PROBLEM-STATEMENT

Long duration between assignment and assessment of the object: Some application scenarios (for example object approval after an earthquake) require quicker results.

Incomplete assessment of the object: Not all building parts can be reached by conventional inspection devices and some defects cannot be detected with customary unmanned aerial vehicles for lack of sensor technology. Conventional surveys by unmanned aerial vehicles only provide photos, i.e. thousands of similar photos without geo-reference must be manually classified and assessed.

Varying objectivity / reliability during damage classification and assessment: The individual quality and experience of the civil engineer leads to different results in assessment in particular regarding the severity of damage and the recommended measures.

High costs: The low automation level and the high human effort lead to high costs in assessment and report generation.

Non-availability: The application of heavy inspection devices leads to an interruption of object utilization, which results in delays (railways) and traffic jams (roads).

Difficult comparability in longitudinal sections: Manual checks of different inspectors involve heavily varying methods and interpretation. An objective comparison how a defect, for example a crack, has developed in the five years between two inspections requires high reliability and objectivity of the measurement method.

Processing of manually recorded data: Manually composed assessments cannot be directly processed in prevalent infrastructure asset management programmes for maintenance planning. Integration into BIM (Building Information Modelling) systems, which experience a strong upward trend, is immediately possible as well.

PROBLEM SOLVING

ADDED VALUE

VCE’s solution is better. By application of artificial intelligence human errors are largely avoided in assessment. The results are available in completely digital form and with 3D geo-references and can be further processed in other services like BIM without interface disruptions.

VCE’s solution is faster. Due to the high automation level and the vertical integration of all relevant sub-steps (flight planning – data collection – data evaluation – further services) a complete assessment of the object can be done within 24 hours in future and is therefore faster than assessments with the conventional method by a factor of 10.

VCE’s solution is cheaper. Due to the low staff costs and faster implementation the costs are significantly reduced. Even in the initial stage the costs of object assessment are not higher than with conventional methods. The service can be heavily scaled and enables a clear cost reduction in the long run without considering further cost saving potentials that are realized by smaller restrictions of availability.

VCE’s solution is more objective. Varying objectivity / reliability during damage classification and assessment is avoided. Structural inspection is reproducible and verifiable any time.

VCE’s solution can be directly processed in well-established infrastructure asset management programmes for maintenance planning. Integration into BIM (Building Information Modelling) systems, which experience a strong upward trend, is immediately possible as well.

VCE’s solution is transparent. An objective comparison how a defect, as for example a crack, has developed within five years between two inspections requires high reliability and objectivity of the measurement method.

VCE’s solution increases availability. Minimization of interruption of object utilization, reduction of penalties, delays (railways) and traffic jams (roads).

VCE’s solution reduces risks. Identify, analyse and monitor risks objectively and transparently.
TECHNOLOGY AND KNOW-HOW BEHIND THE SOLUTION. VCE has the relevant technical know-how and the required interface competences for maximum automation and integration of all necessary steps.

1. Generation of a Digital Twin. Thousands of images are produced from the object to be checked by means of multi-spectral cameras with a high degree of automation. An exact 3D model of the object is generated from these images with extremely high accuracy. This model represents the digital twin of the real object and can be comfortably examined for damage from the office on the screen. Like in Google Earth the object can be first inspected in full view or you can zoom in at any point or position. Unlike Google Earth the resolution can be increased up to 0.1 mm.

2. Automatic Identification of All Defects and Report Generation. The digital twin is no longer checked in detail by human experts of VCE. Defects like cracks, spalling, chlorinity (from 2019), sulphate attack in concrete and mortar (from 2019) and humidity (from 2019) are automatically searched for and compared to results of earlier inspections if necessary (from 2019). All detected defects are marked in a 3D model and automatically summarized in a report. A certified bridge inspection expert approves automatically prepared reports in less than an hour. The assessment whether a structure is structurally safe (e.g. after a landslide) can be done within a few minutes.

3. Link to Further Services. The digital twin as well as the defects are available in well-established data formats and can be further processed in other programmes as required. Consequently these data can be easily used for condition monitoring, planning of necessary maintenance measures or object assessment.