GECOR8 CORROSION RATE METER FOR STEEL IN CONCRETE

GECOR8 is a new corrosion rate meter for steel in concrete to be used in large structures developed by Institute Torroja IETcc a Spanish Research Centre (www.ietcc.csic.es) and GEOCISA a Spanish firm of DRAGADOS Group (www.geocisa.com), which include 4 different techniques in one equipment.

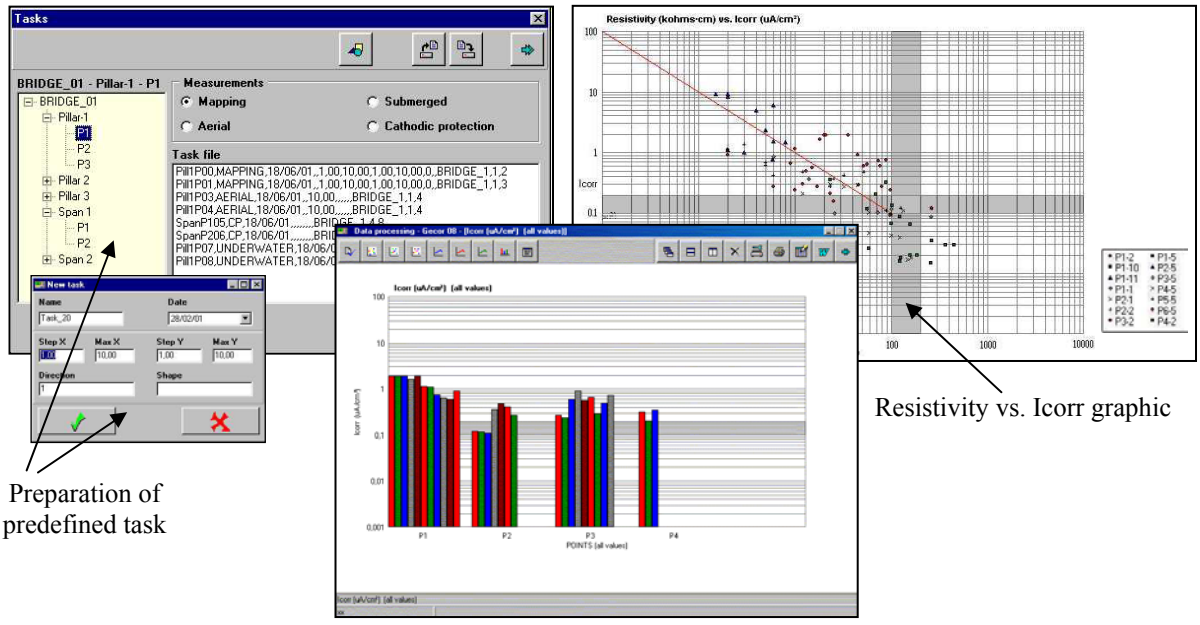
The acquired experience since 1992, during the manufacturing and commercialisation of *GECOR6*, allowed us the development of the new device, which improves in technology and features the former version. ***GECOR8*** is commercialised by James Instruments (www.ndtjames.com) due to an agreement between this company and GEOCISA (in Spain by GEOCISA).

The ***GECOR8*** features include:

- A quick method that combines the classical mapping of corrosion potential (mV) with the measurement of resistivity (Kohm.cm) getting a fast evaluation of the structure.
- An advanced modulated confinement technique for corrosion rate measuring ($\mu A/cm^2$).
- Possibility of working in submerged or very wet structures.
- New technique for measuring the efficiency of cathodic protection without switching-off the current.
- Available sensors A and B with Ag/AgCl reference electrodes recently developed which are detachable minimising its maintenance. These are an alternative to the well-known and more extended $Cu/CuSO_4$ reference electrodes.

Sensors A and B (Ag/AgCl reference electrodes)

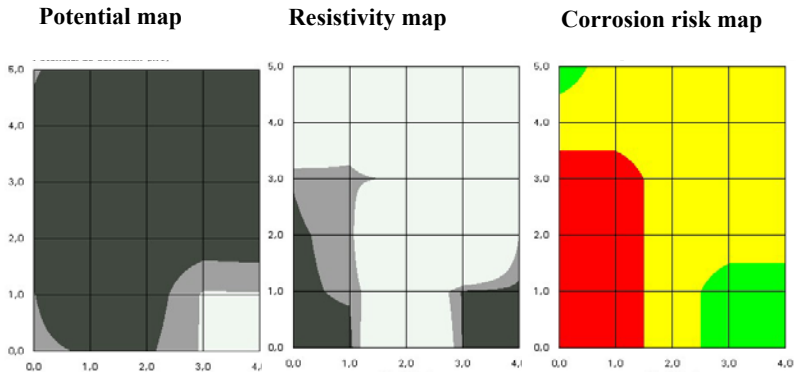
- Data transmission between ***GECOR8*** and PC through PCMCIA card or by standard RS-232.
- Task programming and post-processing software designed for the preparation of predefined task and for an easily stored and process of all results.



