

The Third Lloyd's Register Foundation Lecture and Launch of the Foundation's International Foresight Review on Structural Integrity and Systems Performance

15 October 2015 (Thursday) at 7p.m.
Engineering Auditorium, National University of Singapore

Structural Integrity and Systems Performance: Current Challenges and Future Research Needs

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Programme

- 7.00 p.m. International Foresight Review on Structural Integrity & Systems Performance -
Launch by Prof. Richard Clegg, Managing Director, Lloyd's Register Foundation
- 7.10 p.m. Third Lloyd's Register Foundation Lecture – Prof. Michael Fitzpatrick

Abstract

Failures of engineering systems, products and components range from the mildly annoying to the catastrophic. The field of Structural Integrity has developed over the last Century as a combination of disciplines that support *designing and operating products that are safe*. It aims to incorporate a thorough and complete understanding of a component's operating environment, including its loading; and complete knowledge of the mechanisms by which the materials concerned will fail if their limits are exceeded. Structural Integrity is a fundamental part of the overall concept of product performance, reliability and quality. It focusses on the performance of a physical part or component.

Systems Performance casts its net more widely, encompassing the behaviour, the "health" and the operation of everything within a "System": which may be a large structure such as a ship, aeroplane or oil platform; or a more diffuse system such as a transport network, or the civil infrastructure supporting a city. Systems Performance encompasses aspects such as training, human reliability, human-machine interfaces, software, operating procedures, and business management systems.

This talk will cover some of the current drivers in research for Structural Integrity and Systems Performance. It will take both a broad overview of the topics, illustrated by current research in Professor Fitzpatrick's team on the impact of residual stresses in Structural Integrity. Residual stresses are those stresses that exist in a material or a component as a result of its fabrication. In service, residual stresses can lead to premature failure, or, conversely, can be deliberately introduced in order to increase life and maintain structural integrity. Tensile residual stresses associated with welding can lead to stress corrosion cracking, for example, whilst peening methods from shot peening to laser shock peening can introduce beneficial compressive residual stress.

There are many examples of residual-stress-driven problems in automotive, marine, and other sectors where knowledge of the residual stresses would be of great value, but the drive towards cost containment means that even when a problem is identified as having a residual stress origin, there is neither the resource nor the in-house expertise to be able to tackle it appropriately. With the ongoing improvement in experimental and analytical techniques, we are now at the point where residual stress measurements can be more widely accessed and given correct interpretation.

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The talk will be illustrated with examples from a range of industries. Alongside this talk the Lloyd's Register Foundation will be launching its Foresight Report into Structural Integrity and Systems Performance. The talk will be illustrated by the discussions in the workshops held to inform the Foresight Report, distilling the expertise from university and industrial practitioners in the relevant fields.

About the Speaker



Professor Michael Fitzpatrick is the Executive Dean of the Faculty of Engineering and Computing at Coventry University, and also holds the Lloyd's Register Foundation Chair of Materials Fabrication and Engineering. He is a Chartered Engineer, a Chartered Scientist, and a Fellow of the Institute of Materials, Minerals and Mining.

His research centres around the application of advanced experimental methods to materials engineering applications, particularly in the nuclear power and aerospace industries. His group has a range of research projects assessing materials performance and structural integrity issues in collaboration with partners in industry and government research laboratories around the world, including Airbus, Alcoa, and the US Air Force Research Laboratories. He is a partner in the International Joint Research Centre on Nuclear Safety funded by the Lloyd's Register Foundation.

His current interests include the study of laser shock peening for life enhancement of aerospace and marine structures, and components in nuclear power plant. He also works on the development of novel structural concepts such as bonded crack retarders for improving airframe structural integrity. He has been a user of the international neutron and synchrotron X-ray facilities for over 20 years, for the study of internal stress and damage development in metallic materials and components. He has published over 170 research papers and has successfully supervised 27 PhD students to completion. He was the 2009 recipient of the Lidstone Medal of The Welding Institute.

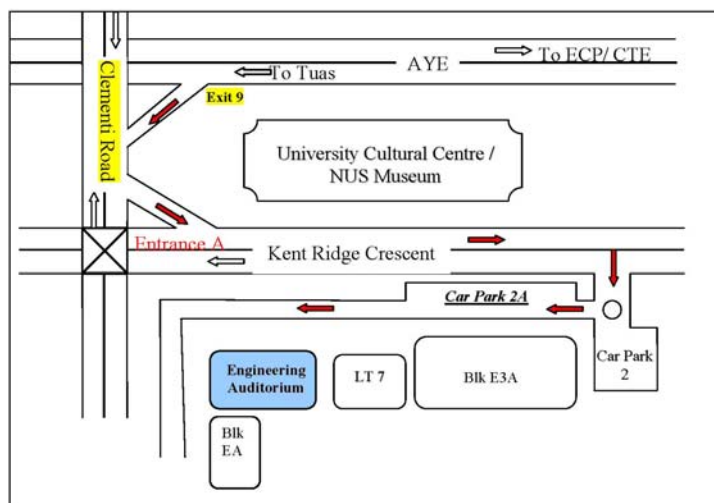
REGISTRATION DETAILS

The Lecture is open to the public.

Please contact Prof. Choo Yoo Sang (ceecys@nus.edu.sg) or Ms Norela (nor@nus.edu.sg) for details

[Click here for registration](http://www.eng.nus.edu.sg/core/) <http://www.eng.nus.edu.sg/core/> (upcoming)

Location map of Engineering Auditorium, National University of Singapore



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