



AXPO HYDRO DIGITAL



Use Cases of drone applications in hydropower plant operations

Axpo Hydro Digital | Robotics Services | hydrone

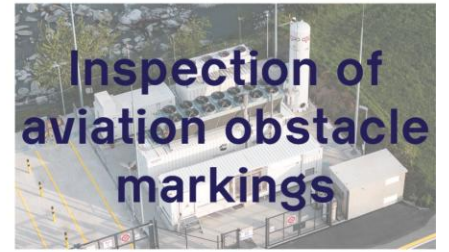
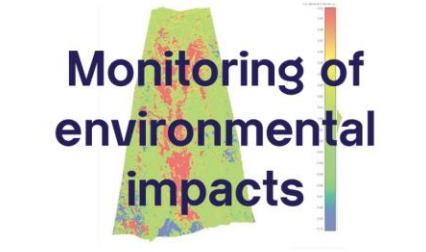
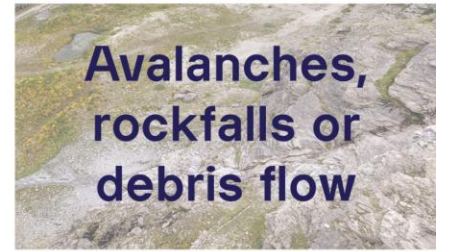


hydrone[®]



**You fly,
we keep you safe**





The potential applications

Routine indoor inspection

During a routine inspection, nuts and washers were found on the floor near the unit transformer.

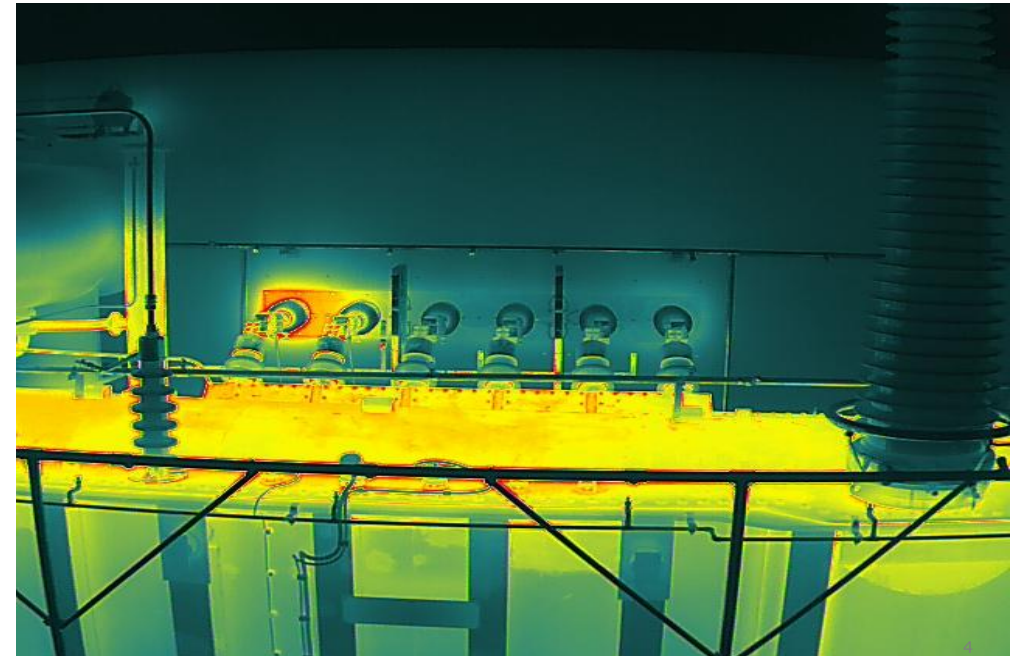
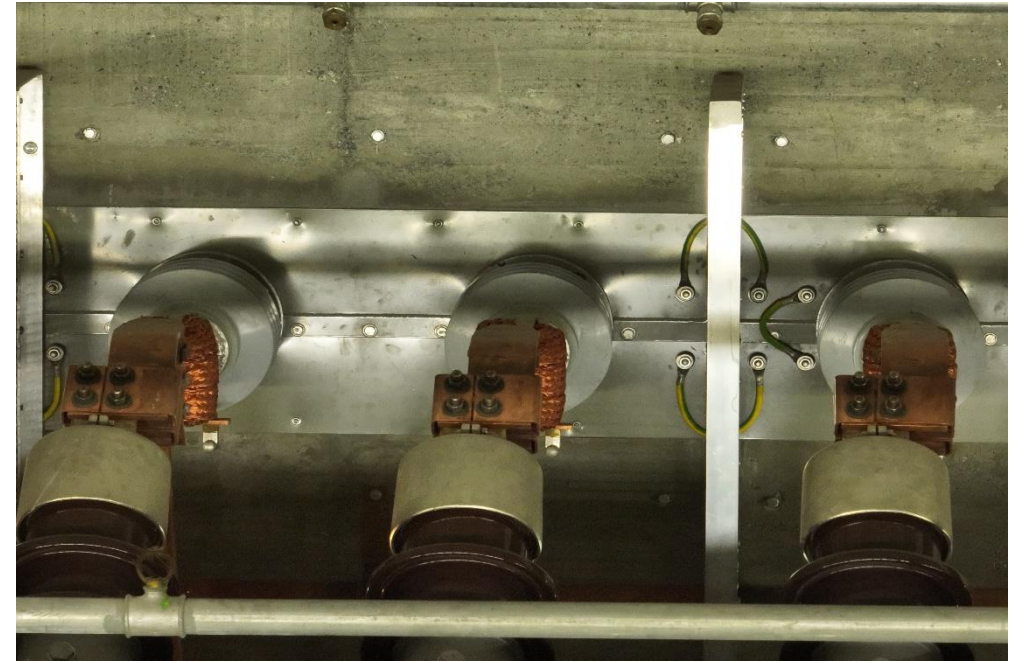
Inspecting the bolted connections would have required shutting down the entire power plant for a day. The drone enabled a quick and safe inspection, which confirmed that the parts did not belong to the transformer.

