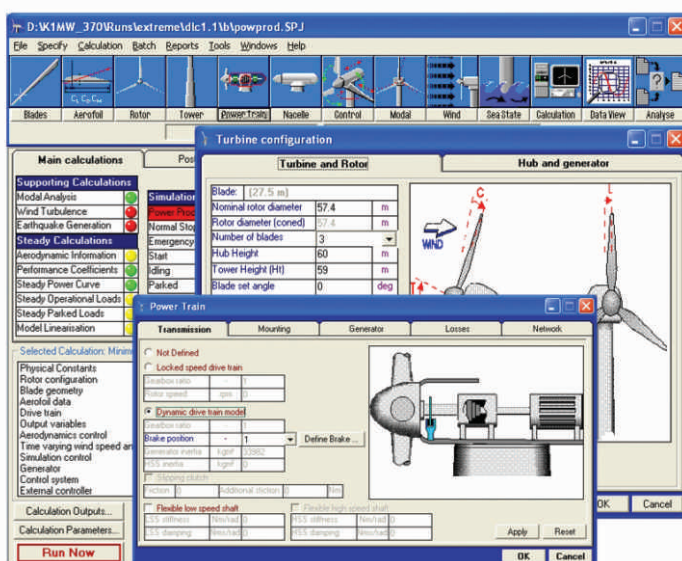


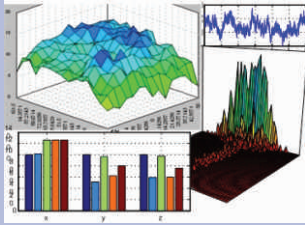
Wind energy expert services

Construction of wind power plants is a demanding task, but it is far more demanding to ensure their optimal utilisation in various weather and operating conditions. For a large number of years KONČAR – Electrical Engineering Institute has been active in the field of renewable energy, with special emphasis on wind energy. In that period KONČAR – Institute has established an expert centre for various aspects of wind turbines and power plants. Combining this specific knowledge with long tradition of expertise in rotating machines and energy sector, KONČAR – Electrical Engineering Institute offers a wide range of expert services needed for an efficient design, management and utilisation of wind power plants. Highly-educated and experienced personnel, state-of-the-art measuring and test equipment, and purpose-oriented professional computer tools guarantee successful solution of problems and customer satisfaction, no matter whether it is a single test or the continuous monitoring of the plant.

Main areas of expert services

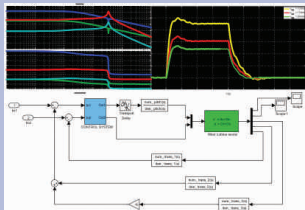
- Computer simulations for wind turbine certification
- Design of wind turbine control system
- Control system testing and wind turbine commissioning
- Control system optimisation for utilisation-specific conditions
- Wind turbine type and routine testing
- Wind turbine condition monitoring
- Continuous monitoring and control of wind power plants in operation
- Measurements of quality of supplied electricity
- Wind turbine acoustic noise measurements
- Supervision of wind power plant construction





Simulation calculations for wind turbine certification

- Defining simulation cases in acc. with IEC-61400
- Defining test winds
- Defining normal and faulty conditions of wind turbines
- Control system simulation
- Extreme load calculation
- Material fatigue calculation
- Estimation of annual energy yield



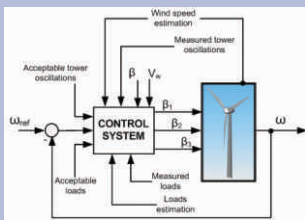
Control system design

- Wind turbine modeling using GH Bladed professional simulation software
- Control system tuning acc. to requirements on:
 - system dynamics
 - extreme loads
 - construction vibrations
 - annual energy yield



Control system testing and wind turbine commissioning

- Hardware-in-the loop (HIL) control system testing
- Wind turbine on-site testing and commissioning
- Wind turbine monitoring during running in
- Laboratory testing of wind turbine subsystems



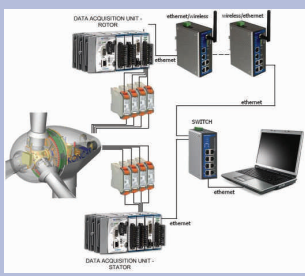
Control system optimisation for specific operating conditions

- Wind gust compensation
- Damping of structural vibrations
- Reduction of cyclic structural loading
- Optimisation of wind power utilisation



Wind turbine type and special testing

- Structural vibration measurements
- Wind turbine acoustic noise measurements
- Measurements of electromechanical wind turbine variables
- Measurements of quality of supplied electricity



Wind turbine condition monitoring

- Monitoring of vibration, structural stress and electromagnetic quantities
- Validation of simulation results against measurements
- Continuous monitoring of wind turbines in operation
- Expert analysis of recorded results

KONČAR – Electrical Engineering Institute Inc.
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