

NAFEMS World Congress, San Diego, 2015

An overview by Angus Ramsay

World Congresses are in many ways showcases of industries such as engineering simulation where one can rub shoulders with software developers, academic researchers and engineering practitioners and find out about current, emerging and future trends in the industry.

Prior to this year's NWC, the last finite element world congress I attended was in 1993 (Monte Carlo, Monaco) which had the theme "FEM, Today and the Future" and I recognised some familiar faces in this year's NWC from the event some 22 years ago. The theme this year was "A World of Engineering Simulation" and whereas in 1993 most papers concentrated on conventional *finite element methods* applied in the field of stress analysis, this year's conference embraced all *engineering simulation* and included papers on much more than just stress analysis.

As is the norm for such congresses the standard of the work reported and the quality of the presentations made were extremely high and provides confidence, for those that need it, that the future of engineering simulation is in good hands. Some presentations I attended on *joints* were particularly impressive in the way that simulation was being validated with measured data and how failure criteria were being developed from the resulting correlation.

One of the emerging themes from this year's congress is termed the 'democratisation' of engineering simulation; handing the power of simulation from the few (experts) to the many (engineering designers, for example). I began my engineering career wanting to be a designer but felt that I could not be effective without understanding stress

analysis and so went into a career in finite element analysis. Over the last thirty years I have developed sufficient expertise to be able to ensure that my FE models are producing reliable and accurate results. Without this experience I could have been responsible for a *computer aided catastrophe* like, for example, the Sleipner Platform. It is of course the issue that running a computer simulation needs a different set of skills and experience than required for designing a component or structure that makes the goal of democratisation a difficult one to achieve in practice. A good *window on the world* of practical engineering simulation can be obtained through the LinkedIn discussion groups – much can be learnt here about the difficulties engineers face in applying simulation technologies to their design problems.

It is interesting to note that one of the emerging technologies from the 1993 congress was *error measures and adaptive mesh refinement*, complementary tools that are supposed to relieve the engineer of having to be concerned about the issue of discretization error and that might well today be seen as tools towards the aim of democratisation of engineering simulation. Of course error estimation is part of the new subject of Simulation Governance which played a prominent part in this year's congress and is a subject which all engineers (experienced analysts or not) need to be considering whenever simulation techniques are being applied.

My conclusion from this NWC is that the future of engineering simulation is bright and is being led by some very able and talented people and I would like to congratulate NAFEMS for organising and running such a successful event. I look forward to the emergence of robust simulation tools for the engineering designer – at which point I may move into engineering design - but in the meantime I will continue to apply the 'Napoleonic Code' to my simulation results, that is, *Guilty until proven Innocent!*