A thermal imaging inspection was also carried out. The temperature differences observed were consistent with the machine's normal operating conditions.

The inspection demonstrated that drones can be used effectively indoors, even in the presence of electromagnetic fields, and can take on new tasks.

Benefits:

- | | | |
|--|--|--|
| ☒ Time savings | ☐ Reduced need to engage external contractors | ☐ Support with regulatory requirements |
| ☒ Improved workplace safety | ☐ Better information for work orders | ☐ Lower downstream costs for damage to plant and structures |
| ☒ Better access to the asset | ☐ Better data for knowledge retention | ☒ Avoidance of unplanned production downtime |



Volume calculation rockfall

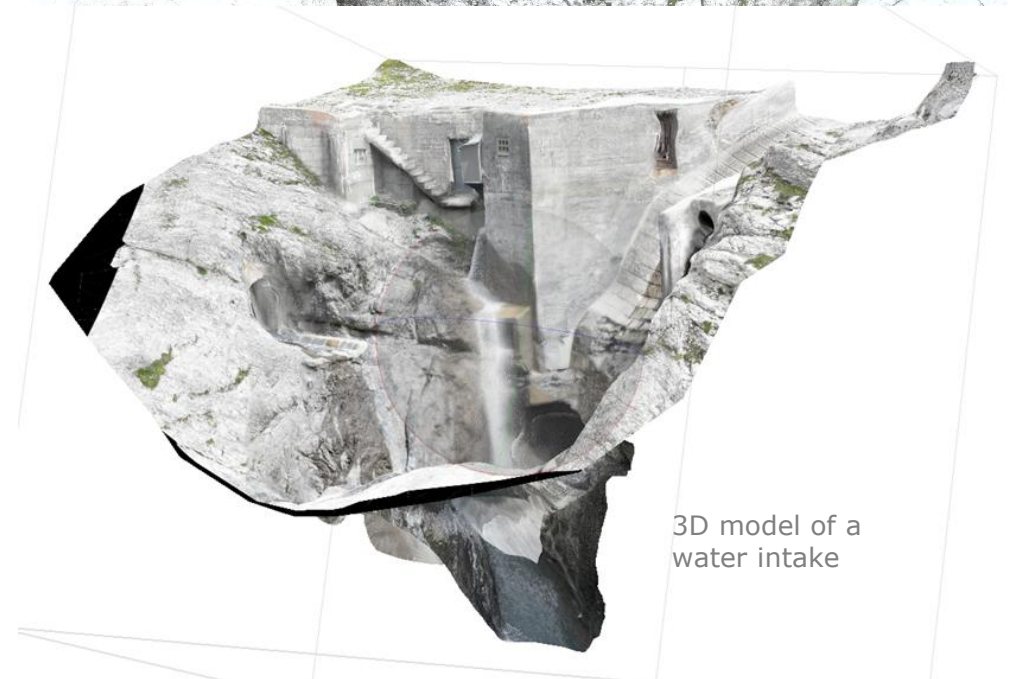
A section of material broke away at a water intake, leaving an overhang. The volume of concrete required for the repair had to be determined.

