

UAV technology rises to the challenge

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Across the renewables industry, UAV technology is now an established and essential part of maintenance inspections and surveys. The accessibility and capability of the mission-critical data gathered for asset integrity inspections has been a 'game changer'.

It is not just the savings in terms of time- and cost-efficiency that are decisive, but the numerous operational benefits that include improved monitoring and planning and the removal of risks to personnel.

The technology has proven itself against so many long-established ways of working. The UAV inspection method avoids the need for rope-access inspections and associated costly asset shutdowns, saving time and money as well as removing the risks of working at height.

Work scope for fabric maintenance can be quantified much more quickly and accurately through close visual inspection for example. CVI inspections generate thousands of images and high-definition video. All of this provides data to inform engineering decisions in a fraction of the time that it would take a large rope access team to cover an area such as a full turbine.

In fact, a UAV inspection of a turbine will take on average about 75% less time than it would take a rope access team to



even save an operational shutdown. They can also often extend production by generating information that feeds into decisions about operational continuity: images and detailed analysis can often mean that the need for an unplanned shutdown can be avoided.

A huge advantage in offshore environments

In harsh offshore environments, where yearly inspections are required, UAV inspections are deployed to log the ravages of sea salt corrosion; turbines in offshore wind farms are subjected to a mixture of salt and seawater that represents the most challenging site conditions for coating performance. The abrasive effect of salt and airborne particles, including sand in coastal locations, is further exacerbated by the action of the rotor blades. At full speed the tips of the blades can exceed 50 meters per second. In addition, levels of ultraviolet (UV) radiation are significantly elevated on the coastline and at sea.

Bespoke UAVs are able to operate in high winds and cope with variable air pressure and high wave conditions, delivering the same high-quality inspection footage. Deploying UAVs in the offshore environment means that rope access crews are not required to be shipped to each turbine and then spend hours rigging up. Instead, the two-man UAV inspection team can carry out detailed inspections of a whole series of turbines from a boat within regulation distance.

At the heart of renewable asset management

It is for all of the reasons outlined above that UAV specialists are at the heart of helping renewables operators to design their asset management programmes. Everything starts with agreeing objective measures of guidelines and condition ratings, which are based on detailed images that identify precisely what each rating represents for each component.

Inspection related to issues such as tip repairs, trailing and leading edge splitting, lightning damage, laminate damage, cracks and faults, shipping and construction related damage and end of warranty campaigns can all be dealt with most effectively by UAV technology.

The technology is equally vital to the inspections and maintenance of solar power plants, ensuring energy efficiency and energy generation - and prolonging the longevity of an asset over decades.

Undetected failures and small issues can have a real impact on overall operations, leading to lower energy generation and associated losses of revenue; such losses can quickly multiply as more problems occur.

Inspections of solar farms are part of a

maintenance regime that monitors all of an array's components to achieve maximum performance.

Dealing with solar farm issues – technical and environmental

UAV technology and imagery on solar farms can deal with a whole range of issues including the identification of damage to PV cells, such as that caused by browning and discoloration.

This degradation in the film, a by-product of UV radiation, leads to impaired output and productivity. Shorted cells can be located too using infrared imaging; some shorting problems can be traced back to defects present in semiconducting materials at the time of manufacture. Dirty panels are a further source of decrease in output; everything from dust to bird droppings can potentially cause problems.

UAV thermography can be used to detect hot spots on solar panels, which can be a sign of a number of faults, depending on their location, ranging from interconnection problems to defective bypass diodes, internal short-circuits or a cell mismatch. Shadowing and cracks in cells show up as hot spots or patches in thermal images, which are compared under load, no-load, and short-circuit conditions.

The natural environment itself can pose a real threat to the integrity of solar farms. Earth movements and ground erosion can be a serious concern, but can be monitored by regular UAV inspections. While gradual ground erosion is to be expected as a natural process, sudden earth movements and erosion are highly damaging to PV plant.

