DARK WING AERIALS

DRONES IN OIL AND GAS

COMPANY BACKGROUND

Darkwing Aerials was founded in 2012, becoming one of the first fully licensed UAV companies in South Africa.

Darkwing quickly became a leader in the film industry, boasting an impressive client list. Darkwing broadened its scope to the Industrial sector in 2018, working in renewables, construction, maritime, telecommunications, security, mining, engineering and insurance.

INDUSTRY OVERVIEW

Drones have come into use in the oil and gas industry as a precise, highly manoeuvrable, and cost-efficient means of carrying out asset inspections, as well as asset management.

Through the increasing use of unmanned aerial vehicles (UAVs), oil and gas companies are enhancing the quality of their inspection procedures and findings, improving the safety and wellbeing of employees, and lowering the typically high costs related to manual inspection and analysis of oil and gas systems.

By implementing the services of drone technology, oil and gas companies are experiencing significant reductions in workplace hazards. Also, based on industry research, the use of UAVs to conduct inspections can produce increased efficiency of up to 33 percent and reduced inspection costs of up to 50 percent.

The main factor prompting oil and gas suppliers to begin using drones is the ability of UAVs to swiftly and securely carry out inspection-related activities that normally require many hours to perform and place workers at substantial personal risk.

In the case of Oil and Gas (O&G) industry, human error constitutes as the largest contributor of over 70% of all accidents.

The services offered by Darkwing in the Oil & Gas industries will enhance workplace safety, reduce downtime of inspections & an increase in cost saving.

Introducing the new Apellix Opus X4 UT System

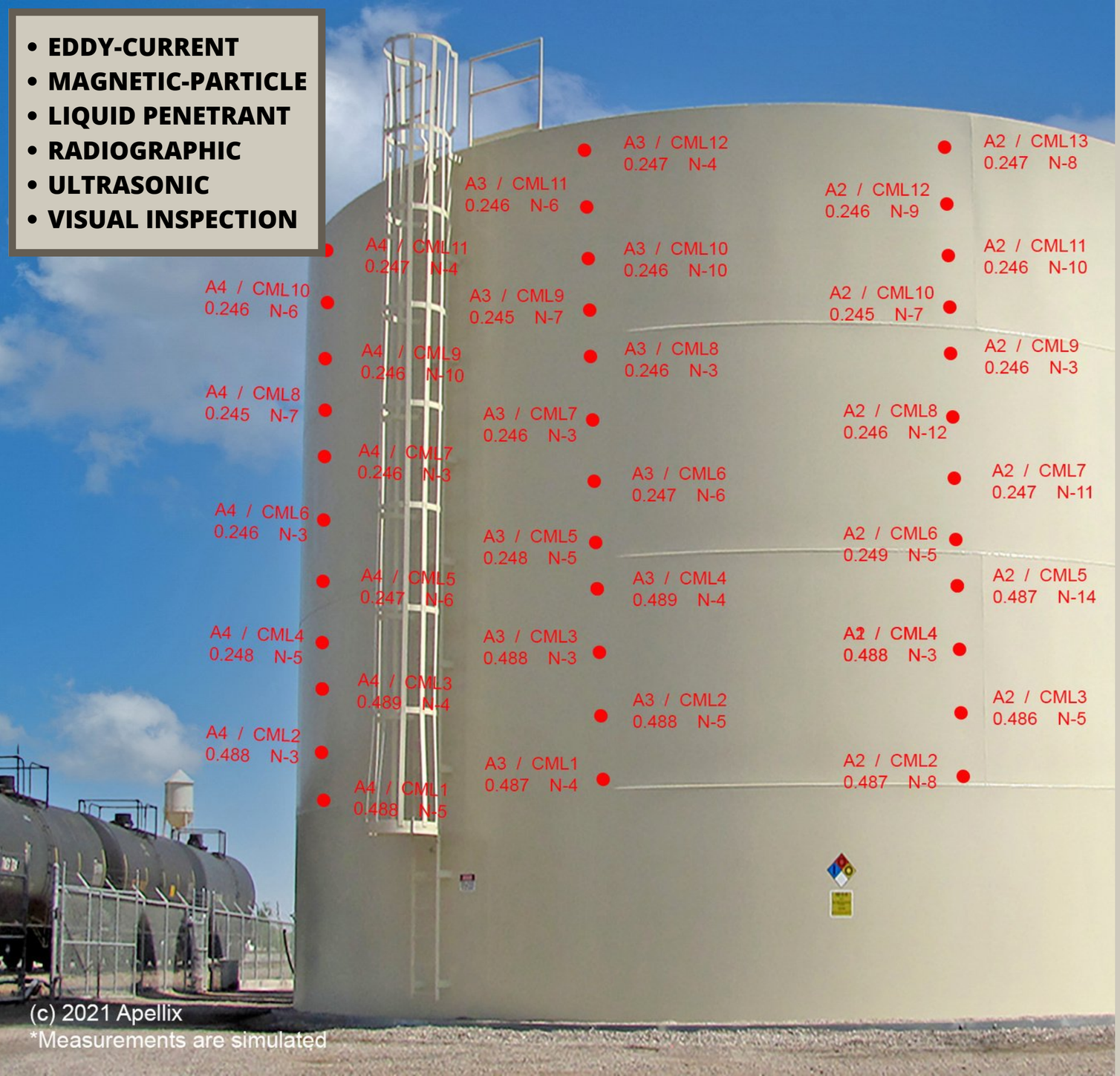
We're excited to introduce the Apellix Opus X4 UT System to our suite of industrial gear. The autonomous drone performs safe, reliable, and cost-effective ultrasonic thickness measurements at height.

