Offshore

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The offshore industries are challenging and potentially dangerous places to live and work. Whether it is the oil and gas markets or the wind energy sector, the prevailing weather conditions provide significant challenges to the continued safe operation of the facility.

Thunderstorms play a significant part to disruption of operations including personnel transportation via helicopters. It is not just the threat of lightning, but also the dangerous wind-shear and icing events which can take place inside a cumulonimbus cloud. Knowledge of the proximity and direction of travel of a nearby thunderstorm is vital to ensure safety and minimise operational downtime.

> ***"Most of the time we get notification after the thunderstorm has arrived. We would like to know about it before it arrives, so that we can take the appropriate safety actions".***

Whilst no one can prevent the arrival of a thunderstorm, early warning of its development and location ensures that key personnel are prepared for the possibility of a quick change to their activities. An additional advantage of the BTD-300 thunderstorm detector is the operational time gained after the lightning has stopped. In the past, technical crew waited for a fixed period of time (one hour) after the last lightning strike was reported in the vicinity by remote, third-party lightning location networks. With the live on site monitoring using a BTD-300 an immediate restart of the O&M activities is possible once it is safe to do so.

In addition to lightning detection, the BTD-300 has the unique ability to detect the presence of electrically charged precipitation and strong electric field. Both of these features indicate the presence of a Cumulonimbus cloud overhead, providing an early warning of potential nearby lightning activity and aiding the reporting of this significant cloud type.

The BTD-300 is virtually immune to all forms of man-made radio-frequency interference, minimising false alarms. With the ability to detect over twice as many flashes as conventional lightning detectors, the high sensitivity combined with low false alarm rates makes it the ideal choice for reliable thunderstorm detection.

To demonstrate the performance at an offshore facility, Cofely Fabricom –GDF Suez (Engie) was asked to install a BTD-300 on a substation for the wind farm C-Power (Thortonbank, Belgian North Sea).

The installation of the BTD-300 on the C-Power substation was used to evaluate its ability to

provide the wind farm operator advanced real time information about thunderstorm activity within a 56km (30nm) radius. During the evaluation period, they maintained their existing lightning warning contract with a large and internationally renowned provider of thunderstorm information to verify the resultant information.

After several weeks of no thunderstorm activity (and no false alarms!) the system was fully tested by one very significant storm on 3 February 2015. On this particular day there was no visible lightning in the distance to give the operator the tell-tale signs of an approaching storm. The reporting timeline was as follows:

- The BTD-300 software screen alerted the operator to a strong electric field at the site
- Within 15 minutes a strike was recorded <20nm (<37km) away, bearing 090 degrees
    - Personnel were informed to implement the risk assessment protocol
- Within a further 2 minutes a strike was recorded overhead – the first of this storm
- 10 minutes **after** the first strike was detected by the BTD-300, the report is received from the existing national network provider.
- The strike was recorded by the network as being 2.3km away from the substation, a range in accordance with the BTD-300 overhead alert.

Denis Renson of Cofely Fabricom –GDF Suez said as a result of this outcome:

> ***"This has clearly demonstrated why the BTD-300 is such a useful tool for the offshore industries by giving an advanced warning of the possibility of a thunderstorm. This warning allowed our customer to make an informed risk assessment and to maintain the safe operation of the platform".***

Thunderstorms present a particular danger to helicopter operations, with published reports of helicopter accident statistics specifically mentioning lightning as a major factor in many serious accidents.

For example, in Oil & Gas UK Health and Safety Report 2013 (for period 1992-2012):

> ***"For accidents caused by external factors, 86 per cent of them were because of weather related events, including five lightning strikes and an encounter with a water spout. The final accident accounts for the remaining 14 per cent and was due to a very heavy helideck landing caused by adverse helideck environmental effects (caused by hot turbine exhaust plume)."***

and

> ***"Eighteen reportable non-fatal accidents have also occurred since 1992. These include major component failures, pilot error, lightning strikes, major airframe damage, and main and tail rotor damage."***

The presence of Cumulonimbus (CB) clouds are treated as a significant weather condition due to their threat to aircraft, as noted by the Helipad Met Observer training course, which includes the following relevant parts in the latest training syllabus:

- Identification of convective clouds and the operational significance of TCU/CB clouds
- Observing and reporting lightning and thunderstorms

Both overhead CB clouds and local thunderstorms are detected by the BTD-300, aiding the Helipad Met Observer. The ability to detect both potential overhead storms and locate all subsequent flashes in the area is unique to the BTD-300, representing a significant step change in both early warning of an impending storm as well as in giving a much higher confidence that the threat has passed.

References:
- www.irata.associationhouse.org.uk/show_doc.php?doc_id=4056
- http://www.stormgeo.com/assets/ArticleFiles/CAP-437-Offshore-Meteorological-Observer-Training.pdf

About the Author

Dr Bennett is the Meteorological Products Manager for Biral, UK. He has a PhD in Atmospheric Electricity and 10 years' experience in research and development of lightning detection systems, including working at the UK Met Office and is a visiting Research Fellow at the University of Bath. He has written over 20 papers in atmospheric electricity, which have been published in peer-reviewed international journals.