



**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, intelligent software solutions, and expert field support services



# 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 and expert field support to efficiently evaluate and combat ongoing machine wear. From software that lets you identify problems before they arise 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.

**The best technology is grounded in knowledge.**

**Intelligent Machines** provide data for smarter decision making.

**If you can predict, you can prevent.**

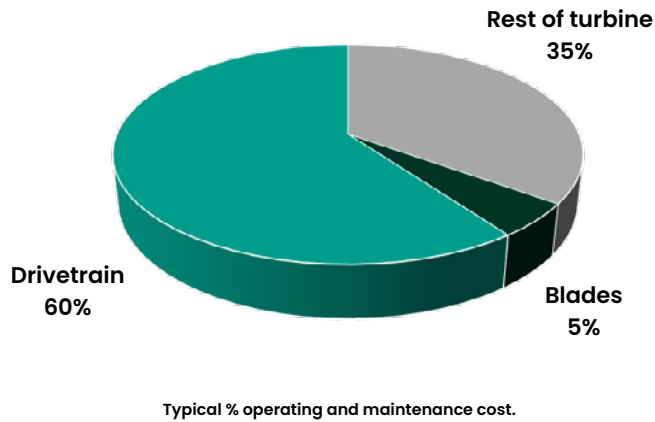
**Advanced Analytics** reflect our commitment to integrating intelligence into software.

**Connections drive solutions.**

**People at Work** rely on our technology to help solve problems quickly.

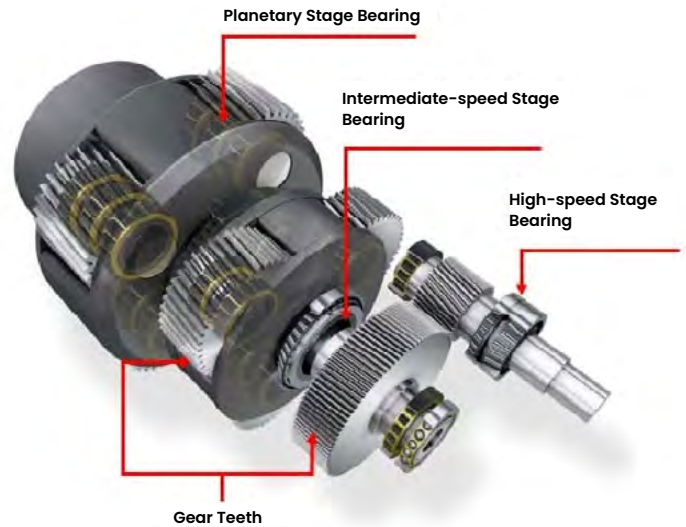
## The drivetrain is priority #1

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.



## 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.



## 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. In addition, they feature advanced intelligent software solutions such as Menu Directed Inspection (MDI), which improves 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
- Guided inspections that shorten the learning curve, reduce inspection variability, and decrease errors
- Automatic inspection report generation
- Faster inspections and easier data sharing





## 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 6.5 inch)
- Rugged construction (IP64, MIL-810H, and MIL-461F STD compliant)
- XpertSteer 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, 3D on-demand Phase Measurement, and real-time video streaming for live inspection collaborations.

## Mentor Visual iQ Analyze

### Achieve precise inspections

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

## Mentor Visual iQ Touch

### 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 Inspect

### 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 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.

## XL Series Video Borescope technology

Protect valuable industrial assets and lower maintenance costs with powerful and accurate video borescope inspection technology from Waygate's XL Series. Ideal for inspecting bearings, gearboxes, generators, pipes and blades, the XL Series provides industry leading image quality in a compact and rugged design.

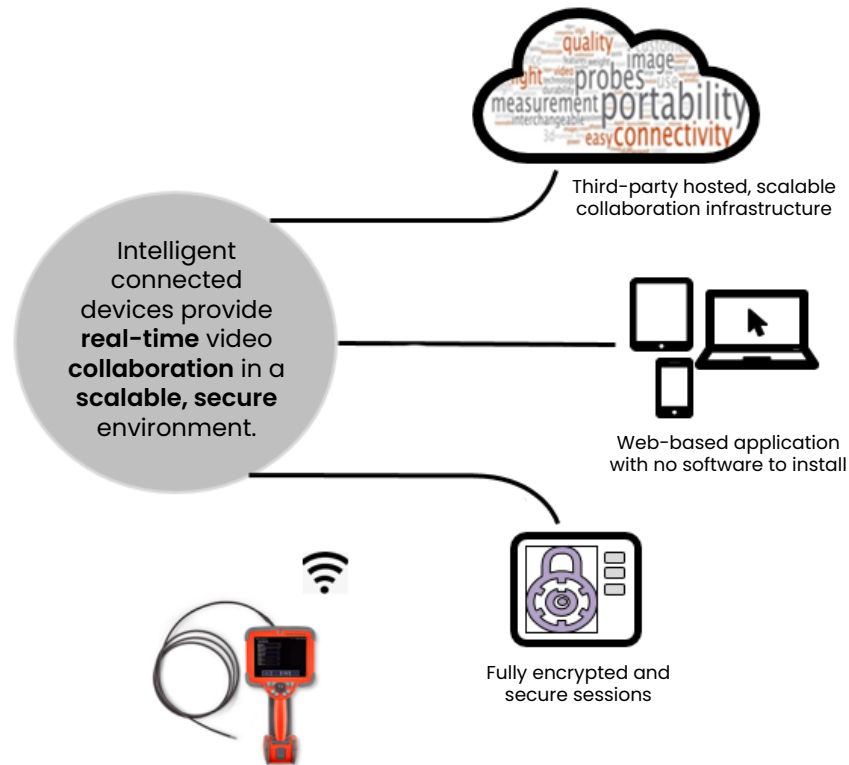
## XL Detect | XL Detect +

### Improve and validate inspection quality

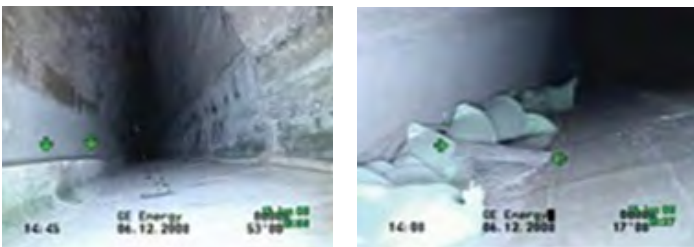
Performance meets value with this durable and lightweight borescope to prevent user fatigue in even the harshest environments.