AERIAL NDT TESTING

The Darkwing team together with **international robotics** companies, developed ground breaking technology to perform **Aerial NDT**.

This purpose built drone has **interchangeable inspection booms for UTM & DFT surveys.**

Mounting these sensors on our drones allow for **NDT testing** to be conducted on any **tall metal structure**.



The Opus X4 NDE systems **autonomously collect data** similar to what is shown here. In this example, the aircraft pilot flies up to the structure engages the software and the aircraft then takes readings in a vertical line approximately every .25 meters (10") stopping at the top of the tank and waiting for the pilot to manually fly it to the next location and re-engage the software.

The Opus X4 NDE systems have received hot work permits to complete UT measurements in Hazardous Spaces such as UL Class 1 Division 2 / ATEX Zone 2 by integrating onboard gas and LEL sensors to ensure there are no explosive gases in the vicinity of where it is flying.

In addition to the **measurements being collected live** and **streamed in real-time** to the engineers on the ground, the Opus X4 NDE systems provide data for **post-flight reports**, and via the onboard application programming interface the data can be directly imported into Enterprise Resource Planning (ERP) systems such as SAP, JD Edwards EnterPrise One, AkzoNobel's Interplan, and others. It can also be streamed live into Preventive Maintenance Checks and Services (PMCS), Integrity Management Systems (IMS), and more. Data can also be placed in the secure Apellix Data Repository.

THERMAL IMAGERY

Our XT2 pairs the FLIR Tau 2 thermal sensor and 4K visual camera with DJI's leading stabilisation and **machine intelligence technology.**

Using our XT2 FLIR camera the drone can easily detect **heat signatures** from a variety of **altitudes** and **distances.**

The thermal **image data** is available in **real time** to the drone pilot and allows for **quick assessment** and response.

AERIAL VISUAL INSPECTION

Adverse weather conditions can cause **surface damage** to structures over time.

These areas are can be difficult to access via the traditional routes of **rope-access** or erection of working structures such as **scaffolding.**

Darkwing's **drones** are **small** and **agile** enough to reach any area on a structure with ease.

With an **HD stabilised camera**, we can quickly capture images and cover every sector of the structure.

