dtbird®
BIRD & BAT PROTECTION

DTBird® System Evolution

DTBIRD TEAM

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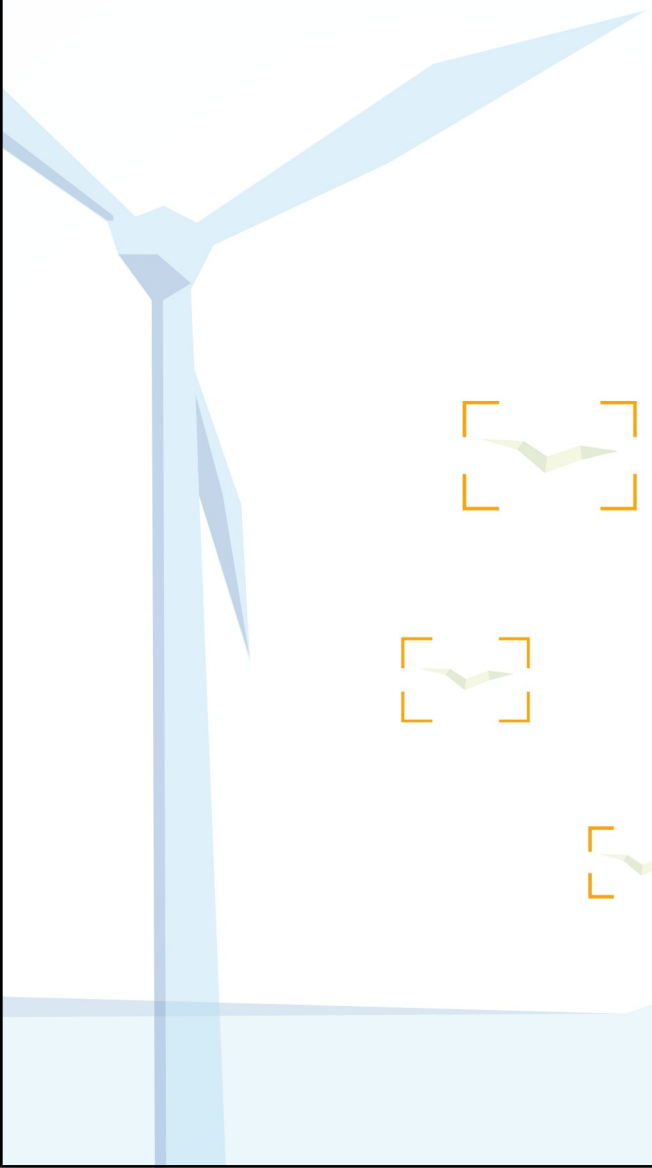
Fulfilled:	Marcos Puente	*20/01/16*
Verified:	Javier Díaz	*25/01/16*
Approved:	Agustín Riopérez	*25/01/16*



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Bird Smart and Transparent Wind Power

INDEX

DTBird® *Detection Module*	2009 - 2010	2011 - 2012	2013 - 2014	2015
Cumulative Units Installed	2 Pilot Units	21	46	61
Installation sites	WTGs	WTGs and Nearshore facilities	WTGs and Nearshore facilities	WTGs, Meteorological Towers (MT), Nearshore facilities, Offshore Platform
Module specifications				
Nº Cameras/Facility	1 or 2 Cameras/WTG	2-4 HD Cameras/WTG	4 HD Cameras/WTG Other sites, project specific.	4-8 HD Cameras/WTG or MT Other sites, project specific.
Megapixels (MP)/Camera	1 MP/Camera	2 MP/Camera	4 MP/Camera	5-6 MP/Camera
Cameras location on the facility	1-2 sides/WTG	2 sides/WTG	All around WTG/Meteorological Towers (patented mounting system), and at different heights for the largest WTGs. Other sites, project specific.	
Meteorological sensors	No		Yes	
Power supply	Electrical grid			Electrical grid & Solar panels
Operational conditions	Pilot Units	Commercial units operating Daylight (>200 lux)	Commercial units operating Daylight (>100 lux)	Commercial units operating Daylight (>50 lux)
Weatherproof	Outdoor components - IP 66		Outdoor components: All-weather tested, protection from lighting and falling ice.	
Data exchange between DTBird and WTG	No	Yes		
Service specifications				
Detectable bird Species/Groups	NA	All bird Species/Groups.		
Bird Species/Group identification	NA	Yes, through the review of bird flight video and audio recordings.		
Surveillance area	90° - 180° around	180° - 360° around WTG/Meteorological Towers		360° around WTG/Meteorological Towers
Radius of the Surveillance area	NA	150 – 300 m		*Bird wingspan* / *Set up range*: >150 cm: 150-600 m 75-150 cm: 75-350 m <75 cm: 25-175 m
Simultaneous detection of multiple bird flights	Yes (360° around WTG/MT), with unlimited nº flights and birds.			
Bird flight detectability	NA	>80%		>80% DTBird® Detection Module achieves a higher detectability rate of birds in collision risk than a human observer devoted to monitoring a wind turbine, according to an independent test (Swiss Ornithological Society).
Bird flight traceability	NA	Semi-automatic.	Automatic: Video recordings uploaded to online *Data Analysis Platform* (User and Password protected access).	
False Positive (recording with no bird)	NA	< 5 FP/day	0.5 - 4.5 FP/day (yearly average)	
Recorded data	NA	Location Flight ID Flight time data		
		Video recordings of bird flight.	Video and audio recordings of bird flight (continuous video recordings of the 10 previous days are stored) Environmental data, and WTG operation parameters.	
Online Data Analysis Platform	NA	No	Video, audio and data storage in DTBird® Server with Data Center Classified Tier 4 and scalable storage capacity for at least 5 years. Flight Analysis tools: review of video and audio records, flight analysis, export data and automatic service reports.	

