Features for Bird & Bat Monitoring

AT METEOROLOGICAL TOWERS
ON & OFFSHORE

DTBIRD® SYSTEM

OCTOBER 2014

dtbird®
BIRD & BAT PROTECTION

Features for Bird and Bat Monitoring at Meteorological Towers On&Offshore

DTBird® system is a very powerful tool for Bird and Bat Monitoring in Meteorological (Met) Towers On&Offshore.

DTBird® is a **self-working system** that detects birds and bats in real time, and performs real time actions, like the automatic **Stop of a wind turbine** (WTG) or the emission of **Warning and Dissuasion sounds** to birds flying in collision risk areas.

DTBird® virtual operation of Dissuasion Module and Stop Control Module according to bird and bat activity detected in the **Met Tower**, will provide accurate data of DTBird® actions once the wind farm is in operation, including the maximum loss of electricity productions due to DTBird® Stop Control Module.

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DTBird® has 4 modules available for birds and 2 for bats with the following features for Met Towers:

Detection

Automatic and real-time detection of birds by high resolution image analysis.

Collision Control

Video recording with sound of high collision risk bird flights, including bird collisions with Met Towers (mast and tensor cables), and injured birds that fly away.

Dissuasion

Emission of Warning and Dissuasion sounds adjusted to birds collision risk with the Met Tower. Virtual operation of Dissuasion Module for a future WTG located in the Met Tower site.

Stop Control

Virtual operation of Bird Stop Control Module for a future WTG located in the Met Tower site.

Bat Detection

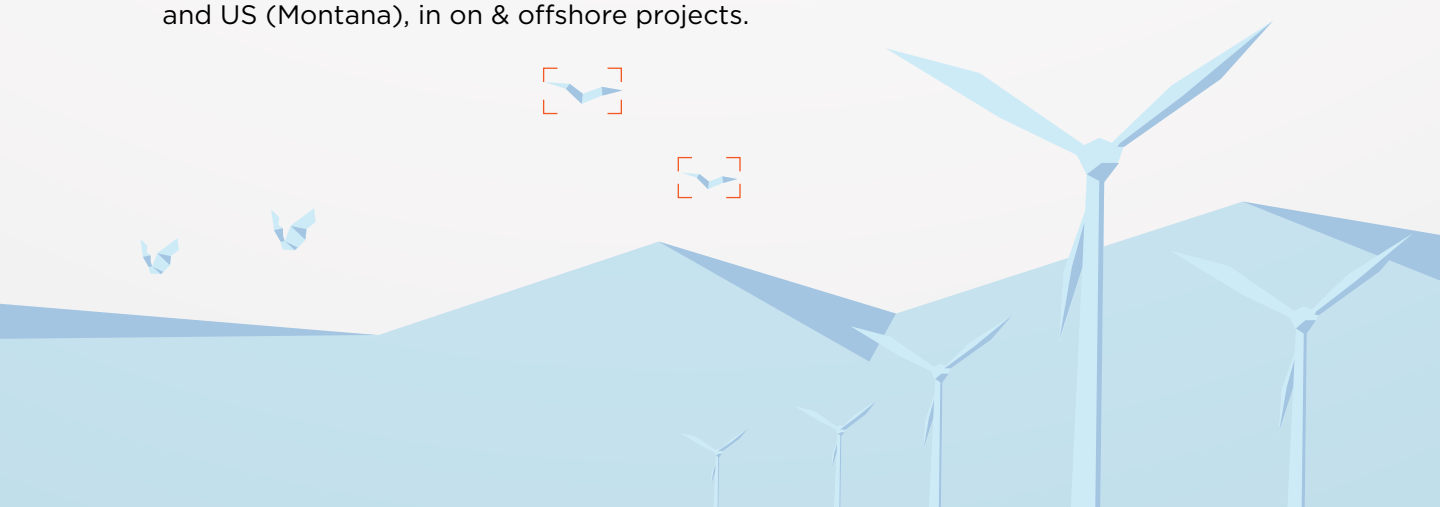
Automatic and real-time detection of bats by ultrasound detectors.

