Reducing risks and costs with virtual reality

How can the latest technology enable real-time monitoring of turbine blades and towers, enabling repair and replacement before a critical failure occurs? Is this the way forward for protecting assets and lowering costs?

In November 2021, US President Biden signed a $1.2 trillion infrastructure bill to rebuild the nation's deteriorating roads and bridges and fund new climate resilience and other initiatives. The Bipartisan Infrastructure Law's investment includes the largest investment in clean energy transmission and grid in American history. It will upgrade the country's power infrastructure, by building thousands of miles of new, resilient transmission lines to facilitate the expansion of renewables and clean energy, while lowering costs. It will also fund new programs to support the development, demonstration, and deployment of cutting-edge clean energy technologies to accelerate the transition to a zero-emission economy.

DarkPulse is a global leader in critical infrastructure/key resource monitoring. The innovative company has developed patented high resolution smart sensors that perform real-time health monitoring of critical infrastructure.

Smart infrastructures for smart cities

The company believes the US has begun its journey towards smart infrastructures, which will lead toward smart cities. It is therefore positioning its systems and capabilities as the foundational technology for smart cities.

In September, Dark Pulse launched the latest virtual reality (VR) technology for infrastructure at the Smart Cities Connect Conference and Expo, held in Washington DC. Its VR capable, 3D, anywhere, any device user interface was available for Smart City leaders to put on headsets and walk the Honcut Bridge, located outside the city of Sacramento, California.

Visitors to the exhibition experienced how the alert system works and how engineers could visit the geo-tagged locations to inspect them in real-time. A digital twin of the bridge has been created, allowing users to see real-time the effects weather, overweight vehicles, storms, or collisions can cause on the bridge structure.

This new virtual reality technology has been used on the world's first intelligent piece of infrastructure; the Honcut Bridge in Sacramento, California. DarkPulse joined the pilot project in November 2021 to monitor the structural health of bridges and roadbeds with the California Department of Transportation (CALTRANS) and used its patented BOTDA system to monitor temperature changes of concrete in real-time ensuring proper curing had occurred.

There, the system remains in place, where it monitors the stress and strain of the bridge's structures and roadbed. The bridge includes a section of Smart Road™ which is capable of overweight vehicle and speed detection and version 2 will include an EV dynamic Charging Lane™, which will allow electric vehicles to charge whilst driving.

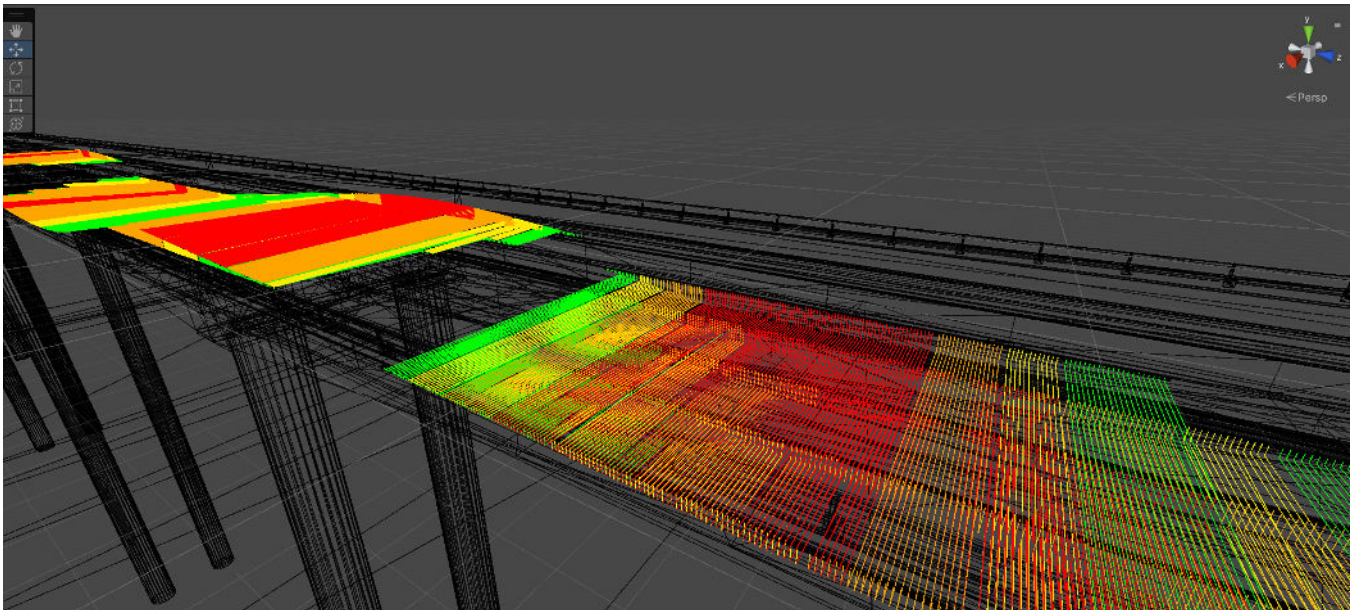
Virtual reality for the wind energy sector

Specifically for the wind market, DarkPulse's solutions can be used from the planning and design stage, through installation and construction, to monitoring and maintaining assets and protecting personnel.

