IRIS INSTITUTE FOR RESOURCE INDUSTRIES AND SUSTAINABILITY

CQUniversity AUSTRALIA RESEARCH

2nd IRIS POSTGRADUATE STUDENTS CONFERENCE:

Resourcing for the Future

BE WHAT YOU WANT TO BE

at comparable wall shear rates. However turbulent and unpredictable fluid flow characteristics of these systems make the collection of meaningful electrochemical measurements difficult. Therefore, correlation to plant environments through conditions of similarity can also be complex.

This presentation introduces a novel Parallel Disc Device (PDD) that is capable of generating very high wall shear rates at the surface of a metal electrode under flow conditions that are presumed laminar. The device has been electrochemically characterised by studying, as a function of both gap distance and top disc rotation, the diffusion limited reduction of hexacyanoferrate(III) at a nickel working electrode and the diffusion limited reduction of dissolved oxygen at a copper electrode.

Mass transfer data recorded for these electrochemical reaction systems have been used to validate an empirical mass transfer model for the PDD in terms of the Sherwood number (Sh), Reynolds number (Re), and Schmidt number (Sc) dimensionless variables. This model is valid for PDD gap sizes ranging from 0.250 mm to 1.00 millimetres up to a maximum wall shear rate of 30,000 s-1.

Harmonic Mitigation Methodology in Low Voltage Distribution Networks

Pubudu Padmaharsha Warusamanna, MEng Candidate, PERG

Harmonic distortion, one of the most important aspects of power quality, is generated by equipment which does not draw linear currents. Since the introduction of many modern electrical appliances and industrial equipment, harmonic distortion has become an increasing problem for utilities. It is necessary that harmonic distortion limits in power systems be kept below compatibility levels to stop equipment failure or malfunction, to ensure equipment operate within ratings and to minimise adverse impact on the life expectancy of connected equipment.

With more disturbing loads and distributed generation being connected to the low voltage distribution network, the industrial partner of this research project Ergon Energy expects that it will need to resort to harmonic mitigation methods to ensure that harmonics in the distribution network remain within acceptable limits.

The proposed research aim is to develop a toolkit of options available for a Distribution Network Service Provider, such as Ergon Energy to mitigate harmonics in the low voltage distribution network.

This entails a literature review encompassing national and international standards applicable to harmonics for distribution systems and for equipment connected to such systems. Then simulations will be developed with sections of Ergon Energy's low voltage network that replicates recorded power quality phenomena in the network. Next identification and modelling of the suitable harmonic mitigation techniques will be carried out. Based on these the suitable mitigation methods will be identified for Ergon Energy to minimise the future impact of harmonics in the Low Voltage distribution network, taking into account relevant facets such as a brief on design, costs, risks and operational issues.

Targeting resource investments to achieve sediment reductions and improved reef health

Megan Star, PhD candidate, CEM

The increased impact of excessive sediment loads entering the Great Barrier Reef lagoon has lead to further awareness of the importance of ground cover in grazing lands. Ground cover has been identified as an important factor in reducing sediment loads, and the most efficient and targeted method to improve ground cover has presented a difficult task for reef stakeholders in both the Fitzroy basin. To further inform these decisions an optimising linear programming model based on paddock scale information in conjunction with land type mapping was developed. This identifies at a catchment scale which land types allow the largest sediment reduction to be achieved at least cost. The results suggest that from the five land types modelled the lower productivity land types present the cheapest option for sediment reductions, and represent a large percentage of the reef catchments. The study allows more informed decision making for natural resource management organisations to target investments. The analysis highlights the importance of efficient allocation of natural resource management funds achieving sediment reductions through targeted land type investments.

Key Words: grazing, natural resource management, investment, linear programming, land type mapping, Great Barrier Reef.