Instead of carrying out an on-site assessment involving a helicopter flight by a specialist, the plant's drone pilot captured images for a photogrammetric 3D model and sent them to the relevant technical department for modelling.

The precise 3D model created from the drone footage enabled a more accurate calculation of the concrete required for the water intake repair. It also provided an efficient basis for planning further maintenance work.

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3D model of a water intake

Roof inspections

Environmental factors such as storms, frost, moisture, hail and lightning can damage roofs.

Drones make it possible to carry out inspections easily and from a safe distance. For example: Are all the roof tiles, rooflights and windows intact? What condition are the gutters in? Has the solar installation been damaged? Even when it is not possible to inspect every detail directly, images and videos can provide valuable information and support a quick, low-effort and safe initial assessment.

This makes it possible to identify where repairs are needed safely, quickly and with minimal effort.

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Preparing for streambed flushing

Before flushing operations, the streambed must be checked for logs and other large pieces of timber. These should be broken down into smaller pieces so they can be flushed away without creating a risk of blockage.

A drone provides a quick overview from a safe distance, helping to determine whether and where staff need to enter the area on foot.

The area must also be checked regularly shortly before and during the flushing operation to see whether anyone is present. If necessary, the drone can also be used to alert people in the area to the upcoming operation.

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Water intake inspection

Water intakes need to be inspected regularly, but some are difficult to access and can only be reached after a long hike.

Remote inspections are often not possible because there is no power supply or data connection. As a result, it is only possible to determine on site whether maintenance work is required.

A drone provides a quick overview from a safe distance, helping determine whether a site visit is actually necessary to carry out maintenance.

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Weir inspection

Weir structures need to be inspected regularly. This includes components such as bearings, service walkways, hydraulic lines and pivot points. However, some areas are difficult to access and can often only be reached using additional scaffolding or ladders, or by boat.

A drone can be flown directly to the areas that need to be inspected. This saves time and improves workplace safety.

The footage can be used for documentation and training. It can also help describe any resulting maintenance work more clearly.

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Reservoir shoreline inspection

Some shoreline areas around our reservoirs are very difficult or sometimes impossible to reach on foot. This means power plant staff must either make arduous descents and climbs or use a boat.

Drones make it possible to carry out inspections and surveys from a safe distance. They can be airborne quickly on site and provide an immediate overview of the areas concerned.

Staff can quickly gain an initial understanding of the situation, then use the footage for analysis, documentation or training. It can also help define any resulting work orders more clearly.

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Avalanches, rockfalls and debris flows

After avalanches, rockfalls or debris flows, damage usually needs to be assessed promptly to prevent consequential damage or production outages.

Reconnaissance often takes place in areas that are difficult to access or hazardous, and may require the use of helicopters.

A drone provides an immediate first impression of the situation. This helps power plant staff better assess the risks and estimate the damage and the scope of clean-up work.

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Building inspection

Environmental factors such as storms, frost, moisture, hail and lightning can damage structures and facilities, including solar installations, bridges, cable car pylons and high-voltage lines.

Drones make it easier to inspect structures and facilities, particularly in difficult-to-access areas.

Even when it is not possible to inspect every detail directly, images and videos can provide valuable information and support a quick, low-effort and safe preliminary assessment. This makes it possible to identify where repairs are needed safely, quickly and with minimal effort.

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Inspection at height

Overhead power lines, telecommunications lines, lightning protection systems, external penstocks and cableway stations are generally located at height and are difficult to access. Inspecting them can take considerable time and may require specialist equipment or specialist contractors.

Drones make these inspections easier and safer to carry out.

Even when it is not possible to inspect every detail directly, images and videos can provide valuable information and support a quick, low-effort and safe preliminary assessment.

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Inspection of aviation warning spheres

Aviation obstacles such as cableways, high-voltage lines, antennas, towers and cranes must be inspected regularly if their location or height poses a hazard to air traffic.

For example, cableways and high-voltage lines are fitted with aviation warning spheres. Over time, weather can cause them to fade and deteriorate. In addition to requiring the markers to be present, the Swiss Federal Office of Civil Aviation specifies a minimum level of orange colour intensity.

A drone can inspect each sphere individually for colour intensity, damage and missing bolts.

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Clearing roads and paths

Power plants are often responsible for clearing roads and paths and making them safe for use.

To protect employees and other people, routes need to be checked in advance for avalanche risk.

