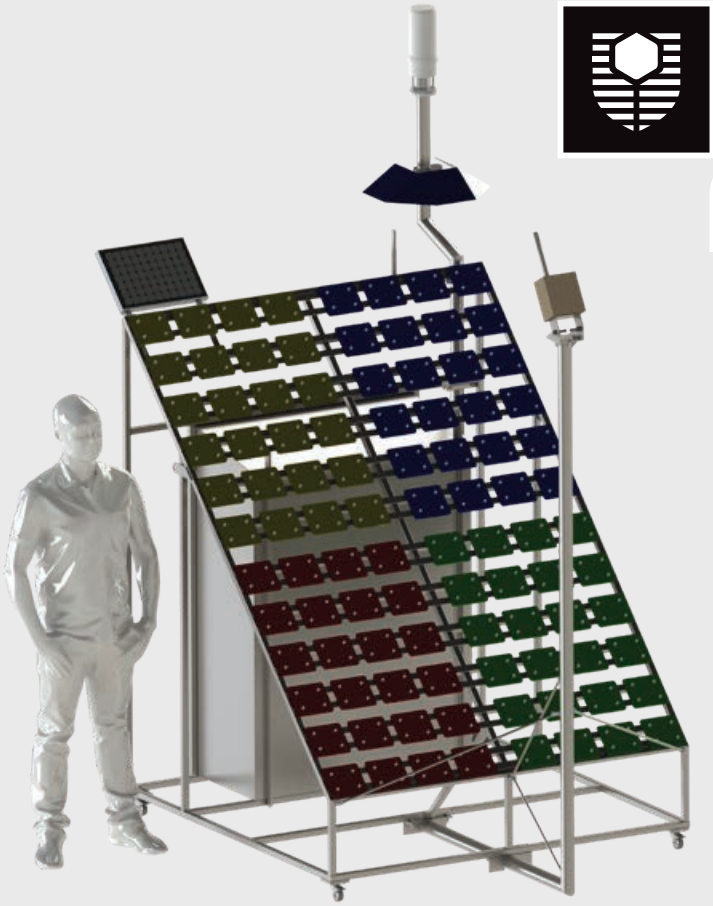
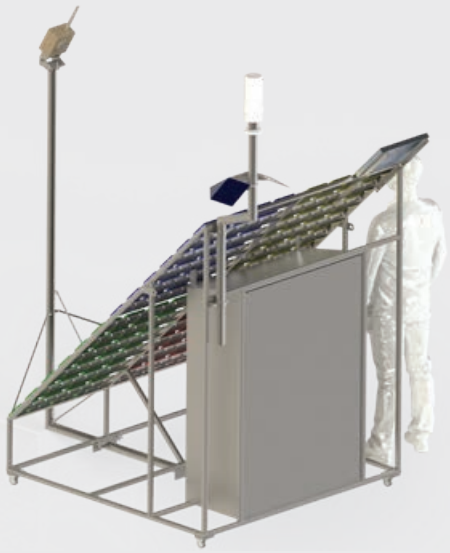
Curtin University

CURTIN CORROSION CENTRE





A PROACTIVE AND SYSTEMATIC APPROACH TO THE QUALIFICATION OF MAINTENANCE COATINGS

The QEERI-Curtin Corrosion Research Alliance has launched a multi-year international effort to combat atmospheric corrosion challenges faced by operators and asset owners in Qatar, Australia and at various locations around the world. Hence, a dedicated research theme has been committed within the alliance to exploring improved practices, procedures, and evaluation techniques in managing atmospheric corrosion via coatings.

Challenge: Coating degradation and the associated corrosion of industrial assets constitute a notable concern for asset owners and operators. Considering the severe environmental conditions faces in the three countries, the selection of coating systems can be a daunting task, in part due to the limited knowledge of the effects of environmental factors on the degradation mechanisms.

The current best practices and industry standards guiding the selection of protective coatings involve a combination of laboratory-based qualification test procedures and assessments from service track records.

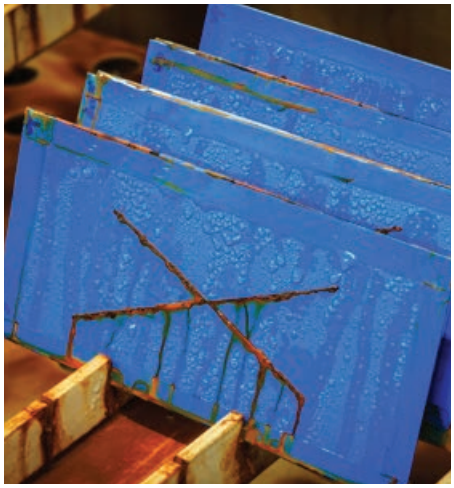
Atmospheric testing has been proven invaluable to the engineering community in evaluating coatings performance in harsh corrosive environments. For example, ISO:12944-9 is commonly used by various asset owners to evaluate the relative performance of coatings for atmospheric service, which involves a series of analyses such as immersion tests, accelerated cyclic corrosion tests, and cathodic disbondment tests. However, qualification testing usually includes an acceleration vector and, hence, does not necessarily relate to the actual service conditions.

PURPOSE

The primary goal of the project is to determine the effectiveness of commercial coating systems in managing atmospheric corrosion under challenging and climatologically diverse locations in Qatar, Norway, and Australia. The project will determine the critical factors affecting coating performance in these different climates.

VISION

The one-of-its-kind study will elucidate the mechanisms associated with coating degradation processes as a function of environmental and materials variables. Likewise, the investigation will correlate the corrosion protection performance of state-of-the-art commercial coating systems subjected to laboratory-based accelerated qualification testing protocols with their performance in extreme corrosive service environments.



ACTIVITIES

This significant multinational undertaking addresses various aspects of coating degradation phenomena, including fundamental mechanistic degradation studies, laboratory-based accelerated corrosion testing, and long-term outdoor service exposure to assess coating durability.

AUTONOMOUS EXPOSURE SITES

A custom-built coating test rig has been designed and fabricated as part of the ongoing project activities. The test rig will house state-of-the-art insitu and real-time image logging and environmental monitoring systems to capture parameters such as ambient temperature, humidity, rainfall, solar radiation, wind speed, wind direction, and air quality at the respective test locations. The test racks have been designed to hold four candidate coating systems for outdoor exposure for a total duration of 3 years at the respective locations.

MACHINE LEARNING

The images obtained from the test sites will be used to train machine learning models designed to recognise coating degradation mechanisms and the extent of the damage.

OPPORTUNITIES AND LONG-TERM BENEFITS

1. The QEERI-Curtin Corrosion Research Alliance will establish a unique collaborative platform that will align various stakeholders, i.e., coating manufacturers, coating applicators, and asset owners.
2. This project will provide a better understanding of the performance of the selected coatings in their respective service environment.
3. Laboratory-based accelerated coating performance evaluations of four commercial state-of-theart coating systems for the respective industry partners will be carried out within the alliance.
4. Periodic sampling of the coated test panels and data collection of the long-term outdoor test racks will be conducted as part of the project.
5. The results obtained during the long-term outdoor exposure in the actual service environment will provide end-users with an opportunity to design and deploy remedial actions and monitor their effectiveness using the QEERI-Curtin test protocols.

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