TECHNICAL TALK

Graphene-enhanced Protective Coatings

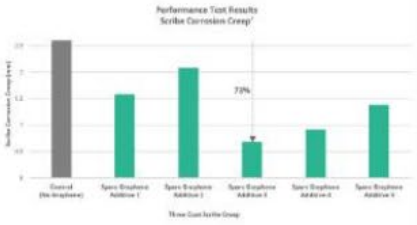

Figure 1: Test results showing anti-corrosion performance of coatings with a Sparc Graphene additive. Lower values demonstrate better performance.

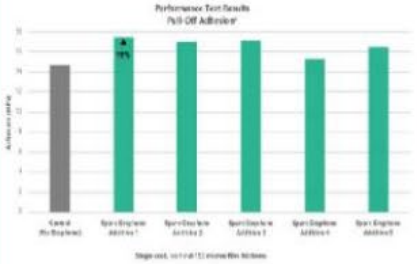

Figure 2: Test results showing adhesion performance of coatings with a Sparc Graphene additive. Higher values demonstrate better performance.

Sparc Technologies Limited (ASX: SPN) is a South-Australian based company that is focused on the development of innovative technology solutions using the unique properties of graphene.

Graphene is a two-dimensional form of carbon, with atoms arranged in a sheet which is one atom thick.

It possesses unique and powerful properties such as strength and flexibility that, with the appropriate adaptation, can be imparted on other materials to improve their performance.

Sparc Technologies has licenced graphene-based technologies from the University of Adelaide, a leading institution in the field of graphene research, and is working on commercialising these technologies in large industrial markets.

The protective and marine coatings market is a key area of interest and as a key step in the company's coatings technology development, Sparc Technologies has optimised the process for the inclusion of specific types of graphene compounds into Epoxy coatings.

This has delivered some exciting performance benefits that will provide improvement in the durability and longevity of industrial assets.

As part of a project to develop a range of graphene-based additives for use in high performance anticorrosive coatings, Sparc is conducting ongoing test programs using industry standard methods.

Sparc Technologies employs a cyclic corrosion test program conducted according to ISO 12944-6:2018 Test Regime 2 aimed at assessing the performance of various coating system types in C4 and C5 environments (ISO 9223 high corrosivity and very high corrosivity respectively).

This cyclic test method was previously employed in ISO 20340 (Paints and varnishes — Performance requirements for protective paint systems for offshore and related structures) and is the same method as used in NORSOK M501 prequalification testing for atmospheric and splash zone systems.

It is designed to mimic the severe corrosion stresses that coating systems will endure across a wide range of environments.

The full 26-week test program is designed to assess likely performance of coating systems in severe offshore environments (Cx), however a shorter 10-week cycle can be used to evaluate coating system suitability in C4 and C5.

The method consists of a repeated cycle:

- 72 hours of exposure to alternating four-hour exposures to UVA-340 at 60°C and four-hour exposure to condensing moisture at 50°C. Method A, Cycle 1 of ISO 16474-3:2013
- 72 hours of exposure to 35°C neutral salt spray as per ISO 9277
- 24 hours exposure to freezing at 18°C.

The coating systems used in this testing represent those typically used in industry to protect steel in harsh environments, providing long intervals to major maintenance requirements.

- Very high durability (25 + years) in C4 environments (e.g. industrial areas and coastal areas with moderate salinity, chemical plants, swimming pool facilities, coastal ship and boatyards)
- High durability (15–25 years) in C5 environments (e.g. industrial areas with high humidity and aggressive atmosphere, coastal areas with high salinity, buildings or areas with almost permanent condensation and with high pollution).

Using the ISO 12944 methodology, Sparc has evaluated the performance of a range of experimental graphene-based additives produced using variations of raw material sources, processing methods and addition levels.

Key measures are adhesion and scribe corrosion creep, along with other assessments of coating film degradation.

Scribe corrosion creep gives an indication of the degree of spread of corrosion from areas of damage on steel structures, and is therefore a good indicator of coating system longevity.

This work has highlighted the performance benefits of graphene additives in general, with a number of the additives generating significant improvement in adhesion and/or scribe creep results at very low addition levels.

As examples, reduction in scribe creep of up to 73% in three coat systems (Figure 1) and improvement in adhesion of up to 19% were observed in single coat systems (Figure 2).

A similar approach has been used to produce coatings with strong bactericidal activity, leading to potential application in areas where control of biological growth on surfaces is important, such as MIC-resistant coatings for tanks and fouling resistant coatings for ocean going vessels and submerged equipment.

Sparc is continuing research in the coatings area to provide owners with improved options for asset protection. **AMR**

SOURCE
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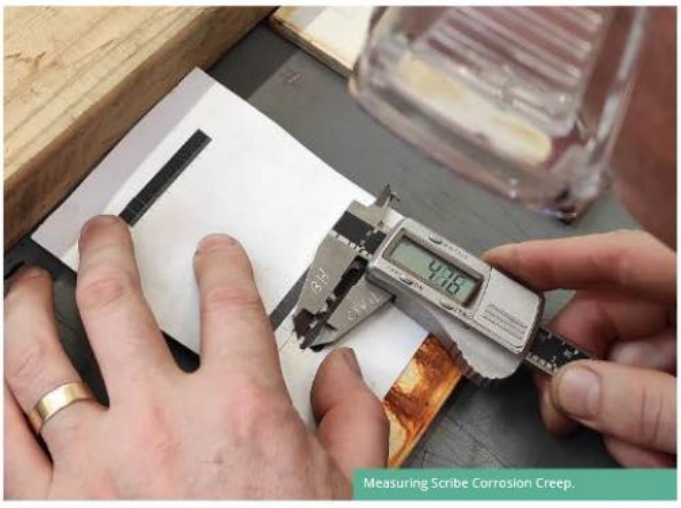
Test panels in a salt spray cabinet.

Panels after test awaiting assessment.



Measuring Scribe Corrosion Creep.

Source: https://australianminingreview.com.au/latest/#page=77