

Meet Spot.

This dog-like robot was put through its paces at our plant in Holyrood recently, helping the team there inspect critical equipment.

 See Spot Run.



From four-legged robots to high-flying drones, technology is taking equipment inspections to new heights.

New technologies are increasingly being employed throughout the energy industry as valuable tools for monitoring and surveilling electricity assets to ensure safe, reliable operation.

From transmission lines to turbines, utility companies are using robots, drones and other devices to conduct visual inspections of equipment. It's an effective way to safely complete work in areas that aren't easily accessible otherwise.

At Hydro, we have been using remotely operated devices more and more often in the field – from taking underwater images of dam structures on the Bay d'Espoir system, to completing field assessments and environmental monitoring of our assets.

At our thermal plant in Holyrood, Spot is on the prowl.

Spot the robot is the star attraction during inspection trials being conducted at the plant. Wood PLC has teamed up with Xplorobot to bring in the devices like Spot and show what they can do.

The trial involved, first, "training" the robot to follow programmed routes inside the plant while it gathered a series of visuals and other data. It surveyed the Unit 1 turbine, generator, condenser, boiler feed pump and fuel lines. That information was then used to create detailed digital diagrams of the equipment. It also produces 3D thermal maps, which are useful for early identification of hot spots.

Spot's built-in capabilities allow it to avoid obstacles, and even scale stairs, on its own! The software used can compare current and past data, determine significant changes in the values and send email notifications to alert appropriate personnel.

While Spot scanned the interior of the Holyrood plant, a specialized aerial drone flies outside, inspecting the stacks, marine terminal and the fuel oil pipelines for any potential structural issues or high temperatures.

Joanne Norman, a plant engineer at the Holyrood Thermal Generating Station, recognizes the value that can be unlocked by using leading-edge innovation. "This delivers so much data, it arms us with the information we can use to proactively find trouble areas, which is great from the perspectives of asset performance and safety," she notes. "And it can help with better planning for preventative maintenance."

The technology used offers an array of capabilities in addition to thermal mapping, including vibration testing and gas detection.

While these recent robot and drone deployments at Holyrood were trials, next steps are underway to closely assess the case to adopt the technology

more regularly, based on cost savings and reliability benefits.

"Embracing technology like this is exciting and I think there's real value to be gained," says Joanne. "It's all part of us being a forward-thinking utility."

At the Muskrat Falls Hydroelectric Generating facility, drones are playing a role as our plant operations team monitors the condition and performance of this new asset.

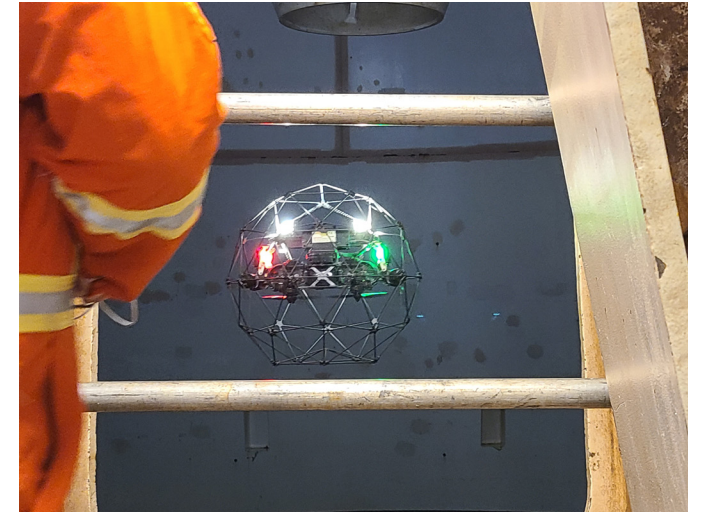
A remotely operated vehicle (ROV) was recently used for internal inspection of the intake area for Unit 1. The ROV was pre-programmed to make a series of precise passes underwater, along the intake structures to collect high-resolution videos and images. These images provide a clear, close-up of the equipment which help our teams detect any damage, unwanted debris or other issues. The videos also give us a visual documentation of current structural condition which can be compared to images from past and future inspections.

For this year's inspection of the turbine runner and spiral case for Unit 1 at Muskrat Falls a drone was deployed inside the unit to gather photos and video of the turbine components, wicket gates and associated civil structures.

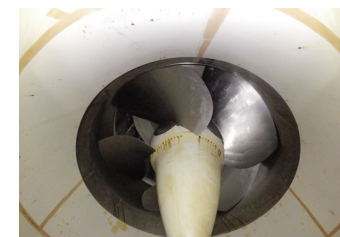
Normal turbine inspections typically require installing a platform below the runner in the unit's draft tube - a process that takes three days to complete, and another three days to remove. The physical inspection itself, done in a confined space, takes at least a day. The drone inspection, was completed in one day. The images captured by the drone allowed us to assess the condition of the turbine components and determine if we need to have a closer inspection performed by our crews.

"There are benefits all around to utilizing these newer technologies," says Des Crawley, Senior Manager for Muskrat Falls Operations. "Physical inspections of our assets, whether done by divers at the intake or our own crews in the turbines, come with inherent safety risks. The biggest benefit I see with these devices is around risk management. The time and cost savings are just another plus."

In addition to safety and efficiency, drones also allow for more frequent monitoring. They are able to provide time-critical inspections and can allow more strategic, planned maintenance decisions to be made.

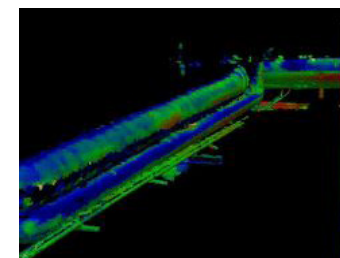


Embracing innovative technology helps ensure we get the most out of our assets to help us run a sustainable utility.



TOP TO BOTTOM:
- This drone was sent inside Unit 1 at the Muskrat Falls Generating Station to inspect the turbine runner, spiral case and other components.

- One of the high-res images that the device collected at Unit 1 in Muskrat Falls.



- 3D thermal map of Holyrood pipelines, created from aerial images taken by a drone.



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