FIELD TECHNIQUES FOR CORROSION MEASUREMENT OF CONCRETE REINFORCEMENTS

Mapping

GECOR8 combines the classical mapping of Ecorr, with a measurement of the resistivity, ρ (unconfined galvanostatic pulse) registered in the time range of 1-2 seconds (1)(2). The technique is applied through a very small sensor (sensor B), which enables mapping of each electrochemical parameter individually as well as the combination of the two parameters.



Measurement with Sensor B for mapping and maps obtained

Measurements in aerial structures

GECOR8 offers an advanced **Modulated Confinement Technique (MCT)** (3)(4) provided by the two reference electrodes controlling the guard ring in order to accurately delimit the area to be polarised. It measures the Polarisation Resistance (Rp, true) through a galvanostatic pulse, which lasts from 30 to 100 seconds in order to reach a quasisteady-state condition. The corrosion current Icorr obtained is referred to the area of reinforcement below a circle delimited by the two reference electrodes, which control the guard ring (guard controllers). MCT having the Guard Electrical-Field Controllers (GEFC) is the only technique able to give accurate values of Icorr and to minimise measurement errors in very localised corrosion.

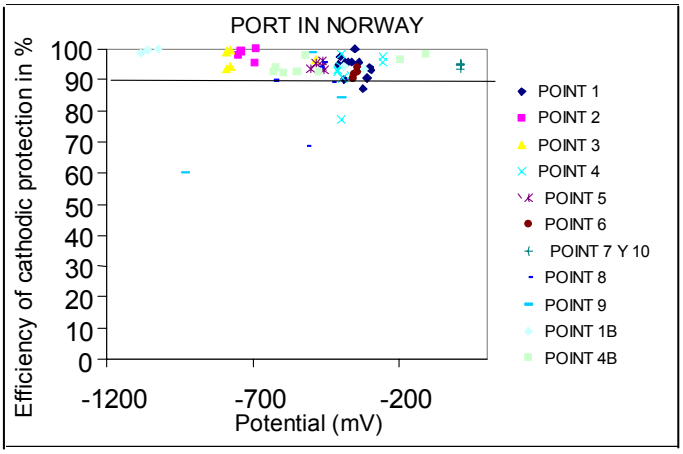
Measurement with Sensor A

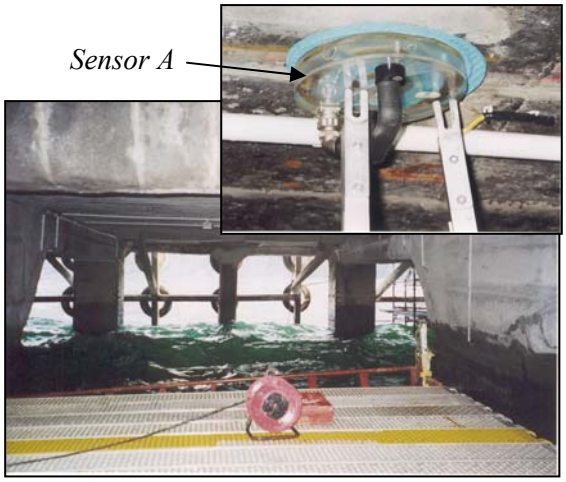
Measurement in submerged or very wet structures

When the concrete is very wet, the resistivity is so low that the current may reach long distances and the area polarised is very large. In order to overcome the difficulty and to avoid the use of large electrodes, **Attenuation of Potential Technique (APT)** (5), which is based in the monitoring of the potential attenuation with the distance, has been implemented in ***GECOR8***. The technique is applied through a longitudinal sensor (sensor C), which measures the critical length, Lcrit, and enables an accurate measurement of the Rp, true through Feliu´s formula (5).

Measurement in structures with cathodic protection

The checking of the efficiency of cathodic protection without switching-off the current is made through the **Passivity Verification Technique (PVT)**. The technique is based in the analysis of the impedance obtained from an alternated current applied with modulated confinement (sensor A) and it gives the efficiency of the cathodic protection in percentage considering well protected over 90 %.





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(2) POLDER, R., ANDRADE, C., ELSENER, B., VENNESLAND, O., GULIKERS, J., WEIDERT, R., RAUPACH, M. “Test methods for on site measurement of resistivity of concrete”. RILEM. Materials and Structures/ Matériaux et Constructions, Vol.33, December 2000, 603-611.

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(5) FELIÚ, S; GONZÁLEZ; ANDRADE, C. “Multiple electrode method for estimating the polarization resistance in large structures”. Journal of applied electrochemistry 26, 1996.