Waygate Technologies
a Baker Hughes business

Wind Turbine Remote Visual Inspection Solutions

Protect your wind turbine's critical mechanical parts with our advanced RVI equipment and intelligent software solutions

The power of wind

By generating low-emission, economical energy, wind power leads efforts to achieve a low-carbon or net zero future for our planet. With wind farm construction complete, the greatest cost associated with wind power generation involves maintaining the turbine and associated equipment.

Wind conditions and environmental debris put considerable stress on a wind turbine's critical mechanical parts—gradually impairing performance and driving up operating and maintenance costs over time. As such, wind turbines require periodic inspections and repairs to achieve their standard lifespan—typically about 20 years.

Predict and prevent

Waygate Technologies offers a proven range of remote visual inspection (RVI) solutions to efficiently evaluate and combat ongoing machine wear. From intuitive software that standardizes inspection processes and data collection to hardware backed by decades of ingenuity, our solutions help maintain plant asset integrity and mitigate costly shutdowns.

With our RVI technology, you can gain an accurate and detailed understanding of the actual condition of your wind turbine's gearbox and other parts as they change over time. Our analysis tools put a wealth of information at your fingertips, helping you predict equipment wear, avoid failures and minimize downtime for both planned and unplanned maintenance events.

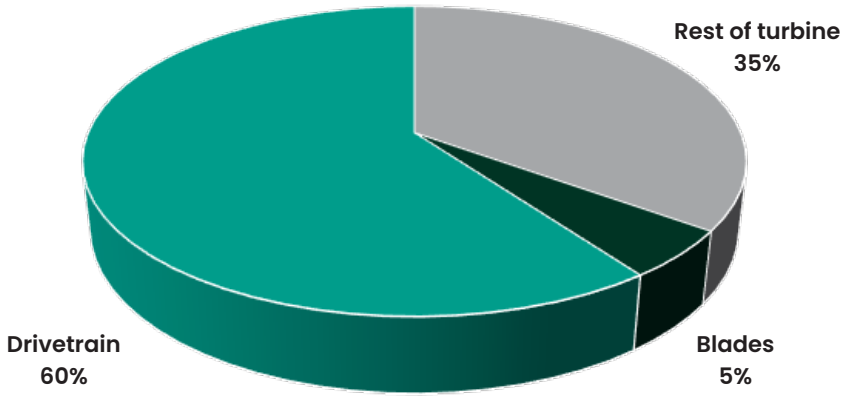
Inspection solutions from Waygate Technologies

When climbing a 100-meter tower to inspect a wind turbine gearbox, a lightweight, portable video borescope is essential. Designed for tightly confined inspections, Waygate Technologies' compact, high-performance video borescopes deliver sharp, clear digital images. Menu Directed Inspection (MDI) and InspectionWorks improve quality and productivity through:

- Automatic and consistent context tagging of captured image and video files for added data integrity without the need for manual note taking
- Standardized inspections shorten the learning curve, reduce inspection variability, and decrease errors
- Automatic data back up and inspection report generation
- Faster inspections and easier data sharing

The drivetrain is priority #1

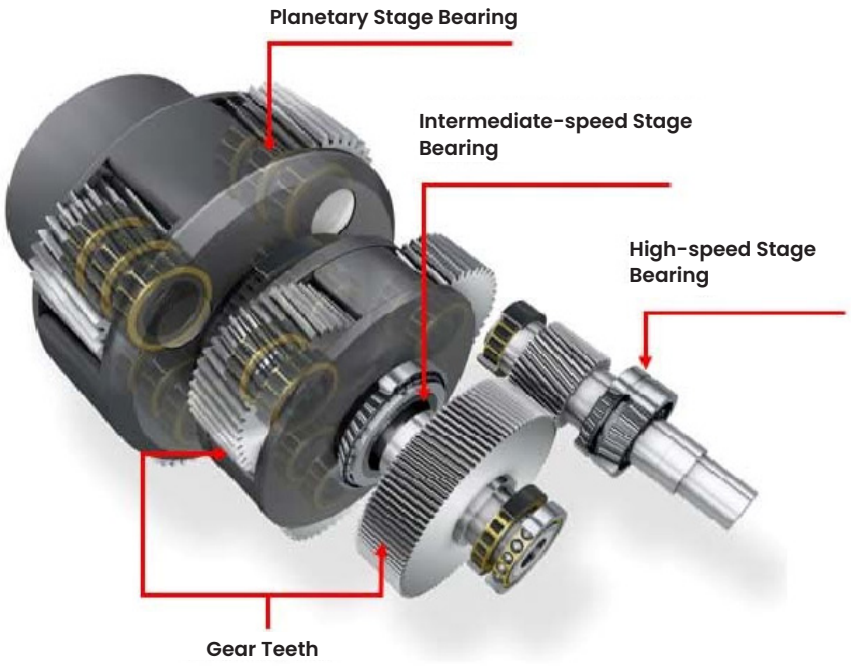
To boost wind farm return on investment (ROI), maintenance costs must be reduced while turbine availability stays high. About 60% of those maintenance costs come from the wind turbine's drivetrain, where the gearbox transforms slow speed, high torque wind turbine rotation to the higher speeds required by the generator, which converts the mechanical power to electricity.

