



Non-contact corrosion monitoring of steel reinforcement

Simen Kaasa HELLNER¹, Bodil HOLST¹, Eugen Florin TURCU²

¹ *University of Bergen, Norway*

² *Norce Research, Norway*

We have evaluated the possibility of monitoring the corrosion of concrete reinforcement with the Field Kelvin Probe (FKP) ¹ technology.

The condition of the steel reinforcement (rebars) in concrete structures is a critical parameter for safe operation of large, load-carrying concrete structures. Road bridges, offshore oil and gas platform legs or concrete storage tanks rely on the steel reinforcement for preserving their structural strength. Norway alone has over 17 thousands road bridges of which many are concrete-based. Currently, the condition of the reinforcement is performed by measuring the potential of the steel versus a reference electrode (typically Cu/CuSO₄). This methodology is rather slow and it alters the chemistry of the concrete as it promotes the absorption of Cu²⁺ ions into the concrete bulk.

The FKP evaluation was carried out on a mock-up consisting of steel rebars with two different diameters and pristine and pre-corroded steel plates embedded in a 63x47x5.5 cm concrete slab. Depth of the steel varied from 0.5 to 4.5 cm. To estimate FKP's lateral resolution and impact of the ohmic drop between the rebars of the measurements, the rebars and steel plates were grounded either individually or collectively. Test data collected by scanning the FKP several mm above the slab shows that the water content has a certain effect on the reliability of the measurement but not on the FKP's response time. Thin floor coatings do not interfere with the measurements. FKP corrosion potentials were compared with the data collected by a tailor-made Cu/CuSO₄ reference electrode. Similar test were carried out outside the laboratory on damaged and intact concrete structures.

The correlation between the known position and corrosion condition of the steel and the FKP data are presented and discussed.