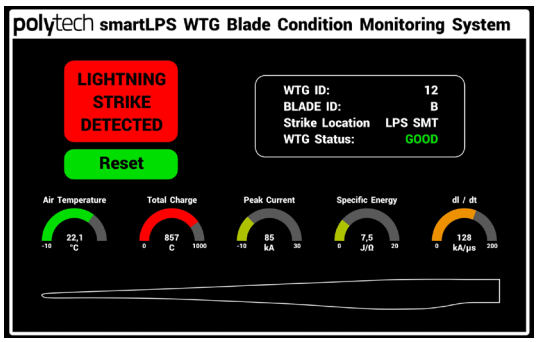
PolyTech smartLPS

INTEGRATED CONDITION MONITORING SYSTEM FOR WTG BLADES

PolyTech smartLPS (patent pending) is an integrated condition monitoring system for WTG blade lightning protection system.

When a lightning strike occurs to the blade, the system can identify which part of the LPS system has been hit and the severity of the lightning impact.



PolyTech smartLPS user interface.

What is the benefit?

Today, existing lightning measurement systems are limited to measuring the bulk current from the lightning event at the root end of the blade.

They do not inform on *where* on the blade the strike occurred, so the data is of limited value to the asset operator.

An example:

Without smartLPS, it is reported that a very large and potentially damaging strike has occurred, but you cannot decide whether to stop the turbine or continue operation based on this information alone.

With smartLPS, you know whether the strike hit the solid metal tip and represents no threat to the blade OR if it hit the surface mesh and was likely to cause surface damage to the blade - which could then be highlighted for inspection and surface repair at the next scheduled interval.

Really useful information for the asset owner - this is what smartLPS delivers.

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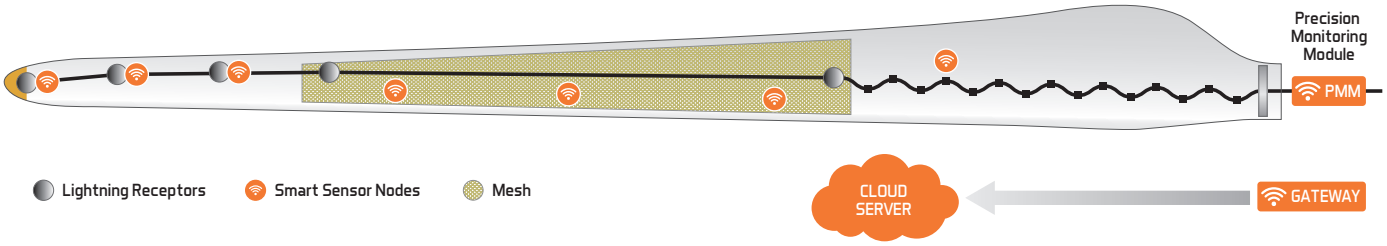
System Architecture



How does smartLPS work?

The core of the system is the distributed array of smart sensors integrated into the LPS and blade.

Strike location

If a strike occurs, the smart sensors measure the lightning current in all the different elements of the LPS, and by analysing the characteristic signature during the lightning strike they determine where the strike occurred. In addition to the smart sensor array, the gateway module in the root of the blade very accurately measures the key parameters of the lightning event, such as peak current, total charge transfer, polarity and pulse shape.

No wires

The sensors communicate together on a wireless mesh network with no wired connections.

Damage quantification

The gateway module transfers the lightning event data to cloud servers for analysis. Then, because the system knows the design data for the specific blade and LPS it can make an accurate assessment on potential expected damage to the blade.

Condition assessment

The system then updates this information in real time to the operation centre. This output can also be configured to simultaneously send alerts or warnings to smart devices such as phones or tablets. Now the operator has a real meaningful assessment of the lightning event and can now make an informed decision on the operational planning.

Smart sensors - Additional advantages

The smart sensor technology can measure various parameters such as vibration G-force, shock, temperature and more. Condition monitoring of blades in general will be taken to a new level, which provides greater knowledge and lower cost to the asset owner.

Components Overview

Smart Sensor Nodes (SSN)

The system consists of discrete sensor nodes which can be embedded in the blade laminate or LPS and are geometrically very small and require no external power or data wiring. The sensor nodes consist of a central microprocessor, sensor elements, local memory storage, power supply and ZigBee communications.

The sensor measures the signature of the magnetic field caused by the lighting current flow. The data is broadcast to all other SSN and the gateway.

Precision Measurement module (PMM)

The PMM is located at the root end of the blade or in the hub and measures the current flow along the down conductor where it exits the blade.

This module utilises a much faster processor and larger storage capacity which enables precision measurement of the lighting event parameters. The PMM transmits this data to the gateway.

Gateway Module

The gateway packages up the raw data from the PMM and SSN's and transmits the data to the secure cloud server. The data packet indicates date and time of event, sensor readings from all SSN's and PMM, turbine ID and blade ID.

Cloud Server

The data analysis is performed on the cloud server and the results published to a secure web server with individual client login.

In addition to secure web portal, alarms and warnings can be pushed directly to the monitoring app running on the client smartphone or tablet device for instant alerting.

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