



Bird Monitoring & Reduction of Collision Risk with Wind Turbines

DTBIRD® SYSTEM

NOVEMBER 2016



dtbird®
BIRD & BAT PROTECTION

Bird Monitoring & Reduction of Collision Risk with Wind Turbines

DTBird® is a self-working system that monitors bird activity in real-time, and detects any bird Species in daylight all year round.

DTBird® System can be installed in Wind Turbines (WTGs), Meteorological Towers and other facilities (On & Offshore).

In operating Wind Farms, **DTBird®** System includes specific modules that take automatic actions to reduce the collision risk of birds with the WTGs: **DTBird®** Collision Avoidance Module, and **DTBird®** Stop Control Module. In addition, **DTBird®** Collision Control registers bird collisions.

Overall **Bird Collision Probability** in WTGs installed with **DTBird®** Collision Avoidance and/or Stop Control Modules is <0.1 % (<1 collision*/ 10,000 birds detected at <300 m to the WTG), with <0.05 collisions*/WTG/Year.

* Collisions monitored by **DTBird®** Collision Control Module.



DTBird® has 4 modules available for birds:



Detection

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



Collision Control

Video and audio recording of high collision risk flights, including bird collisions (with the blades, tower and nacelle), and injured birds that fly away.



Collision Avoidance

Emission of Warning and Discouraging Sounds adjusted to bird collision risk and legal requirements.

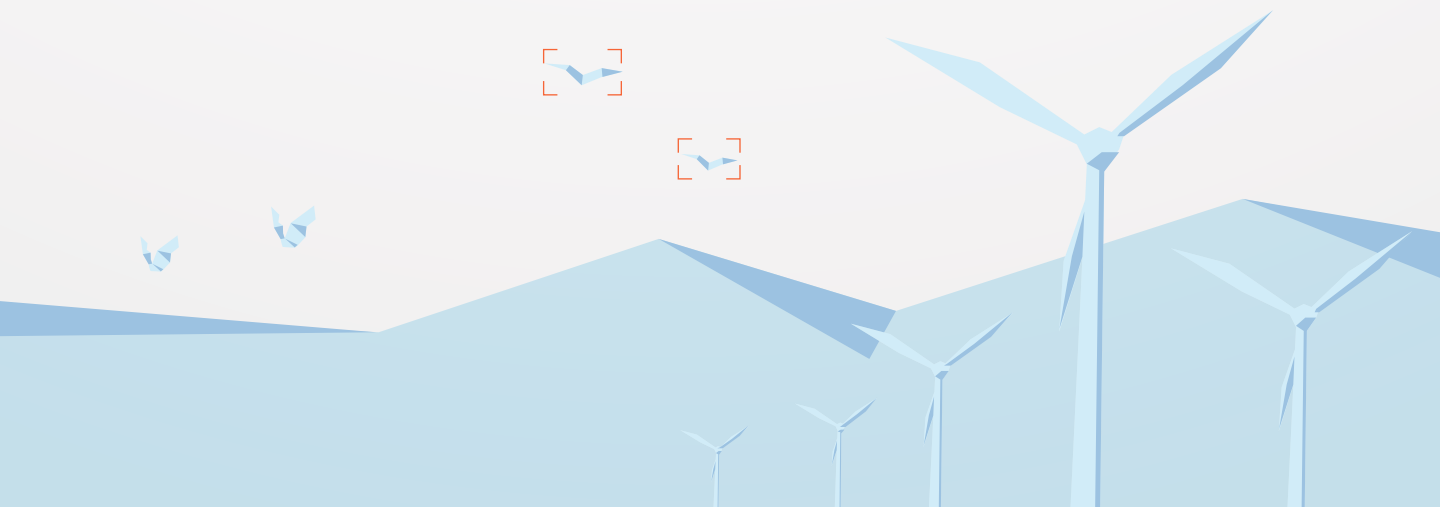


Stop Control

Automatic wind turbine stop trigger and restart, according to real-time collision risk of bird flights detected.

Videos of every bird flight, environmental data, wind turbine operation parameters and DTBird® actions are recorded and uploaded daily to an online Data Analysis Platform (DAP), available to the Client through the Internet. The DAP also provides Automatic Service reports that summarize service profiles, bird flights, DTBird® actions, and bird collisions detected.

The first installation of DTBird® in a WTG was set up in March 2009 in Spain. DTBird® is currently installed in Austria, France, Germany, Greece, Italy, Poland, Spain, Sweden, Switzerland, Norway and the USA, in On & Offshore projects.





Detection Module

Features

- ✦ **Installation sites:** WTGs, Meteorological Towers and other facilities (On & Offshore).
- ✦ **Detection sensors:** 4 to 8 HD Cameras per WTG.
- ✦ **Surveillance area:** 360° around the installation site.
- ✦ **Detection distance:**

BIRD WINGSPAN	SET UP RANGE
> 150 cm	200 - 600 m
75 - 150 cm	100 - 350 m
< 75 cm	25 - 175 m

- ✦ **Daily service period:** Continuous monitoring during daylight (light > 50 lux). Day & Night service available.
- ✦ **Bird Detectability:** > 80 %.**
- ✦ **False Positives(FP)/day** (videos with no bird): 0.5 – 5.0 (yearly average).

