

Insensys Load Measurement System for Individual Pitch Control

IPC

Proven Technology for Advanced Turbine Control

insensys 

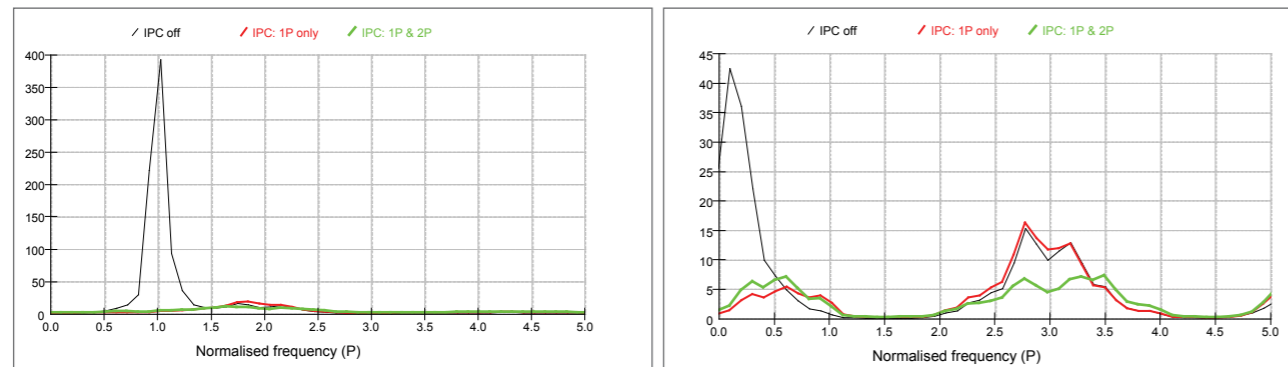
Insensys systems deliver increased performance and cost effectiveness to the wind turbine.

The current trend in wind turbine development is towards higher power, lower cost per MW machines, with larger swept areas and correspondingly larger rotor diameters. Whilst these larger rotor diameters enable increased power output they also present turbine manufacturers with significant design challenges since the loads increase with the cube of the rotor diameter.

Insensys IPC Load Measurement System IPC

In addition to increasing loads, the larger rotor diameter makes the turbine much more susceptible to variations in wind speed and intensity across the swept area resulting in increased asymmetric loading on the turbine blades, main-shaft and other key structural components. If not managed correctly, this loading can result in increased component wear, reduced efficiency, increased machine downtime and even lead to premature machine failure.

These challenges can be overcome by designing the turbine with an Individual Pitch Control (IPC) system, which dynamically adjusts the pitch of each blade in real time, to balance the loading across the rotor disc, eliminate asymmetric loading and reduce the peak loads.



Reduction in Main Shaft Loads with IPC*

Reduction of Stationary Loads with IPC*

IPC schemes have been proven to deliver significant benefits in design and manufacture in addition to operational benefits post-installation. Many of the new MW Class wind turbines have been designed with an IPC philosophy from initial concept, resulting in lower cost, higher reliability and more efficient turbines.

It has been demonstrated that IPC using the Insensys blade load measurement system can significantly reduce loads on the rotor and key structural components providing reductions of 10-20% in the blades, 20-30% in the main shaft and significantly reduced tower and yaw bearing loads.

The significant load reductions achieved through IPC implementation can be utilised in multiple ways by a turbine manufacturer:

- Reduced structural materials and lower parts cost
- Lighter design, resulting in reduced transportation and installation costs
- Increased rotor diameter for higher energy yield
- Modified wind class for existing machines
- Installation on more complex terrains
- Improved reliability and MTBF

A successful IPC system will be fully integrated in the wind turbine's blades and control system and will be installed during the turbine manufacturing process.