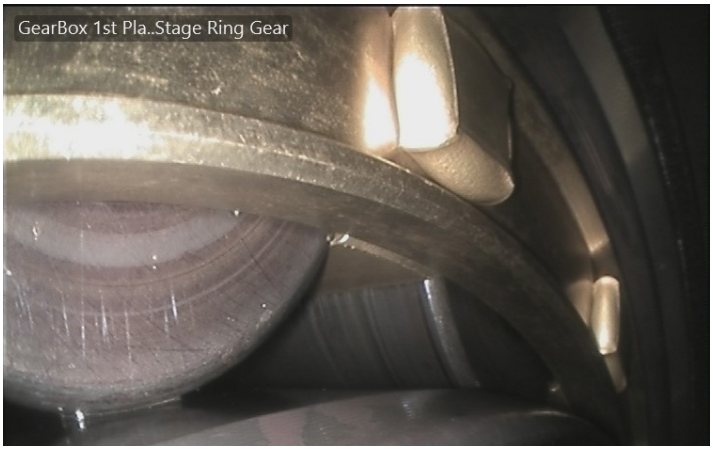


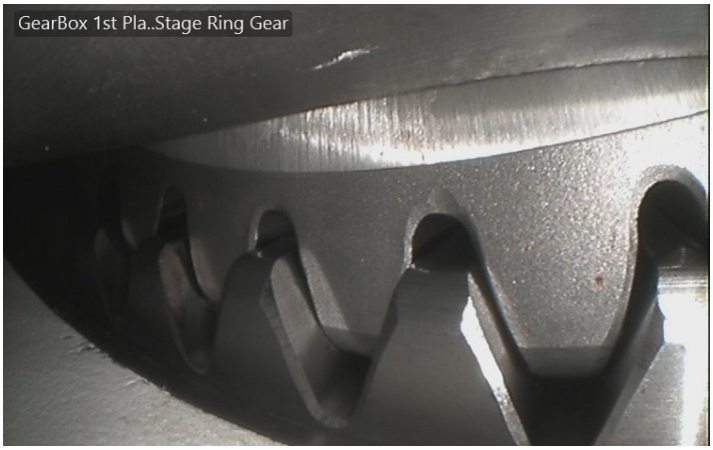
Typical % operating and maintenance cost.

Gearbox issues

Most wind farm operational expenses are related to maintaining and replacing the drivetrain's gearbox, along with production losses due to a non-functioning gearbox.







Intermediate- and high-speed stage bearings

The Problem: The failure of a high- or intermediate-speed bearing can lead to damage of other gearbox parts, and in some cases the entire gearbox may need to be replaced. The root cause of this bearing damage is myriad and can include misalignment between the high-speed shaft and the connected generator as well as foreign object, lubrication oil viscosity, and cleanliness issues.

Our Solution: Waygate Technologies' video borescopes offer superior image quality, state of the art image processing tools, and an intuitive user interface, making it easier to inspect, detect and monitor minor flaws on the intermediate- and high-speed shaft, the bearings' roller surface, and the inner and outer race. These advanced tools combined with the ability to upload rich data to the InspectionWorks Insight platform help to predict potential damage and prevent it from spreading to other components.

Planetary stage bearings

The Problem: The planetary gear and the planetary stage bearings serve to absorb varying wind stress. However, limited planetary stage space due to gear dimensions means that bearings used here generally have shortened component life.

Our Solution: Waygate Technologies offers a wide selection of semi-flexible guide tubes giving the user more control and stability to navigate the challenging planetary gears.

Gear teeth

The Problem: Another common failure point for a gearbox is a broken gear tooth, which can be caused by material quality, surface grinding, or hardening process issues.

Our Solution: Videoscopes are needed to conduct a visual inspection of gear teeth—especially those on the low-speed shaft gear, the planetary gear, and the ring gear. Our near-focal optical tips greatly aid in the inspection of gear teeth, allowing very small flaws to be detected.

