

Intelligent switching of warning light intensities *on wind turbines*

At the beginning of this year European Legislation modernised the aircraft warning light requirements for wind turbines with hub heights of 80 m or more above ground level.

The aircraft warning lights that are used on these tall wind turbines have a very high light intensity of over 20,000 Candela*. This light is a great aid to navigation in poor weather but it can be quite intrusive in highly populated areas, especially when the visibility conditions are good. Until now, the warning lights were always required to be illuminated at full intensity in all conditions and this not only proves irritating to nearby

residents but also restricts the number of wind turbines that can be placed in one location. This has a very negative impact on the amount of renewable energy that can be generated. The new legislation will help by allowing the intelligent switching of warning light intensity levels relative to local weather conditions.

For the past few years Biral has been working with Enercon GmbH (the leading wind energy turbine manufacturer in Germany) and the manufacturer of the warning lights to prove the validity of the concept of switching the light intensity

intelligently to different intensity levels according to ambient visibility conditions. All considerations were taken into account for this study, including the difference in horizontal and diagonal visibility that pilots would have when flying and looking down at the land surface.

After proving the concept (which is valid providing that the visibility sensor used for the intensity switching is completely reliable and highly accurate) Enercon trialled two sensors for over a year, namely Biral's HSS VPF-710 visibility sensor and a well known inexpensive competitor's sensor. The trial not only looked at



Above: E70 turbine



Instruments are mounted on the back of the turbine hub.

Cup and vane anemometer to measure wind speed and direction.

Biral HSS VPF-710 to measure visibility.

the measurements on the turbine but also how the sensors could be integrated into the existing electronics systems.

The Biral HSS sensors performed extremely well during this trial with the usual accuracy and reliability that these sensors are known for and the contract to supply visibility sensors for over 100 wind turbines was awarded to Biral.

The Biral HSS sensor performed particularly well in two key areas;

1. The Biral HSS sensors use several levels of hard and software filtering on the receiver optics that ensure they are able to work in close proximity to the tried and proven aircraft warning light sources without these same light sources affecting the measurements of the visibility sensor.

2. The very large amount of vibration on a turbine with hub heights above 80 m is quite difficult to deal with and the Biral sensors performed satisfactorily compared to the competitive models in this regard.

For wind energy turbine applications the sensors are mounted next to the existing wind sensor on the rear of the turbine hub facing away from the blades (see pictures).

Using the collected visibility data the aircraft warning lights can be adjusted to one of three intensity levels. The wind speed and direction data is used to alter the hub orientation and the alignment of the

blades. The data is also archived and available for viewing along with the other operational parameters of the wind turbine.

The Biral HSS sensors have been used in nearly every visibility application from lighthouses to airports for over two decades. For more information on this application, the Biral HSS sensors or our extensive range of wind anemometers please contact the Biral Met Team.

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For details on Enercon please go to www.enercon.de

** All the units for measuring and defining light are based on the candela, which is the unit defining the luminous intensity from a small source, in a particular direction. This unit was originally based on the light emission from a flame. (www.electro-optical.com/whitepapers/candela.htm)*

*** Annual consumption figure taken from www.npower-renewables.com/pressreleases/onshorewind/060627_mansfield.asp*

Did you know that . .

- When the wind speed is between 11 and 27 m/s each E70 turbine can generate up to 2,300kW of energy.

This is enough energy to supply one household with electricity for 6 months (based on 4,700kW annual consumption**).

- The hub on the E70 is approximately 80m above ground level,

That is the equivalent of approximately 7 London double decker buses stood end to end.

