RIEG Conference 2010 – Call for papers

Modelling of Elastomeric Materials and Components

"There is nothing so practical as a good theory" - Boltzmann

This conference is aimed at sharing advances and opportunities in practical design methodology for elastomeric engineering products. Abstracts are invited that illustrate theory in practical action, explore the experimental foundations of design methodology, or present advances in modelling materials or components relevant to engineering design, for example in the following aspects.

- Development of new models - in areas such as swelling, leaching or stress-strain behaviour.
- New approaches in data collection, analysis and model validation.
- Resolution of outstanding problems in finite element and other numerical modelling methods and their application.
- Modelling of life prediction.
- Modelling of macro-composites.
- Modelling of elastomeric materials as microcomposites.
- Fast approximate methods.

Thanks to pioneering work of scientists such as Boltzmann and Rivlin as well as increasing computational capacity, viscoelastic and hyperelastic continuum mechanics models implemented with finite element are now used routinely, often via the finite element method, for design optimisation. However computational design methods are only as good as the experimental, scientific and mathematical foundations on which the material or component descriptions are based, and the reliability of the numerical implementation. Validation requires a critical look at these inputs, as well as good performance in benchmark applications.

Issues remain regarding contact, time and history dependence, the dynamic amplitude or Payne effect, anisotropy as well as large and/or difficult geometries to name but a few. Accurate, efficient modelling of macro-composites such as cord, fabric or shim reinforced elastomers remains a challenge. Issues surrounding life prediction – notably likelihood of failure initiation and development – remain a crucial concern.

Increasing computational power opens up possibilities in modelling not only of force-deformation behaviour but also of diffusion, swelling and chemical reaction. Similarly there is much potential in modelling elastomeric materials as micro-composites for insight into the effects on performance imparted by constituents and their distributions have; notable examples are fillers of different shapes and sizes (eg platelets, short fibres and nanoparticles).

As in all nonlinear optimisation problems a good starting point can be key in the design of elastomeric products. Fast approximate methods can play a crucial role in providing such starting points or elsewhere large time-domain problems – such as is the case with Multi-Body Simulation (MBS) software.