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Digital Twins
Believe the Hype?
NAFEMS is a partner in a new R&D project funded by ITEA, a EUREKA Cluster programme supporting innovative, industry-driven, pre-competitive R&D projects in the area of Software-intensive Systems & Services (SiSS). This 3-year project (reference ITEA3 Call 3 - 16010 VMAP) started in September 2017 with 30 partners, including NAFEMS, officially entering in a staggered manner.

The NAFEMS role will be to lead all dissemination activities during the project including a survey of industrial requirements (to be launched soon), the organisation an international conference and creating a vendor-neutral ‘Material Data Exchange Interface Standard’ community which will carry on the standardisation efforts into the future.
The Challenge

The lack of software standards in virtual engineering workflows and incompatible interfaces for the transfer of virtual material information not only cause additional costs and complex manual adaptation but also lead to inflexible IT solutions, loss of information and significant delays in the overall design process. The standardization of material interfaces in CAE is therefore vital for all industry segments where material behaviour is central to product and process design.

The Proposed Solution

The work within the VMAP project will result in an open software interface standard that will be implemented in a number of software tools.

The advantages of integrated material handling will be demonstrated by the following industrial user cases from different material categories, manufacturing domains and industry segments (industrial end-user partners are shown in brackets):

- Extrusion blow moulding of plastic drums (Rikutec)
- Composites for lightweight automotive vehicles (Audi)
- Injection moulding of various components for different applications including fibre reinforced components for crash applications (4a Engineering)
- Additive manufacturing of plastic parts (Robert Bosch)
- Hybrid multiscale modelling for shaver products (Philips)
- Aerospace composite manufacturing (Convergent Manufacturing Technologies)

These simulation processes include anything from 3 to 6 stages including manufacturing process simulations up to product assessment simulations sometimes using up to 20 different commercial software packages between them.

In brief, VMAP aims to generate universal concepts and open software interface specifications for the exchange of material information in CAE workflows. Implementation of extended CAE tool interfaces will be realized and, where necessary, translation tools that follow the open interface specification. VMAP will also implement virtual industrial demonstrators for relevant material domains and manufacturing processes.

An important part of the project is to establish an open and vendor-neutral ‘Material Data Exchange Interface Standard’ community that will provide best-practice guidelines for the community and will ensure that standardisation efforts continue into the future.

Projected Results and Impact

Interoperable virtual material models and a seamless transfer of material data history in a CAE workflow enables industrial users to develop and produce better products in a shorter timescale using more efficient manufacturing processes. Interface standards will also help CAE software developers and vendors to achieve further virtual material models that can easily be integrated into holistic design, simulation and optimization workflows. It is considered that this can significantly benefit Europe’s future manufacturing market where materials technology is a key factor, especially in the rapidly emerging market of additive manufacturing for metal and plastics.

Project Details and Partners

The project is being funded under ITEA 3 Call 3 and has a total budget of almost 16000k€ for almost 123 person-years effort distributed among the 30 partners coming from Austria, Belgium, Canada, Germany, Netherlands and Switzerland – NAFEMS is working within the German part of the consortium.

Figure 2: Extrusion blow moulding simulation workflow.
The project is being managed and led by Fraunhofer SCAI based in Sankt Augustin, Germany and includes the industrial case leader companies mentioned above as well as manufacturing companies, software vendors, engineering companies, materials institutes and universities forming the following project consortium:

**Austria:** 4a Engineering, Wittmann Battenfeld,
**Belgium:** e-Xstream engineering,
**Canada:** Convergent Manufacturing Technologies Inc.,
**Germany:** AF-Color, Audi, Dr. Reinold Hagen Stiftung, DYNAmore, EDAG Engineering, ESI Software Germany, Fraunhofer SCAI, Hagen Engineering, inuTech, Karlsruhe Institute of Technology (KIT), Kautex Maschinenbau, NAFEMS Deutschland, RIKUTEC Richter Kunststofftechnik, Robert Bosch, Simcon Kunststofftechnische Software,
**Netherlands:** Delft University of Technology, DevControl, In Summa Innovation, KE-works, Materials innovation institute M2i, MSC Software Benelux, Philips, Reden, University Groningen,
**Switzerland:** BETA CAE Systems International, Sintratec.

**Questionnaire and Community**
During the next few months VMAP will be sending out a simple questionnaire to interested parties in order to gather information on as many simulation processes, and the material data transfer, as possible. This will enable the standardization process to be more open and far-reaching and encourage the participation of more software vendors. Following on from this the first ‘Material Data Exchange Interface Standard’ community meetings and communications will take place.

If you or your company is interested in the VMAP project please contact Dr. Gino Duffett of NAFEMS. **Gino Duffett**, gino.duffett@nafems.org

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