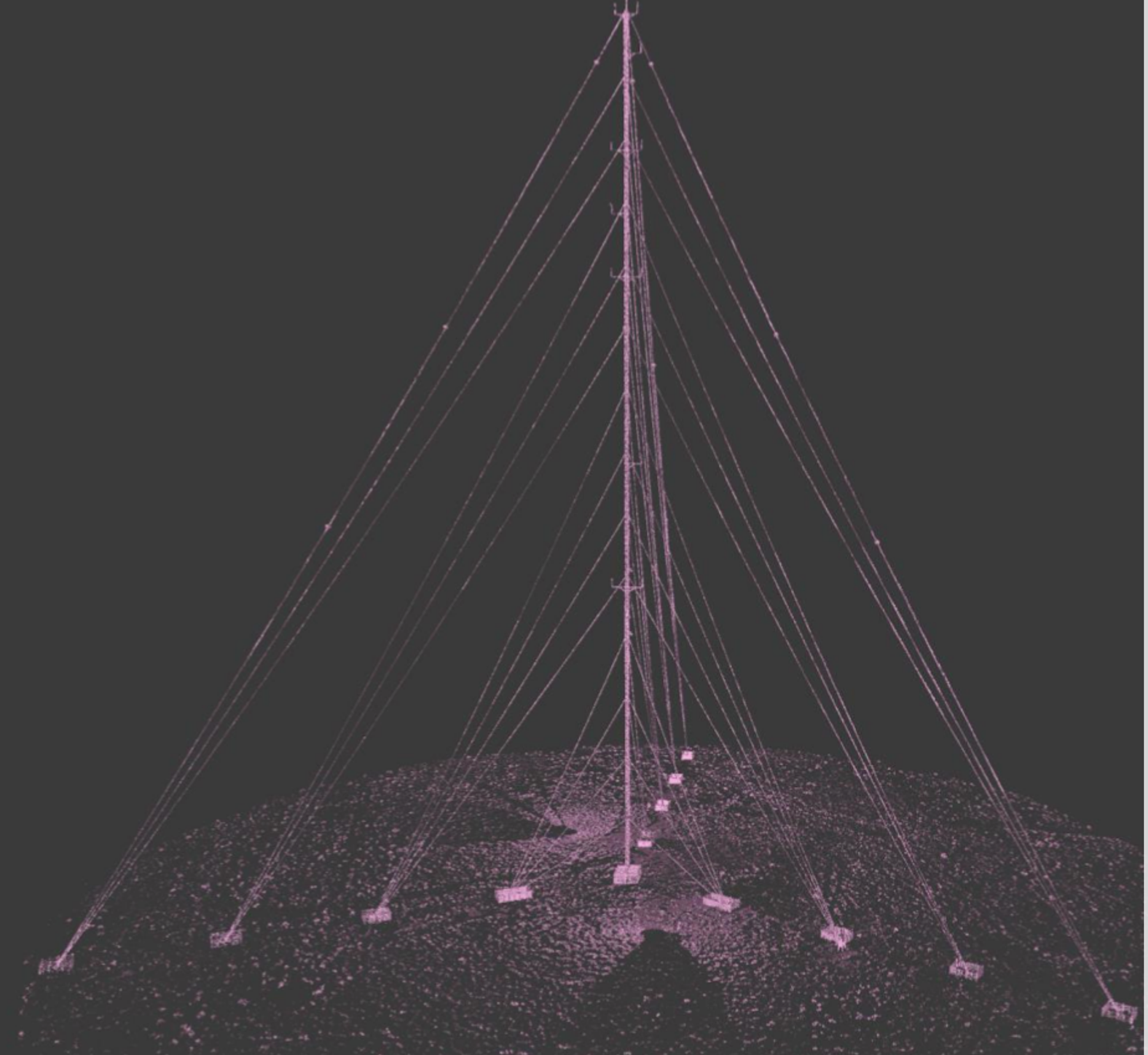
Using drones, **paint degradation** and **structural integrity** can quickly be established and proper **maintenance** arranged.

3D PHOTOGRAMMETRY

Aerial photogrammetry allows Darkwing to reconstruct any structure to scale as a **3D model.**

Photogrammetry uses **2D images** to build a scale accurate **digital twin** of the **structure**. This allows for the recreation of **3D positional data.**

Extremely accurate measurements can be taken from these 3D models.



AERIAL & TERRESTRIAL LiDAR

By generating a **3D point cloud** of your site, we can **reduce** the time, **cost and complexity** of inspections and surveying while providing a detailed 3D model of the area.

We digitise the world around us to create powerful analytical 3D models to extract engineering value. We strive to **improve efficiency, reduce costs**, and provide **comprehensive information** for accurate and informed decisions.

Combining cutting edge drone platforms and **scanning technology** together with **3D digitisation**, Darkwing can produce **pin-point accuracy** in digital twin models.

PREVIOUS WORK: Astron Oil Tank Drone Inspection - September 2021

Darkwing Aerials mobilised to the Astron refinery for the inspection of the internal surfaces of a massive oil tank. The nature and location of the inspection presented our drone team with several challenges. The storage tank is completely covered by a metal roof. There is no natural light available inside the tank and all lighting is via spotlights. The metal roof also blocks all GPS signal and reduces the drone to manual flight control.

Despite the limited light conditions inside the tank, we were able to **capture clear and high-definition images**. This was thanks to the camera mounted on our drone. We used our P1 camera which has a 45-megapixel sensor. It is **excellent for use in low light conditions** and gives the pilot more room to breath and focus on flying the drone.

We did two full rotations of the tank's interior in both directions. All the flying inside the tank was done in **less than thirty minutes**. Despite the difficult conditions it was the right call to use a drone for this inspection. The speed of the drone ensured that the inspection team only had to spend **minimal time** inside the confined space. The image data provided by the P1 also gave **unparalleled coverage** of the tank's interior surface.

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