Material knowledge based design methodologies for production control in zero defect multi stage processes in Smart Industries

ICME 2016

Jan Post*, Albert Konter†

*Prof. dr. Ing. Jan Post, Digital Fabrication, ENTEC
Nijenborgh 4, 9747 AG Groningen PO box 221 Groningen, The Netherlands
Head Strategic Partnerships Innovation Philips HealthTech, Personal Care.
E-mail: j.post@philips.com

† ir. Albert Konter,
†Manager Valorization Material innovation institute M2i, E-mail: a.konter@m2i.nl

ABSTRACT

The last decades of research on Integrated Computational Materials Engineering has resulted in lot of complex material models, reaching increasing levels of accuracy and maturity. In most cases these materials models are used to create more understanding about the constitutive behaviour of the material in question. Another area of research/application of these models is the creation new materials or improvement of existing materials e.g. due to different processing conditions. Most of this work is done in an academic environment and the amount of simulations that is done for industrial application is limited.
The Industry has realised the potential of improved models and there is a trend to use this kind of complex modelling in:

- saving innovation time by first time right design of product and process,
- use the models for process window studies to improve the process robustness,
- create meta models for process control.

A commonly used technique in this industrial environment is DACE* (Design and Analyses of Computer experiments) where a lot – could be over 1000 - of simulations is done in parallel, in a multi-dimensional space. The results of these simulations are subsequently used to create a new model which is called: the meta model. These meta models can then be used to optimise the process or as a part of a control system in a factory platform.
Because of the huge number of multi stage simulations and all the huge amount of resulting information, a number of issues are very important:

- the simulations platform must be very robust and stable
- data processing has to be fully automatic
- standardisation plays an essential roll to create platform robustness

The presentation will show how Philips handles this problem, finds workable solutions and applies the knowledge in an European FP7 zero defect project called: **"Megafit"

Reference:

*Post J., Klaseboer G., Stinstra E., van Amstel T., Huetink J. (2009) Journal of materials processing technology 209, 2648–2661.
** van Ravenswaaij, R.; van Tijum, R.; Hora, P.; van den Boogaard, T.; Engel, U.: Towards zero-defect manufacturing of small metal parts. In: IDDRG 2013 Conference Proceedings, (2013), Zurich: Institute of Virtual Manufacturing, ETH Zurich, pp. 87-92.