

NAFEMS Technical Working Group Overview

Stochastics Working Group (SWG)
2019

Stochastics Working Group

The focus of the SWG is to champion and improve best practices that relate to stochastic engineering analysis and simulation methods and tools. It will promote the extension of current engineering analysis and simulation practices to include stochastic methods and tools to enable the virtual product development processes to be closer to the real world behavior of the modelled systems and components

This will allow you to extract significantly more business value from your investment in engineering analysis and simulation via:

- the generation of repeatable, realistic and rapid results
- the reduction of design cycle times through faster iterative analysis
- the reduction of the number of physical prototypes required for design validation
- improved accuracy to drive down product, development, manufacturing, and warranty costs

- Monthly online meeting.

- Chair – Alexander Karl, Rolls-Royce

- Information about the Stochastics Working Group can be found on the NAFEMS website at www.nafems.org/community/working-groups/stochastics

- To enquire about joining this working group complete the online form at www.nafems.org/community/working-groups/stochastics/get_involved

Stochastics Working Group

Current topics of interest for the working group

- the NAFEMS focal for stochastic engineering analysis and simulation methods and tools
- the NAFEMS focal for Uncertainty Quantification (UQ) methods related to performing engineering simulation,
- the primary link between NAFEMS and the other areas active in the UQ and Stochastics space, and to capture and share knowledge & guidelines related to:
- Stochastic engineering simulation processes, methods and tools,
- Uncertainty Quantification associated with engineering simulation processes, and
- Competency requirements related to Stochastics and UQ.

Outputs recently created by the working group

- 1st publication: Stochastics and its Role in Robust Design
- "Challenges in Uncertainty Quantification" (Benchmark, October 2014)
- Working on 2nd publication: topic area will be Uncertainty Quantification

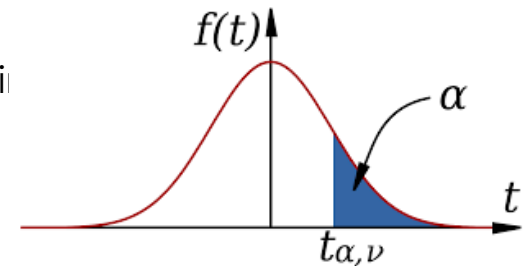
Events recently supported by the working group

- Seminar: Uncertainty analysis in engineering computations held at "Politecnico di Milano" on the 10th of April 2017
 - *"The seminar had 82 participants and gave an overview on the most recent advancements in the fields of reliability analysis, robust and accurate modelling of uncertainties, sensitivity analysis, advanced simulation techniques as well as imprecise probabilities."*
- 2 Stochastic Sessions at NWC17
- 1 Stochastic Session at NAFEMS Americas Conference, June 7-9 2016, in Seattle.
- 1 Training Session "Introduction To Probabilistic Analysis And Design", at NAFEMS Americas Conference, June 7-9 2016, in Seattle.

Stochastics Working Group

Current / future areas of interest

- Define terminology, acronyms etc. in this area
- Develop Benchmarks and Challenges in this area
- Define the profession simulation engineer competencies in this area
- Develop appropriate training materials in this area



Key Individuals in the working group.

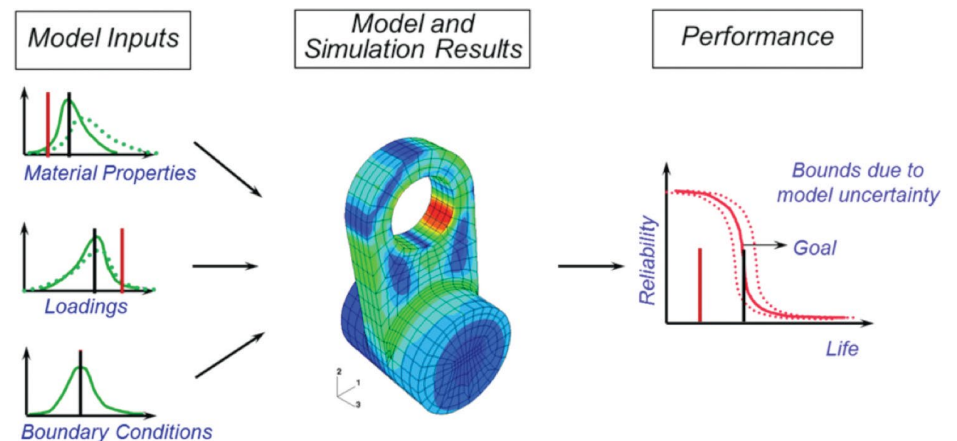
- Alex Karl, Rolls-Royce Corporation, Chairman, USA
- Jack Reijmers, Nevesbu, The Netherlands
- Louise Wright, National Physical Laboratory, UK
- Ramesh Rebba, General Motors, USA
- Dietmar Vogt, Airbus Group Innovation, Germany
- Patrick Koch, SAS, USA
- Gordon May, Rolls-Royce PLC, UK
- Matteo Broggi, Leibniz Universität Hannover, Germany
- David Riha, Southwest Research Institute, USA
- Peter Qian, SmartUQ, USA



Stochastics Working Group

KEY Achievements:

- **Publication:** 'Stochastics and its role in Robust Design'
https://www.nafems.org/publications/resource_center/r0107/
- **Flyer:** 'What is uncertainty quantification?'
https://www.nafems.org/publications/resource_center/wt08/
- **Challenge problems:**
 - 'Challenges in Uncertainty Quantification' (Benchmark, October 2014)
https://www.nafems.org/publications/resource_center/bm_oct_14_5/
 - 'Stochastic Challenge Problems' (Benchmark, April 2019)
https://www.nafems.org/publications/resource_center/bm_apr_19_8/



Chair Bio

Alexander Karl holds a PhD and MSc in Aerospace technology from the University of Stuttgart in Germany. He has 21+ years of work experience with Rolls-Royce. During this period, Alexander was working in several major sites and sectors (Dahlewitz, Derby and Indianapolis). Alexander's background is thermo-mechanical analysis but for the last 18+ years Alexander has been working actively in the area of multi-disciplinary optimization, Robust Design (Design for Six Sigma) and Systems Engineering. His main focus is the application of these tools, methods and processes to real engineering challenges.

Alexander's current focus within Rolls-Royce is the global pervasive implementation of Robust Design within the company. Alexander is an Associate Fellow for Robust Design and Systems Engineering and a Master BlackBelt within Rolls-Royce. He is also an active member of NAFEMS and ERCOFTAC promoting a wider application of these methods, processes and tools.