DarkPulse sensors provide real-time monitoring of structural heath and temperature changes of turbine blades, structural health and corrosion of towers, and integrity of array cables. This enables repair and replacement to be conducted before a critical failure occurs, protecting assets and lowering costs.

All types of blade failures can cause significant economic loss and incur negative social impact. Despite regular inspections, 85% of blade failures are due to poor maintenance. These failures are extremely costly, ranging from £80,000 to £811,000 with the highest reported failure costing £4.8m, according to TWI Global, 2020. Early detection through instant identification ensures an immediate and correct response by engineers.

The easy-to-use interface helps every team member get involved, without needing to be an engineer or the need to use a headset. The high-quality 3D visuals are accessible to personnel from any position and any location. For example, if an engineer found a concern on a tower, they could geo-tag the position and raise an alert which allows others to take a closer inspection.



Turbine health and cost savings

The VR element of the DarkPulse offering could be used to look at the condition of wind turbine blades after electrical storms or impacts from objects, to check their condition immediately, allowing decisions to be made about turbine health or next steps should the system be showing stress.

Whilst VR might not be applicable for subsea cables, the ability to look for hot spots using fibre installed could prevent catastrophic failure and reduce downtime associated with cable failures, or allow planned maintenance. All of this is with the aim of keeping unplanned unavailability to a minimum and limiting the effects of weather on wind farm access for technicians to complete works or visual checks on suspected emergencies.

With tight budgets, it's also good to know that Dark Pulse systems can easily be added to existing infrastructure, so there is no need to consider the cost of rebuilding. For example, if single mode fibre is already installed in cables, a single core can be utilised to deploy the DarkPulse technology and through drone technology their 3D scans turn in-service assets into 3D models allowing retrofits and the planning of maintenance activities.

During the planning through co-design, learning, and education, the DarkPulse software can also be deployed in control rooms to give accurate, instantaneous data on the health of the wind farm to control room staff, technicians, and engineers.

As well as the DarkPulse fibre technology, holistic access control, security, communication, and radar systems can be designed, tested, and installed by the team. With ongoing maintenance and 24/7 support services, the company ensures all clients get the most from their assets, whilst preserving the integrity of their operations. With a multi-layered maintenance team that includes accredited technical engineers and trainers to support the lifecycle of the telecommunications and security solutions. The diagram above shows not only the size of stress / strain applied to the bridge (in this instance) but also the direction in which it has been seen, which could aid in determining the issue or root cause.

The user interface can also be an aid for training, allowing operators to scroll back through time and see the stress and strain on components at precise moments or events, this can aid lessons learnt and advise measures needed should similar events occur in the future.

Part of the DarkPulse mission is to safeguard human security and the company believes its patented sensor systems will reduce accidents drastically. Not only with the VR technology but also through its perimeter security and surveillance services, which evaluate conditions on the remote site and safeguard personnel whilst monitoring operations.

Offshore wind engineers trained virtually

In the UK, the offshore wind energy industry is developing at an enviable pace, with more than 1,465 installed turbines. But it has also experienced a significant increase in accidents, both in the UK and globally. For example, the Caithness Windfarm Information Forum (CWIF) reports that there have been 1,951 wind energy accidents, with 165 fatalities since 1970, with most of these accidents occurring within the last eight years.

One of the reasons for this high number of accidents is the lack of skilled workers. This gap is likely to grow as the renewable energy industry moves even further offshore in the future. So there is clear potential for a rise in the number and severity of accidents unless action is taken to ensure workers have the necessary skills.

In July in Massachusetts, 12 offshore wind workers became the first in the world to receive certification through virtual reality training. With DarkPulse equipment and digital twin technology, staff training can become an easy task, where inexperienced trainees can gain hands-on training whilst staying within the safety of an office, reducing risk to personnel safety, and reducing training costs significantly.

Using the capabilities and experience of six members of the DarkPulse team, they can not only offer end-to-end solutions for wind farms, but also reduce accidents and catastrophe, reduce maintenance costs, and provide better training ready for future developments in the wind industry.

www.darkpulse.com

About DarkPulse

Founded by Dennis O'Leary, DarkPulse was started in 2010 in New Brunswick Canada, and via a reverse merger went public in 2018. Headquartered in the USA with a global footprint, DarkPulse and its subsidiaries provide engineering, installation, and security management solutions for critical national infrastructure to governments and industries worldwide.

DarkPulse is more than a global leader in critical infrastructure/key resources monitoring. Its patented high-resolution smart sensors perform real-time health monitoring of critical infrastructure, creating the foundational technology necessary for building and interconnecting smart cities to monitor around the world.