Assessment of Galvanic Anode Performance for Cathodic Protection of Reinforced Concrete Structures

IITM Technology Available for Licensing

Problem Statement

- Corrosion of steel reinforcement is considered one of the most **significant deterioration processes** in reinforced concrete structures.
- Concrete patch repair is the most commonly adopted solution for addressing **corrosion problems** in reinforced concrete; however, it only provides a **temporary** solution.
- There are many solutions discussed herein including **patch repairs** which may result in repeated repairs leading to a costlier process & taking a longer period. Further, to ensure the quality & life of the galvanic anode, a short-term test method to evaluate the long-term performance of galvanic anodes is required
- Hence, Galvanic Anode Performance (GAP) test is developed.

Technology Category/ Market

Technology: Cathodic Protection;
Industry & Application: Energy/Infrastructure, Advanced Material;
Market: The global **cathodic protection** market is anticipated to flourish at a **CAGR of 5.2%** from **2024 to 2033**.

Technology

- Present invention describes a **short-term method** for evaluating the long-term **performance of galvanic anode for cathodic protection of RC structures**.
- Said method comprises a few steps illustrated in the first step in the smart chart:

1 **Obtaining a Galvanic Anode Performance (GAP) test specimen by embedding an anode test piece in a cementitious mortar to simulate an alkaline environment;**

The following steps are mentioned herein below:

2

- Placing the cathode below the GAP test specimen and connecting said anode to the positive terminal of the DC power supply.

3

- Placing the GAP test specimen on the cathode made of corrosion resistant material and connecting it to the negative terminal of DC power supply.

4

- Filing up the reaction chamber above the base of the said test specimen, with an electrolyte such as concrete pore solution having a **pH of 12-14;**

5

- Setting a voltage gradient arrangement of a self-regulating cooling system, and

6

- Measuring and recording the output current from each specimen.

Intellectual Property

IITM IDF Ref. 1864; Patent No:387704;

TRL (Technology Readiness Level)

TRL-4, Proof of concept tested in Lab;

Research Lab

Prof. Radhakrishna G Pillai,
Dept. of Civil Engineering

CONTACT US
Dr. Dara Ajay, Head
Technology Transfer Office,
IPM Cell- IC&SR, IIT Madras

IITM TTO Website:
https://ipm.icsr.in/ipm/

Email: smipm-icsr@icsrpis.iitm.ac.in
sm-marketing@imail.iitm.ac.in
Phone: +91-44-2257 9756/ 9719

IIT MADRAS
Indian Institute of Technology Madras

Technology Transfer Office
TTO - IPM Cell

Industrial Consultancy & Sponsored Research (IC&SR)

Key Features / Value Proposition

❖ *Technical Perspective:*

- Cathode is selected from a group of **corrosion-resistant metals or metal alloys**.
- **The cathode** has a surface area **greater than the surface area of the anode**.
- Cathode is embedded in **the mortar or placed adjacent to the surface of the mortar cover**.
- The level of **concrete pore solution** should be maintained at a **minimum level of 5 mm** above the base of the GAP test specimen.
- Created potential gradients should be **less than 10 V, ambient temperature** is in a range from **10-40ºC**.
- The **quality & service life of the anodes** are assessed based on the **measured output currents** of the **anode specimens**.
- **Self-regulating cooling system** comprises an **embedded temperature measuring sensor, self-controlling system, a continuously running electrolyte at a temperature** in the range from **10-30ºC,** and one or more **exhaust fan arrangement.**
- Using the proposed test method, **the anodes of any shape, size or metal type can be evaluated for their long-term performance.**

❖ *Industrial Perspective*:

- Develop an **efficient short-term test method** for **evaluating the performance and life** of **galvanic anodes used** for **cathodic protection of concrete structures from corrosion.**
- Helps in identifying a **high-performance, durable, and long-lasting galvanic anode component.**
- Applicable simulate steel in **reinforced concrete structures, pipelines, power plants or any other infrastructure.**

Images

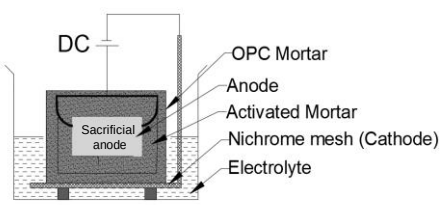

FIG 1: Illustrates a schematic representation of test setup for assessing long term performance of galvanic anode for cathode protection.

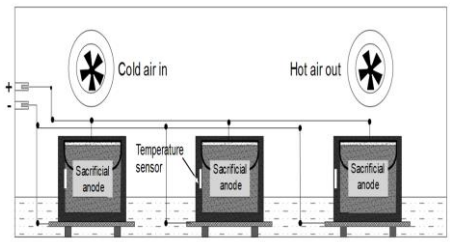

FIG 2: Arrangement of self-regulating cooling system

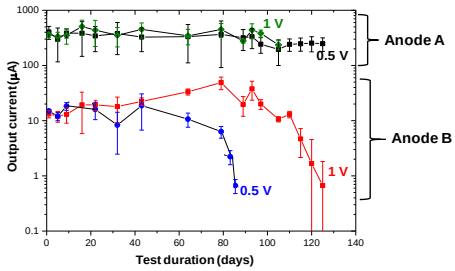

FIG 3: Comparison of output currents from different galvanic anode specimens

CONTACT US

Dr. Dara Ajay, Head
Technology Transfer Office,
IPM Cell- IC&SR, IIT Madras

IITM TTO Website:
https://ipm.icsr.in/ipm/

Email: smipm-icsr@icsrpis.iitm.ac.in
sm-marketing@imail.iitm.ac.in

Phone: +91-44-2257 9756/ 9719