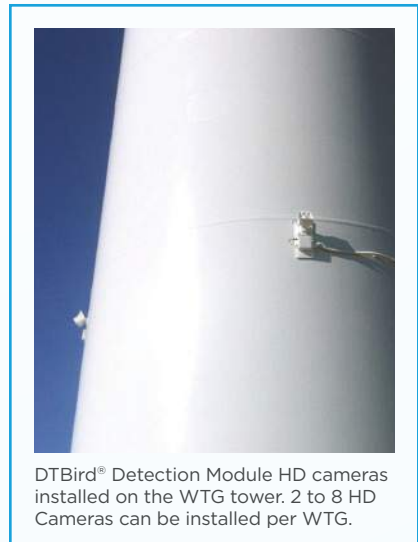
Observations:

* 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 WTG and 76 – 92% in a radius of 300 m. DTBird® detectability has been improved since 2012, and detection distances have increased to the present figures in the table.

Recorded Data

- ✦ Video and sound recordings of every flight.
- ✦ Flight time data: Init time and total length.
- ✦ Environmental data*, and WTG operational parameters.
- ✦ Species/group and bird behaviour review from video recordings.



DTBird® Detection Module HD cameras installed on the WTG tower. 2 to 8 HD Cameras can be installed per WTG.





Collision Avoidance Module

Features

- ✦ **Installation sites:** WTGs.
- ✦ **Dissuasion units:** 4 to 10 Speakers per WTG.
- ✦ **Sound features:**
 - Warning Sounds to bird flights with Potential Collision Risk.
 - Discouraging Sounds to bird flights in High Collision Risk Area/Rotor Swept Area.
 - Trigger in real time: < 2 s after flight detection in collision risk.
 - Power adjusted to legal requirements and bird sensitivity.
 - Sound emission projected to the Rotor Swept Area.
- ✦ **FP/day** (sound triggers with no bird): 0.2 - 4.5 per day with a duration of 0.1 - 2.5 min/day (yearly average).

Observations:

The Collision Avoidance Module can reduce the number and length of flights within the collision risk area around a WTG. This results in the reduction of the number and length of WTG Stops, which are triggered by the Stop Control Module.

Recorded Data

- ✦ Warning/Discouraging Sounds time data: Init time and total length.
- ✦ Video and sound recordings of bird flights and Warning/Discouraging Sounds.



DTBird® Collision Avoidance Module Speakers installed on the WTG tower. 4 to 10 Speakers can be installed per WTG.





Stop Control Module

Features

- ❖ **Interface with WTG:** DTBird® system hardware and software compatible with all WTG manufacturers.
- ❖ **Automatic Stop trigger:** Linked to real-time flight detection at the collision risk distance.
- ❖ **Collision risk distance:** Configured according to WTG complete rotor Stop time and Target Species flight features in the installation site.
- ❖ **Rotor Stop init time:** 2 - 10 s after DTBird® stop trigger, depending on WTG manufacturer.
- ❖ **Complete rotor Stop:** 10 - 25 s after WTG stop init, depending on WTG manufacturer.
- ❖ **Stop length:** Linked to real-time flight detection in collision risk.
- ❖ **Automatic restart** of the WTG when the collision risk disappears.
- ❖ Automatic **email notification** of every Stop: Trigger time (first email), end time and duration (second email).
- ❖ Stop adjustment to legal requirements.
- ❖ **FP Stops/year** (stops with no bird): 0.5 - 10 hours/year.

Observations:

Depending on bird activity, DTBird® model and the stop protocol applied, the total stop duration produced by DTBird® is estimated in the range of 10 - 130 hours (with wind speed above 3 m/second)/year.

Recorded Data

- ❖ Stop time data: Init time, end time and total length.
- ❖ Video recordings of bird flight and the whole Stop.



DTBird® installation in a 119 m tower height WTG.





Collision Control Module

Features

- ❖ **Installation sites:** WTGs and Meteorological Towers.
- ❖ **Detection sensors:** 2 to 4 HD Cameras.
- ❖ **Daily service period:** Continuous monitoring during daylight (light > 50 lux). Day & Night service available.
- ❖ **Surveillance area:** The whole rotor swept area.
- ❖ **Register of potential collisions in > 96% of flights detected** (360° bird monitoring around the rotor swept area).

Observations:

Currently, the capability to register potential collisions in flights detected, for all bird species and in all [DTBird® Systems](#) operating worldwide, vary from 96 to 100%.

Recorded Data

- ❖ Collision check from video and sound recordings, including birds potentially injured that fly away.
- ❖ Video and sound recordings of bird collisions.
- ❖ Continuous video recording of the previous 10 days. Day & Night service available.



DTBird® System: a world wide reference for bird protection at wind farms

NOVEMBER 2016

DTBird® features are being requested by Environmental Agencies in an increasing number of countries.



95 DTBird® & DTBat® units are distributed in 21 existing / projected, onshore & offshore wind farms in 11 countries:

- | | | | |
|-----------|----------|----------|---------------|
| ✚ Austria | ✚ Greece | ✚ Poland | ✚ Switzerland |
| ✚ France | ✚ Italy | ✚ Spain | ✚ USA |
| ✚ Germany | ✚ Norway | ✚ Sweden | |

2 additional units will be installed in Spain this year.