EMMC Case Study Development

Status Update

Objectives

- General consensus regarding the need for case studies on the deployment of materials modelling:

  Credible case studies are necessary to convince end-users of the performance of the models. There is an industrial need for the development of case studies and examples of successful application of modelling and simulation to solve real problems

- Case studies should illustrate how the **integration of different modelling levels** (e.g. data modelling, physical modelling, supply chain inputs etc.) have led to a successful decision for industry and should be released and shared as success stories

Progress to date

- Contact list of all of **manufacturers** that attended the February 2014 and/or November 2014 meetings was collated – comprising **21** distinct contacts
- E-mail to invite cooperation in the development of case studies sent to the contacts on 18th December 2014, requesting a response by 12th January 2015.
- In addition Lula Rosso selected the most promising projects that use both **discrete and continuum models** from chapter 5 of the Modelling Brochure.
- **23** e-mails sent to the projects on 23rd January 2015, requesting input to be sent back by 30th January 2015.

Outcomes

- **Nine potential case studies identified.**
  - Of the 21 contacts in first e-mail shot obtained 5 positive responses.
  - Of the 23 contacts in the second e-mail shot, 3 positive responses were received, highlighting 4 case studies.
- Most applications are **mainly based on continuum models**.
- However, amongst the examples there might be cases that uses discrete modelling to arrive at a new constitutive equations for continuum models: useful for case study.
- Cases where the constitutive equations are derived from experiments are not considered suitable examples.

Potential case studies

Suggested by	Topic	Modelling type
Matthias Funk, Schaeffler Technologie AG	Influence of microstructure and fabrication on the strength of steels	Continuum models based on existing constitutive equations
Filip Oosterlinck, DSM Ahead B.V.	Optimisation of polymer processing through modelling multilayer flow dynamics and interface behaviour	Constitutive equations for continuum models
Thomas Göhler, MTU Aero Engines AG	Simulation of additive manufacturing production of metallic components	Continuum
Pieter Janssen, SABIC Innovative Plastics	Optimisation of polymer processing	Kinetics and continuum modelling
Arno Plankensteiner, PLANSEE SE	Modelling of Thermo-Mechanical Fatigue (TMF) in metals	Constitutive equations for continuum models

Potential case studies (continued)

Suggested by	Topic	Modelling type
Nenad Filipovic, Risk Technologies	Development of nanocontainers for self-healing materials	Mesocopic and Continuum
Olaf van der Sluis, Phillips	Improvement of interface reliability in microelectronic devices	Constitutive equations for continuum models derived from small scale applications of continuum models
Mark Gubbins, Seagate	Integrated Recording Model for Heat Assisted Magnetic Recording (HAMR)	Discrete + Continuum
Mark Gubbins, Seagate	Integrated Transducer Model for Heat Assisted Magnetic Recording (HAMR)	Discrete + Continuum

Future actions

- Prioritise and produce a **short-list of 3-4 for development**.
- The ‘selected’ providers of the case studies will be contacted in order to develop the detailed content. This will involve:
  - talking with the providers and collecting the information,
  - drafting the case study and obtaining their comments and permission to use it.
- Finalise three case studies which can be made ready for the press by the EU communication tender winners.
- It is estimated that the three case studies will be available by the end of March 2015.
- Following these three case studies, more could be identified and a request for examples is to be included in the EMMC newsletter to be widely distributed following this meeting.

Suggested template (Part 1)

- Objectives of the industrial customer:
  - Open description of the industrial problem.
  - Classification of the project:
    - Material,
    - Industrial sector,
    - Scale of the material,
    - Industrial application (system, sub-system, component, fluid state, solid state, etc.),
    - Weakness of actual approach (trial and error, only simplified lab experiment, no full scale model, etc.)
  - Requirements and expected results to understand the material behaviour.

Suggested template (Part 2)

- How materials modelling played a key role in problem solving.
- Description of the tool(s) and methodology(ies) that have been applied (one scale, multi-scale, optimization strategy, calibration of model before of iterative solution research etc.).
- Expected improvement of the material behaviour simulation.
- Technical and technological benefits and return on investment (KPIs and ROI are part of the agreement to measure the modelling outcomes versus industrial investment and previous approach).