Material Modeling and Business Decision Support Systems at Dow

EMMC-CSA BDSS Experts' Meeting

March 27th, 2018

Brussels, Belgium

Dow.com

Focus of this talk

Materials modeling in plays a role in:

1. Development and commercialization of new materials by Dow.
   Main focus of this presentation.

2. Evaluation & Introduction of new materials at Dow Customers.
   Depends on Dow Customers' BDSS: Dow makes available material models for Customers to use in their systems.

Material development is market driven – Where does materials modeling comes in?

Depending on the level of innovation at the material level or on the targeted market Dow follows a stage-gate process from concept shaping to commercialization including all key stakeholders, which typically include lead customer(s). Every stage gate will evaluate market opportunities, risks, costs, value proposition, resources etc.

Materials modeling plays a role to predict the material properties and to determine the value proposition of the material in the targeted applications. Also plays a role in determining most promising routes for material development (e.g. formulations).

Material development is market driven – Where does materials modeling comes in?

Depending on the innovation at the material level or on the targeted market:

Dow follows a stage-gate process from concept shaping to commercialization including all key stakeholders, which typically include lead customer(s).

Every stage gate will evaluate market opportunities, risks, costs, value proposition, resources etc.

Materials modeling plays a role in:

- predicting material properties.
- determining the value proposition of the material in the targeted applications.
- determining most promising routes for material development (e.g. formulations).

Some examples – high level

E.g. developing thermoset formulations for high volume composites applications:

Develop material models which predict rheo-kinetics and use these models to predict the processing & performance of (typical/targeted) customer applications: these will be used for overall benefits of the technology and value of the material to the customers/market.

- Cycle time benefits → Investment/cost benefits at customer
- Quality benefits→ lower part rejection rate, increase productivity
- Performance benefits (e.g. lower weight of a part)
- Other benefits (e.g. ability to model integration of complex parts)

Some examples – high level

E.g. developing a new foam formulation for acoustic/thermal insulation of appliances:

Foam modeling (both process modeling and structure-property modeling) followed by acoustic and thermal modeling of the foam in the (customer) application: Obtain through this modeling the benefits in terms of:

- Material usage needed to reach target performance
- Performance benefits (e.g. acoustic – reduced dB, insulation – lower k)
- Cycle-time benefits -> costs/investments
- Other benefits: e.g. improved EH&S, reduced packaging space (design freedom),….

Material modeling outcomes in BDSS

Modeling outcomes are used to:

- Develop and communicate the overall value proposition, determine material value
- Define areas for improvement in the material development: gives direction/priorities for further enhancement during material development; trade-offs
- Score different development tracks

Together with all the other aspects goes into NPV / Investment/ Risks assessment

Types of modeling

Depends on what is needed and what data is available:

- Theory- and data-driven for structure-property prediction
- Continuum for process/application performance modeling,
- Data-driven for identifying candidates for formulations with improved performance
- …
- Also modeling optimization strategies and methods are critical in a BDSS

Main Actors

BDSS is not (yet) a fully integrated process: Many different parallel tracks which will flow into the stage-gate decision process:

- Materials modeling
- Business Strategy / Finance
- Marketing
- Specific lead customers feedback
- Manufacturing, EH&S
- Finance
- Intellectual property

Material Modeling can be made accessible to customers (not our BDSS)

- Customers can look for Dow solutions for a required material performance (e.g. Rheodata)
- Dow to model feasibility/benefits of Dow solution in customer application

Moving towards more integrated BDSS

Benefits would be for:

- More educated / better decision process both at Customer and in Dow
- Will accelerate decisions/developments (value)

Will make innovation go faster/more efficient

Will make it easier for customers to select/be convinced of Dow technology being the right choice.