Bat Stop Control

Virtual operation of Bat Stop Control Module for a future WTG located in the Met Tower site.

Videos of every bird flight, bat sonograms, environmental data, Met Tower data, DTBird® Dissuasion Module actions (if required) and virtual operation of DTBird® Dissuasion and Stop Control Modules for a WTG locate in the site, are recorded and uploaded daily to an on-line Data Analysis Platform (DAP), available to the Client through Internet. The DAT provides Automatic Servide reports.

First installation of DTBird® in a WTG was set up in March 2009 in Spain, and currently is operating in France, Greece, Italy, Poland, Spain, Switzerland, Norway and US (Montana), in on & offshore projects.



Bird Monitoring

Features

- **Detection sensors**: 4 HD Cameras.
- **Surveillance area**: 360° around every WTG.
- **Detection distance**: DTBird® configuration for flyways maximum detection distances 400 to 50 m to the Met Tower, depending on species size. Further distances are available under request.
- **Daily service period**: Continuous monitoring during daylight (light > 50 lux).
- **Bird Detectability**: > 80 %.**
- **FP/day** (video with no bird): < 1,5 FP, yearly average.

Observations:

* Environmental variables include, at least: temperature, rain, wind speed, wind direction and light.

** DTBird® detectability reported by the Norwegian Institute for Nature Research, NINA in December 2012 for all bird species, in an area where the most frequent species are eagles, was 86 – 96% of all birds in a radius of 150 m to the wind turbine and 76 – 92% in a radius of 300 m. DTBird® detectability has been improved since 2012.

Recorded Data

- Video and sound recordings of every flight.
- Flight time data (init time and total length) and environmental data*.
- Virtual operation of DTBird® Dissuasion and Stop Control Modules.
- Species/group identification from video recordings.
- Optional cotinuous **Day & Night** recording (light > 0,05 lux).

DTBird® video image with *Larus sp.* in Offshore installation.

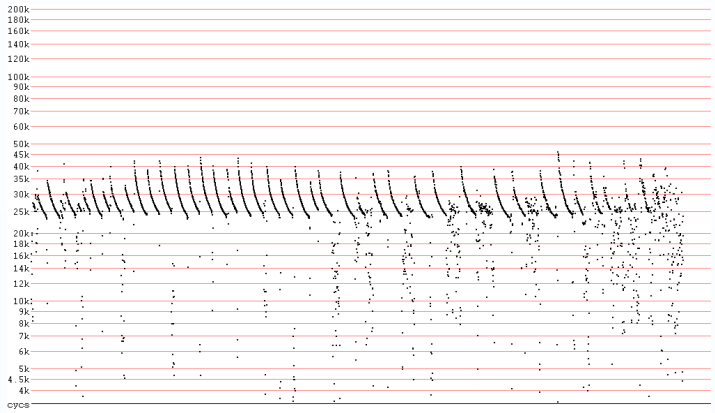
Bat Monitoring

Features

- **Dissuasion units**: 2 Ultrasound Bat Detectors.
- **Surveillance distance**: Depending on the bat species, from a few meters to 100 m to each bat detector, that will be installed at the rotor swept height of the wind farm project.
- **Service period**: Whole night (starting 30 min before sunset and ending 30 min after sunrises) in bat activity periods.

Recorded Data

- Bat sonogram of every bat call.
- Flight time data (init time) and environmental data*.
- Virtual operation of DTBird® Bat Stop Control Module.
- Species/genus identification from bat sonograms.



Example of DTBird® bat sonogram.

Observations:

* Environmental variables include, at least: temperature, rain, wind speed and wind direction.

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DTBird®
Worldwide Presence

44 DTBird® units are operating in 12 wind farms distributed in 8 countries:

- France
- Greece
- Italy
- Norway
- Poland
- Spain
- Switzerland
- US (Montana)

Currently 9 DTBird® units are being installed in France and Norway.

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