A drone provides a quick overview from a safe distance, helping determine whether a path is safe to walk on or a road is safe to drive on.

Any clearance work, as well as avalanches and snow accumulation, can also be documented.

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Monitoring of environmental impacts

Targeted drone surveys are carried out to create photogrammetric 3D reference terrain models.

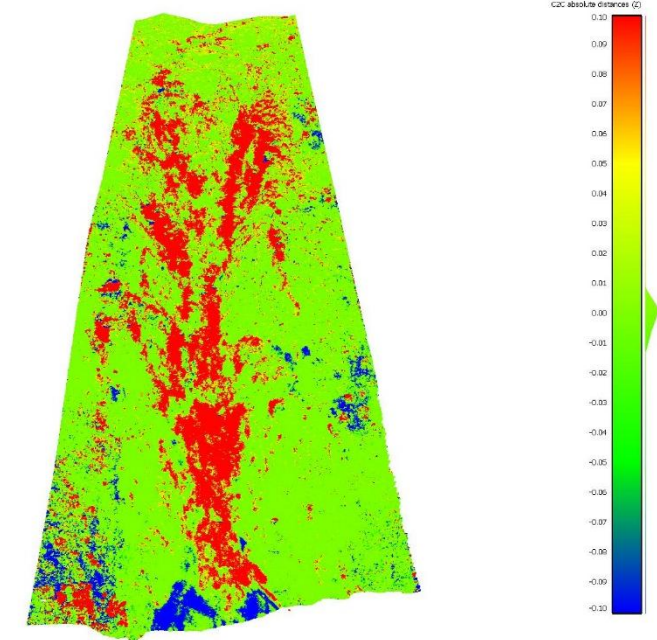
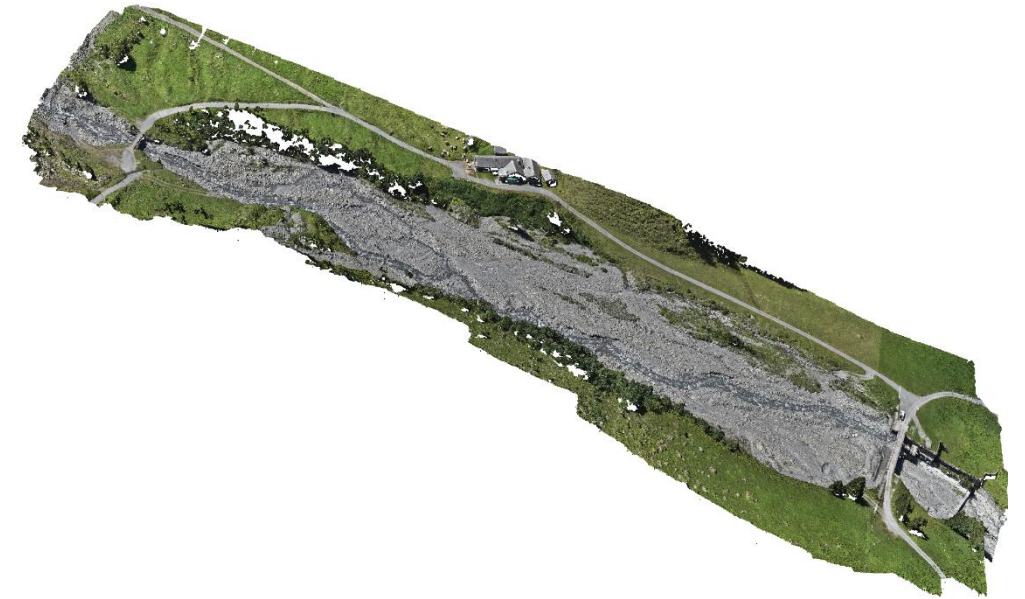
These models can be used to monitor gravel bars, track bedload transport in rivers and observe erosion.

This data-based approach enables changes in river areas to be documented and analysed accurately. It supports well-informed decisions on maintenance measures and river management.

The technical department generally handles the modelling. On site, pilots use pre-programmed flight routes to capture the required images. These routes can be retrieved and reused at any time.

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Documentation

A wide range of documentation can be produced, for example:

- Striking aerial images of the power plant
- Environmental damage following a landslide or storm
- An overview of the construction site, access routes and construction progress
- Aerial views of waterways, for example, to show a new fish passage following work on Weir Ems (KWR)

Drones can capture images that would otherwise require a third-party contractor. The footage can be used in reports, training, work preparation and knowledge retention

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**Contact us if you would like to deploy drones safely
in your organisation.
Benefit from our active community.**



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