# Intelligent software for smart decisions

Get the most from your inspection data with InspectionWorks.



## Advanced turbine blade inspection solutions for critical care in hard-to-reach places



Visual inspection shows the actual condition inside the blades.

Because they are subjected to tremendous aerodynamic forces, turbine blades can suffer fatigue-related damage, particularly crack-forming delaminations. High blade-tip velocities can erode the blade's leading edge, while constant stall on the trailing edge can degrade the laminates.

Waygate Technologies offers equipment rental and full-service solutions to meet your specific needs. Equipped with a large inventory of the latest inspection technologies—including robotic crawlers, video borescopes and a variety of pan-tilt-zoom cameras—highly experienced field technicians can help you effectively examine your turbine blades for irregularities, especially those between the skin laminate and load-carrying main spar. Our robotic crawlers thoroughly survey any blade shear using visual inspection to help ensure proper blade balance and bending resistance.

# Product Kit Technical Details

## Mentor Visual IQ Wind Kits

3.9mm MVIQ Wind Kit	
Kit Part Number:	MVIQCS3930-WIND
<b>Includes:</b>	
Model	Description
MVIQCS3930-9250	MVIQ INSPECT, 3.9mm x 3m in carry on case
MVIQ-TOUCHSCRN	Touch screen feature addition
PXT480SG	3.9mm side view brown tip
PXT490SN	3.9mm side view red tip
MVIQABATT	2-hour battery pack
XA-CLEANKIT	Optical tip cleaning kit in hard case
GTD-400S	Flexible guide tube with 4mm gripper
MVIQ-MDI	Menu directed inspection software enhancement

4.0mm MVIQ Wind Kit	
Kit Part Number:	MVIQCS4030-WIND
<b>Includes:</b>	
Model	Description
MVIQCS4030-CO	MVIQ inspect flame 4.0mm x 3.0m in carry on case
MVIQ-TOUCHSCRN	Touch screen feature addition
T40I20SF	4.0mm side view blue tip
T40I15FN	4.0mm forward view black tip
T40I15SN	4.0mm side view red tip
MVIQABATT	2-hour battery pack
XA-CLEANKIT	Optical tip cleaning kit in hard case
GTD-400S	Flexible guide tube with 4mm gripper
MVIQ-MDI	Menu directed inspection software enhancement

6.1mm MVIQ Wind Kit	
Kit Part Number:	MVIQCS6130-WIND
<b>Includes:</b>	
Model	Description
MVIQCS6130-CO	MVIQ Inspect Flame 6.1mm x 3.0m in carry on case
MVIQ-TOUCHSCRN	Touch screen feature addition
XLG3T6I120SG	6.1mm side view blue tip
XLG3T6I120FG	6.1mm forward view black tip
MVIQABATT	2-hour battery pack
XA-CLEANKIT	Optical tip cleaning kit in hard case
GTD-600S	Flexible guide tube with 6mm gripper
MVIQ-MDI	Menu directed inspection software enhancement

## XL Detect Wind Kits

3.9mm XL Detect Wind Kit	
Kit Part Number:	XLDEB3930-WIND
<b>Includes:</b>	
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

3.9mm Everest Mentor Flex Wind Kit	
Proposed kit part number:	MFLAS3930-WIND
<b>Short SAP description:</b>	Everest Mentor Flex Wind Kit, 3.9mm x 3.0m
<b>Includes:</b>	
Model	Description
MFLAS3930-BP	3.9mm x 3.0m Mentor Flex VideoProbe, backpack case
PXT480SG	3.9mm side view brown tip
PXT490SN	3.9mm side view red tip
MVIQABATT	3 hour battery pack
XA-CLEANKIT	Optical tip cleaning kit in hard case
GTD-400S	Flexible guide tube with 4mm gripper

4.0mm Everest Mentor Flex Wind Kit	
Proposed Kit Part Number:	MFLAS4030-WIND
<b>Short SAP description:</b>	Everest Mentor Flex Wind Kit, 4.0mm x 3.0m
<b>Includes:</b>	
Model	Description
MFLAS4030-BP	4.0mm X 3.0m Mentor Flex VideoProbe , backpack case
T40I20SF	4.0mm side view blue tip
T40I15FN	4.0mm forward view black tip
T40I15SN	4.0mm side view red tip
MVIQABATT	3 hour battery pack
XA-CLEANKIT	Optical tip cleaning kit in hard case
GTD-400S	Flexible guide tube with 4mm gripper

6.1mm Everest Mentor Flex Wind Kit	
Proposed kit part number:	MFLAS6130-WIND
<b>Short SAP description:</b>	Everest Mentor Flex Wind Kit, 6.1mm x 3.0m
<b>Includes:</b>	
Model	Description
MFLAS6130-BP	6.1mm X 3.0m Mentor Flex VideoProbe , backpack case
XLG3T6I120SG	6.1mm side view blue tip
XLG3T6I120FG	6.1mm forward view black tip
MVIQABATT	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 [here](#).