Loss of topsoil can lead to channels, holes and slopes forming, which can cause conduits to break, racking to shift and have an adverse effect on the efficiency of panels as well as exposing the site to possible water ingress.

Weather events such as high winds and hail storms can damage panels, racking and other equipment – again UAV inspections offer a way of getting a quick overview of just what has occurred.

Other natural environmental issues that can be dealt with most effectively by UAV inspections include overgrown vegetation, which shade cells, interfere with wiring and damage structures. Shaded cells can absorb the power output of many cells in the string, with consequent and drastic falls in output.

Future proofing the technology

The UAV landscape is ever-changing – and UAV companies and their technology need to be the same. Competition is significant and companies have to be on top of and ahead of the challenges facing the industry, developing bespoke platforms that meet

complete. Additionally, the versatility of UAV inspections also includes the ability to carry out precise asset information modelling, optical gas imaging and hyperspectral and thermographic investigations of structures.

A time and cost saving technology

On a windfarm, a UAV can be launched in a matter of minutes and deliver real-time high-definition footage to an inspection team safely located on the ground or from a supply vessel below. The level of detail coupled with the ability to review, slow down, and replay footage means that highly detailed inspections can be carried out to identify problem areas, common difficulties, or regular maintenance requirements. It also means that repairs can be precisely planned, based on the level of detail acquired.

Skilled UAV pilots can acquire data that reduces time spent on a shutdown and



customer needs precisely by engineering solutions from the 'bottom up'.

Texo Drone Survey & Inspection Ltd has been doing exactly this – investing in technology that allows for heavier payloads and enabling its fleet of UAVs to operate under more onerous weather conditions. The UAVs currently in operation can deal with wind speeds of up to 18 metres per second (40.2 mph), with the flexibility to carry a variety of custom payloads. Texo Drone Survey & Inspection Ltd operates under expanded permits, including EVLOS/ BVLOS and a UAV increased weight class (outside the standard 0 - 7kg) for UAV platforms weighing 7 - 20kg.

Achieving ever greater accuracy

Investment is driving ever greater accuracy across the industry, and LiDAR survey work is a prime example. Traditional ground or boat-based surveys typically take ten times longer to carry out than a LiDAR survey – worse still; they come without the added benefit of high-definition images of the site or installation.

Advantages of LiDAR over traditional surveying methods include: dramatic cost savings; step improvement in safety; faster

turnaround and improved site information to aid decision-making.

As with so many UAV applications, it is the scale and accuracy of LiDAR that differentiates it and raises it above conventional survey and inspection methods. UAV surveys can cover hundreds of hectares in a single day and acquire thousands of high-definition geo-referenced aerial photographs.

The principle of LiDAR is to measure distances via light in a pulsed laser form and record the time it takes from its generation and subsequent return to calculate distances. The images are then processed to provide highly detailed aerial mapping and topographic surveys.

In a standard LiDAR survey, accuracy of data is generally to around 40mm; However, substantial investment and development of its LiDAR UAV fleet and associated survey software has led to Texo DSI Ltd achieving accuracy of 1 - 3mm with its survey grade UAV integrated LiDAR system, which is delivered via a custom-built UAV platform that measures over 1,000,000 points per second.

This degree of precision means that

surveys of assets can achieve pinpoint accuracy, which act as highly reliable baselines for future surveys. Combined with the ability to conduct long range (BVLOS), precision inspection of turbine and other renewable assets, via its HEF 32 UHS (Unmanned Helicopter System), allows Texo DSI Ltd to offer a totally unrivalled and unique UAV service to potential clients.

A constant technological evolution

Advances in the technology and customised UAV platforms are bringing ever more operational benefits to renewables operators, providing them with highly accurate data that removes subjectivity and errors from maintenance and planning.

UAV technology is now, quite simply, central to inspection and maintenance regimes across the renewables industry. That looks set to continue due to the versatility and commercial effectiveness of the technology and constant evolution to provide ever more customised inspection solutions.

For more information about Texo Drone Survey and Inspection Ltd please visit www.texodroneservices.co.uk