Wind Turbine Gearbox RVI Solutions Portfolio

Waygate Technologies offers a full range of innovative remote visual inspection (RVI) systems designed to fit your specific inspection needs and budget.

Key features:

- Portable, lightweight, rugged, and versatile (from 3.8 lbs. to 6.75 lbs.)
- Gesture based touchscreen with intuitive user interface (3.7 to 5.8 inch)
- Rugged construction (IP65, MIL-810H, and MIL-461F STD compliant)
- High-power steering motors deliver long lasting maximum articulation probe articulation
- Menu Directed Inspection (MDI) software that guides inspectors through the inspection process, intelligently names files and tags files, and creates inspection reports

Benefits:

- Portability - especially important when climbing the wind tower
- Delivers greater probability of detection (POD) through enhanced image quality
- Stands up to severe environments
- Allows for precise articulation control
- Provides guided inspection and automatic reporting

Mentor Visual iQ+ Video Borescope technology

This revolutionary RVI tool delivers the versatility needed for fast, efficient and accurate decision making. Ideal for inspecting bearings, gearboxes, generators, pipes and blades, the MViQ+ delivers a wide range of advanced features including Real3D on-demand probes that easily reconfigure probe diameter and length, and 3D on-demand Phase Measurement.

Mentor Visual iQ+ Pro

Achieve precise inspections

Our powerful TrueSight™ imaging and analysis software delivers extreme image quality for increased probability of detection (PoD).

Mentor Visual iQ+ Enhance

Boost inspection productivity

This highly capable borescope is designed for exceptional inspection productivity with QuickChange probes and a intuitive touch-screen interface.

Mentor Visual iQ+ Start

Gain ROI with greater inspection efficiency

This value-priced offering provides excellent image quality, a streamlined user interface, and Wi-Fi and Bluetooth connectivity.

Everest Mentor Flex+

Get cost-effective advanced inspection capability

Our versatile MDI 2.0-enabled video borescope offers Real3D stereo measurement capability, a 5.8" WXGA touch screen display, and 3 hours of battery life. Advanced mechanical design enables increased articulation range and responsiveness to ensure thorough inspections in less time with QuickChange probes available in 4.0 and 6.1mm diameters and a 6.2mm working channel probe option.

The Mentor Flex+ also provide Always Up with a real-time gravity indicator for consistent orientation during inspection.

XL Detect | XL Detect +

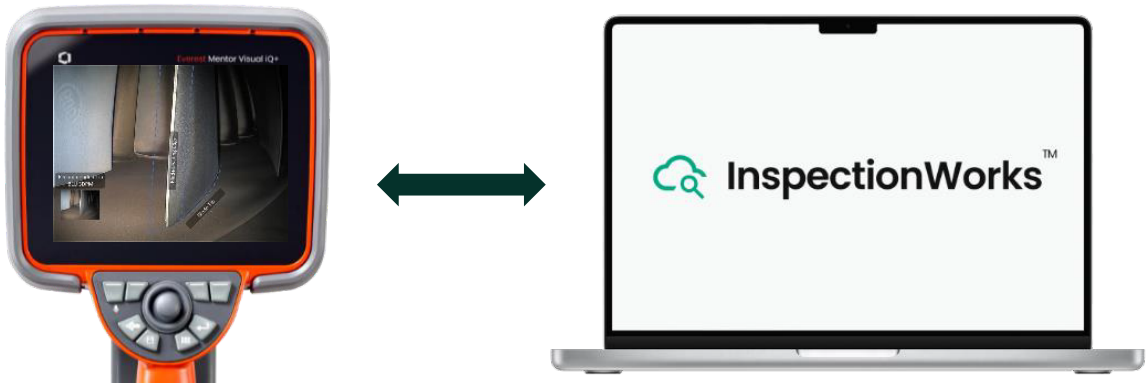
Improve and validate inspection quality

Performance meets value with this durable and lightweight borescope to prevent user fatigue in even the harshest environments.

Inspections Made Simple

InspectionWorks is a nondestructive testing (NDT) software platform designed to simplify and standardize aircraft maintenance inspections, without sacrificing quality. It streamlines inspection processes, standardizes reports, improves collaboration across key stakeholders, and much more.

And the best part is, it seamlessly integrates with MViQ(+) and Mentor Flex borescopes.



Standardize your Inspections
Borescope inspection templates ensure that all inspections are done the way you want them, every time.