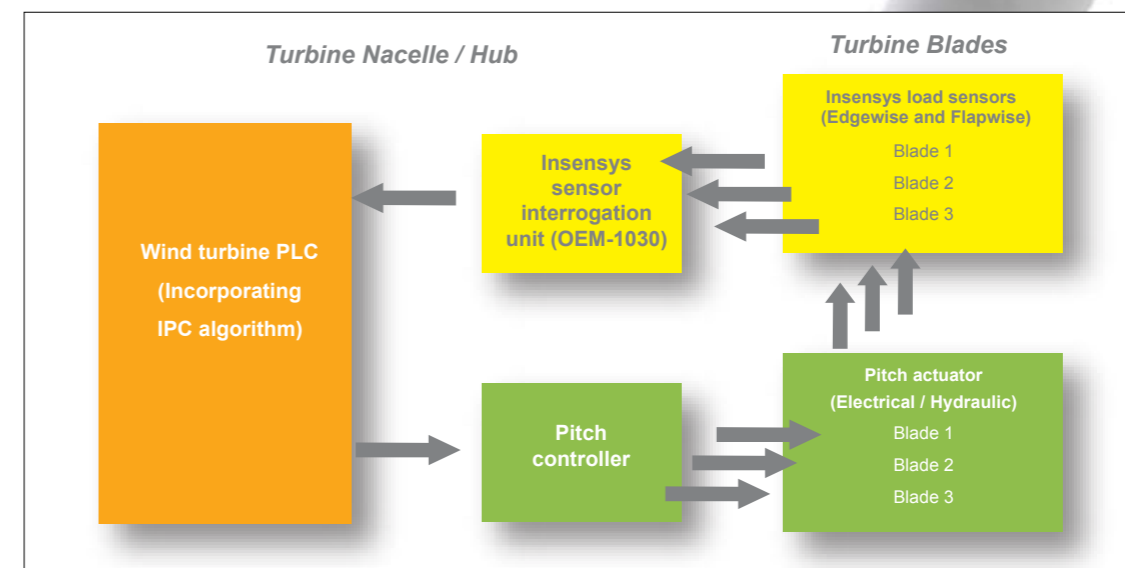
Insensys has worked with leading blade, pitch system and control system designers to develop a modular load measurement system to enable the fast and reliable development of IPC for your turbine, minimising your investment and time to market.

Blade Load Sensors are installed in the cylindrical root section of each blade to provide edgewise and flapwise bending moment data to the IPC control system. Insensys has developed partnerships with all of the leading blade manufacturers enabling new blades to be procured from your existing blade manufacturer with IPC load sensors already installed.

The Sensor Interrogation Unit is designed for installation in the hub PLC or pitch cabinet to enable simple interfacing to the turbine's PLC. Insensys has developed partnerships with all leading PLC and pitch system suppliers to enable the delivery of a fully integrated load measurement system.

The IPC Algorithm is run in the main turbine PLC or in the master pitch controller. This utilises the data from the blade sensors in conjunction with the turbine data to optimise the blade pitch angles in real time and provide updated pitch commands to the pitch system.

Pitch Systems utilising electrical and hydraulic actuation mechanisms have been proven to successfully operate as part of an IPC system.



IPC Schematic Diagram

Insensys IPC Load Measurement System

IPC

Proven technology for advanced turbine control applications

Key benefits of the Insensys system for IPC applications

The Insensys IPC load measurement system has been specifically designed for wind turbine operation and is based on a mature fibre optic sensing platform that provides an accurate, reliable and cost effective load signal input.

- Proven, reliable, technology for wind turbine deployment
- OEM-specific design for simple system integration
- Cost effective for series deployment
- Simple interfacing with existing control systems
- Fast, simple, sensor integration into the blade production process
- Excellent long term sensor fatigue performance
- Non-conductive system eliminates EMI and lightning issues in the blade and hub

Typical system specification

Number of blades	3
Number of sensors per blade	6
Range	±4500 microstrain
Measurement resolution	1 microstrain
Measurement frequency	25 Hz/sensor
Power supply	24 V DC
Power consumption	<3 W
PLC interface	RS232, RS422, RS485,CANbus
Weight	2 kg
Dimensions L x D x W	240 x 97 x 120 mm
Operating temperature	-40°C to +60°C
Protection Class	IP40

For more information contact:

Insensys Ltd

6 - 7 Compass Point, Ensign Way

Hamble, Southampton

SO31 4RA, UK

+44 (0)2380 450550 (t)

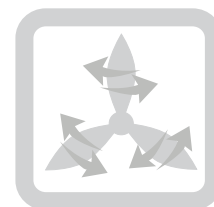
+44 (0)2380 450551 (f)

info@insensys.com

www.insensys.com

*Data courtesy of Garrad Hassan and Partners Limited

Insensys reserves the right to change without notice design, specification, form, fit or function relating to the products herein. Copyright 2008 Insensys. All rights reserved. IPC 26-08-08



Insensys IPC Load Measurement System

IPC

Proven Technology for Advanced Turbine Control

insensys