



GREAT TURBINE HEALTH STARTS HERE...

Natural Power's inspections team believes that the key to great turbine health is to identify issues early. With a global capability covering over 3000 turbine inspections on more than 400 projects, it has developed a wide capability in this area. From factory inspections to end of warranty and post warranty health assessments, the team can advise clients on the condition of their turbine fleet throughout its lifecycle. By flagging risks early they can help clients to schedule maintenance activities, ensuring great turbine health and reduced operational costs.



PREDICTIVE MAINTENANCE

The Natural Power inspection team adopts a predictive maintenance approach. By getting involved in the very early stages of damage detection, it can equip it's clients with a more robust awareness of forecast repairs, allowing them to schedule maintenance at a more favourable time. By identifying the components in need of repair before they reach the point of catastrophic failure, more maintenance can be performed up-tower. This vastly reduces the associated crane costs and protects against unexpected and costly repairs.

CORE CAPABILITIES

Natural Power's dedicated inspection team has a core of technology experts and engineering professionals who are committed to providing services in the areas of:

- Consulting
- End of Warranty Inspections
- Drivetrain endoscope
- Generator testing
- Turbine Health Assessments
- SCADA reviews
- CMS vibration analysis
- Portable vibration system
- Remote access and real-time condition monitoring
- Generator alignment
- Oil sampling, trending and analysis
- Grease sampling, trending and analysis
- NDT
- Blade inspections
 - Internal - 360° camera system
 - External - Drone or ground based system
- Electrical and HV inspections
 - Transformer condition inspection
 - Thermographic study

KEY INSPECTION RESOURCE

KEY SENIOR STAFF	ROLE	BLADE	FACTORY	COMMISSIONING	END OF WARRANTY	POST WARRANTY HEALTH	HV	DRIVETRAIN	GENERATOR	MAIN BEARING	SCADA	VALIDATION AND CMS
Craig Gordon	Head of Inspections	X	X	X	X	X	X	X	X	X	X	X
Scott Maxwell	Inspections Technician	X	X	X	X	X		X		X	X	
Daryl Hickey	Mechanical Engineer	X	X	X	X	X		X	X	X	X	X
Charlie McGlynn	Wind Turbine Inspector	X	X	X	X	X	X	X	X	X		
Neil McArthur	Inspections Project Manager	X	X	X	X	X	X	X	X		X	
David Stroud	Electrical Engineer		X	X	X	X	X					
Richard Bernard	Senior Authorised Person		X				X					
Manuel Flores	Supplier Quality and Development		X									

The senior team is supported by a team of highly professional and experienced wind turbine technicians.

ON AND OFFSHORE TURBINE EXPERIENCE

- Siemens
- GE
- Enercon
- Senvion
- Alstom
- EWT
- Vestas
- Nordex
- Gamesa
- SUT
- Fuhrländer
- Suzlon

STANDARDS

All inspections are carried out to the highest level of international standards. A list of these is available on demand.

A SELECTION OF RELEVANT PROJECT EXPERIENCE

COUNTRY	NO. OF WTGS	MAKE AND MODEL	MW PER WTG	TOTAL MW	TYPE OF INSPECTION	YEAR
France	24	Siemens SWT-3.0-101	3.00	72	Snagging/Commissioning	2014
England	27	Siemens SWT-2.3	2.30	62.1	End of Warranty	2014
England	5	Nordex N60	1.30	6.5	End of Warranty	2016
Scotland	19	Senvion MM82	2.05	38.95	End of Warranty	2016
England	6	Vestas V90	2.00	12	End of Warranty	2017
Wales	6	Enercon E82	2.35	14.1	Snagging/Commissioning	2018
Northern Ireland	6	GE 2.5-100	2.50	15	Snagging/Commissioning	2017
Hawaii	14	GE 1.5 SE	1.50	21	Drive train replacements	2015

CASE STUDIES



CASE STUDY 1

PROJECT END OF WARRANTY INSPECTIONS, SCOTLAND, 24/09/2016 - 24/08/2017

CLIENT LARGE SCALE RENEWABLES CLIENT

PROJECT DESCRIPTION

A full end of warranty campaign was conducted for 19 Senvion MM82 2.05MW wind turbines at a wind farm site in Scotland. The main aim of this work is to inform the client of any defects requiring rectification prior to the end of the turbine manufacturer's warranty period.

SERVICES PROVIDED

Review of maintenance logs	High definition ground based blade inspection
Full internal inspection of tower, nacelle and hub	Internal blade inspection
Gearbox inspection	Portable vibration system installation and data analysis
Gearbox oil sampling & analysis	Review of SCADA data
Main bearing endoscopic inspection	
Main bearing grease sampling and analysis	

ADDED VALUE

The Natural Power Inspections team combined expert software and data analysis, signal processing and statistical methods, using their technical ability to combine SCADA reviews, vibration monitoring and high resolution visual representations of the client's assets. This enabled delivery of a complete health assessment of the entire site to the client.

Natural Power reported on both acceptable and unacceptable components. In cases where components were damaged or failing, reports were created detailing the detection, identification and characterisation of damage, arming the client with necessary information to ensure these components were replaced under the warranty agreement in place with the OEM.



PROJECT OFFSHORE BLADE INSPECTION PORTFOLIO - 2017

CLIENT DONG ENERGY (ORSTED)

PROJECT DESCRIPTION

Offshore ground based external blade inspections to > 500 WTG's including Siemens SWT-3.6MW, Siemens SWT-2.3 MW, MHI Vestas V164-8.0 MW, MHI Vestas V112-3.0 MW, MHI Vestas V80-2.0 MW, Senvion 5MW.

ADDED VALUE

Working autonomously whilst providing daily progress reports to the client, these projects involved liaison with both onshore co-ordination team and transfer vessel crews to facilitate seamless completion of works for all parties whilst maximising delivery to the client. Due to the success of the project, Natural Power were invited to tender for Dong's blade inspection framework covering over 300 WTGs and were successfully awarded the contract in 2017.



PROJECT WIND FARM BLADE INSPECTIONS - N.E. FRANCE

CLIENT CONFIDENTIAL

PROJECT DESCRIPTION

Ground based external blade inspections to 23 WTG's.

SERVICES PROVIDED

External blade inspection services to 23 No. Gamesa G97-2.0MW. Reporting with defect categorisations.

ADDED VALUE

The inspections team was only given a short mobilisation period to site to enable a defect finding campaign that followed potentially serious defect identification. The campaign was completed within stringent client timescales (5 days max).

An international effort was required, liaising with both French and Spanish speaking technicians to allow for turbine control and manipulation.