Collaborate with Key Stakeholders
Collect inspection data for the entire maintenance process. Share data securely not only with your direct team, but also with asset owners and engine manufactures.

Digitize your Inspection Process
Data gathered from your MVIQ+ can automatically populate InspectionsWorks. Then, generate reports with the click of a button.

Centralize your Inspection Data
Bring all your inspection data into one unified platform. View and compare detailed inspection information on incoming and outgoing inspections.

Start with an MDI
Create a Menu Directed Inspection (MDI) to templatize your inspection process and launch it on your borescope.

Capture & Analyze Data
Gather data and analyze with Real3D Measurement and AI. Automatically upload with Push2IW.

Store, Search, Measure & Share
All your inspection data is at your fingertips. Collaborate and share with key stakeholders.

Report
Automatically generate reports based on your MDI. Share those reports with asset owners & engine manufacturers.

Product Kit Technical Details

Mentor Visual iQ+ Wind Kits

3.9mm MViQ Wind Kit	
Kit Part Number:	**MVIQCS3930-WIND**

Includes:

Model	Description
MVIQKS3930-9531	MVIQ+ Start, 3.9mm x 3m in carry on case
PXT480SG	3.9mm side view brown tip
PXT490SN	3.9mm side view red tip
MVIQBBATT	2-hour battery pack
XA-CLEANKIT	Optical tip cleaning kit in hard case
GTD-400S	Flexible guide tube with 4mm gripper

4.0mm MViQ+ Wind Kit	
Kit Part Number:	**MVIQCS4030-WIND**

Includes:

Model	Description
MVIQES4030-CO	MVIQ+ Start flame 4.0mm x 3.0m in carry on case
T40120SF	4.0mm side view blue tip
T40115FN	4.0mm forward view black tip
T40115SN	4.0mm side view red tip
MVIQBBATT	2-hour battery pack
XA-CLEANKIT	Optical tip cleaning kit in hard case
GTD-400S	Flexible guide tube with 4mm gripper

6.1mm MViQ+ Wind Kit	
Kit Part Number:	**MVIQCS6130-WIND**

Includes:

Model	Description
MVIQES6130-CO	MVIQ+ Start Flame 6.1mm x 3.0m in carry on case
XLG3T61120SG	6.1mm side view blue tip
XLG3T61120FG	6.1mm forward view black tip
MVIQBBATT	2-hour battery pack
XA-CLEANKIT	Optical tip cleaning kit in hard case
GTD-600S	Flexible guide tube with 6mm gripper

XL Detect Wind Kits

3.9mm XL Detect Wind Kit	
Kit Part Number:	**XLDEB3930-WIND**

Includes:

Model	Description
XLDEB3930-9270	3.9mm x 3.0m XL Detect VideoProbe
PXT480SG	3.9mm side view brown tip
PXT490SN	3.9mm side view red tip
XLGOABATTB	4-hour battery pack
XLDE-MDI-11	Menu directed inspection software enhancement
XA-CLEANKIT	Optical tip cleaning kit in hard case
GTD-400S	Flexible guide tube with 4mm gripper

Everest Mentor Flex+ Wind Kits

4.0mm Mentor Flex+ Wind Kit	
Kit Part Number:	**MFLC4030-WIND**
Short description:	**MFLEX+ Wind Kit, 4.0mm x 3.0m**

Includes:

Model	Description
MFLCSYS1-CO	Everest Mentor Flex+ System, CO Case
MFLCP4030	4.0mm x 3.0m Everest Mentor Flex+ QuickChange Probe
T40120SF	4.0mm blue side view blue tip
T40115FN	4.0mm side view black tip
T40115SN	4.0mm side view red tip
MVIQBBATT	3-hour battery pack
XA-CLEANKIT	Optical Tip Cleaning Kit, Hard Case
GTD-400S	Flexible Guide Tube with 4mm Gripper

6.1mm Mentor Flex+ Wind Kit	
Kit Part Number:	**MFLAS6130-WIND**
Short description:	MFLEX+ Wind Kit, 6.1mm x 3.0m

Includes:

Model	Description
MFLCSYS1-CO	Everest Mentor Flex+ System, CO Case
MFLCP6130	6.1mm x 3.0m Everest Mentor Flex+ QuickChange Probe
XLG3T61120SG	6.1mm side view blue tip
XLG3T61120FG	6.1mm forward view black tip
MVIQBBATT	3-hour battery pack
XA-CLEANKIT	Optical tip cleaning kit in hard case
GTD-600S	Flexible guide tube with 6.1mm gripper

Explore our website at **waygate-tech.com**

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