DTBird® Collision Avoidance *Module*	2009 - 2010	2011 - 2012	2013 - 2014	2015
Cumulative Units Installed	2 Pilot Units	13	33	45
Installation sites	WTGs			
Module specifications				
Nº Speakers/Facility	NA	2 Speakers/WTG	4 Speakers/WTG	4 – 8 Speakers/WTG
Sound classes	NA	Warning/Discouraging Sounds		
Location in the facility	1 Side/WTG	2 sides/WTG	All around WTG (patented mounting system), and at different heights for the largest WTGs.	
Power supply	Electrical grid			
Operation conditions	Pilot Units	Commercial units operating Daylight (>200 lux)	Commercial units operating Daylight (>100 lux)	Commercial units operating Daylight (>50 lux)
Weatherproof	Outdoors components - IP 66		Outdoors components: All-weather tested, protection against lightning and falling ice.	
Service specifications				
Coverage area	NA	360° around WTGs		
Sound power	NA	Adjusted to legal requirements and bird sensitivity (Project specific)		
Sound trigger	NA	Automatic and in real-time, <2 s after flight detection with Potential Collision Risk		
Sound emission traceability	NA	No	Automatic: Video & Audio recordings uploaded to online Data Analysis Platform (User and Password protected access)	
False Positive (sound trigger with no bird)	NA	-	0.2 – 2.9 FP/day, with a total duration of 0.1 - 1.5 min/day (yearly average)	
Recorded data	NA	Location Sound trigger ID Sound time data		
			Audio recordings of every sound trigger Environmental data, and WTG operation parameters	
Online Data Analysis Platform	NA	No	Video, audio and data storage in DTBird® Server with Data Center Classified Tier 4 and scalable storage capacity for at least 5 years. Flight Analysis tools: review of video and audio records, flight analysis, export data and automatic service reports.	

DTBird® *Stop Control Module*	2009 – 2010	2011 - 2012	2013 - 2014	2015
Cumulative Units Installed	-	17	40	52
Installation sites	-	WTGs		
Module specifications				
Nº Cameras/Facility	See DTBird® *Detection Module*			4-8 HD Cameras/WTG
Megapixels (MP)/Camera				6 MP/Camera
Location in the facility				All around WTG (patented mounting system), and at different heights for the largest WTGs.
Operational conditions				Daylight (>100 lux)
Weatherproof				Outdoors components: All-weather tested, protection against lightning and falling ice.
Service specifications				
Species/Group Stop trigger sensitivity (true positives) and specificity (true negatives)	NA	Variable, depending on target Species/Group and bird community inhabiting the installation site.		
Surveillance area	See DTBird® *Detection Module*			360° around WTG
Radius of the Surveillance area				*Bird wingspan* — *Set up range* >150 cm — 150-600 m 75-150 cm — 75-350 m <75 cm — 25-175 m
Simultaneous detection of multiple bird flights				Yes (360° around WTG/MT), with unlimited nº flights and birds.
Bird flight detectability				>80% DTBird® Detection Module achieves a higher detectability rate of birds in collision risk than a human observer devoted to monitoring a wind turbine, according to an independent test (Swiss Ornithological Society).
Stop trigger	NA	Automatic and linked to real-time bird flight detection Collision risk calculation according to bird flight features.		
Complete rotor Stop	NA	20 – 40 s after Stop trigger, depending on WTG model		
Stop length	NA	Linked to real-time bird flight detection in collision risk Automatic restart of WTG when the collision risk disappears		
Stop & bird flight traceability	NA	Semi-automatic	Automatic: Video recordings uploaded to online Data Analysis Platform (User and Password protected access)	
False Positive rate (Stops with no bird)	NA	-	0.5 – 5 hours/year/WTG	
Recorded data	NA	The specific WTG that stopped Stop trigger ID Stop time data: Init time and total length		
		Video recordings of bird flight.	Video and audio recordings of every Stop event Environmental data, and WTG operational parameters during the Stop	
Online Data Analysis Platform	NA	No	Video, audio and data storage in DTBird® Server with Data Center Classified Tier 4 and scalable storage capacity for at least 5 years. Flight Analysis tools: review of video and audio records, flight analysis, export data and automatic service reports.	