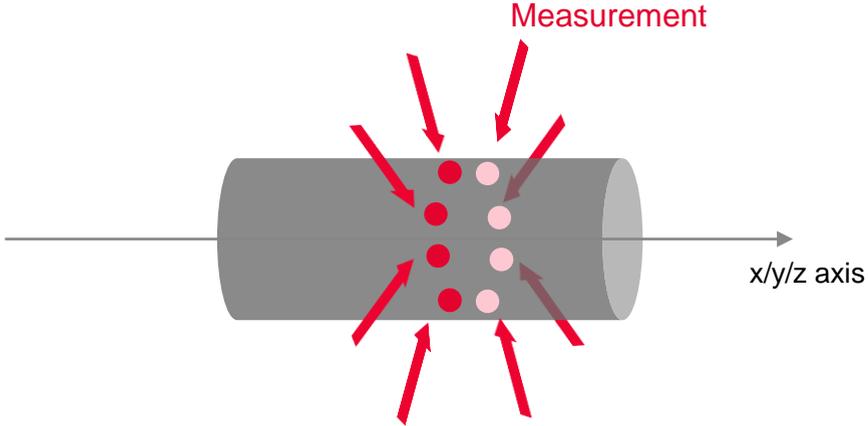


MIDAS - Maintenance of Infrastructure with Drones in Autonomous Flights

«Automated measurement of the corrosion level of masts using drones» project



«Automated measurement of the corrosion level of masts using drones» project description

Initial situation

Some supporting structures, particularly portals, consist of steel pipes that are hermetically sealed on both extremities so that no water or moisture can get into the pipe and no corrosion occurs.

However, it has been ascertained that corrosion sometimes occurs on the inside of the pipe. Since pipes are treated with paint to protect against corrosion, rust goes unnoticed during classic visual inspections.

Climbing supporting structures is expensive and dangerous for employees, as the supporting structures can be over 50 metres high and the lines are live.



Project objective

This project aims to test whether corrosion on masts can be detected using an automated process without switching off the line.

For this purpose, the surface will be tested using an electromagnetic acoustic transducer (EMAT) and the thickness of the pipe walls measured.

Unlike a traditional ultrasound probe, an EMAT does not require a heavy coupling agent and can be installed as the payload on a drone or robot.

The drone employed must be able to allow the EMAT to touch the surface of horizontal and vertical pipes with controlled force and must also be capable of flying 360° around the axis of the pipe.

Flight automation is to take place subsequently, with the pilot only taking over control of the drone in an emergency.

R&D project period: December 2020–June 2021

Partners

- Voliro AG, Weinbergstrasse 35, 8092 Zurich

Project objective

To test an automated process for detecting visible and hidden corrosion areas on masts and portals without switching off the line

Procedure

Use of an EMAT probe

Test of a flying robot to reach hard-to-access places

Deliverable

- Measurement report about the corrosion level of a portal on a substation

Abstract – «Automated measurement of the corrosion level of masts using drones» project

Supporting structures in the grid are exposed to extreme weather conditions. Most structures are made from steel and corrode if steel comes into contact with water. Swissgrid treats all steel supporting structures with paint to protect against corrosion in order to ensure the outside does not come into contact with water. The extremities of cylindrical structures are hermetically sealed to ensure that no water can penetrate them and come into contact with untreated steel.

Detailed inspections have recently identified cylindrical structures where corrosion is already advanced and remains unnoticed behind the protective paint. Since additional supporting structures and, in particular, portals could be affected, all portals are to be inspected.

The traditional approach consists of a mechanical inspection by engineers, who climb up the structures and assess the condition of the steel using a chisel. This approach is dangerous, as the engineers have to climb up to 70 metres, non-standardised, as it depends on the experience of the engineers, and takes a long time, as the lines first have to be switched off. In this project, an innovative approach is being examined, which enables corrosion analysis to be carried out more quickly and safely in a standardised manner.

A drone with an embedded sensor will test the surface of steel elements in an automated process and identify points where the thickness of the steel has reduced, without the line needing to be switched off. Since the sensor has to be applied 360° around the axis of a pipe, the drone must be able to turn 360° around all axes. The drone made by the company Voliro is the only one with this skill and will be tested for use. It will be equipped with an electromagnetic acoustic transducer (EMAT). This sensor measures the thickness of a steel structure without using coupling agents, as a traditional ultrasound sensor does. The use of EMATs on electricity pylons with a strong electromagnetic field has not yet been tested. If the measurements with manual control are carried out successfully, the flight will be automated to enable the measuring sequence to take place more quickly.