APP3 – Composite Prepreg

Translator Partner:

Fraunhofer IFAM

End User Partner:

Composites Evolution
Business Case

In terms of the business case, the following factors were highlighted as the most important:

- Market, regulatory and safety requirements drive the transition towards non-toxic, low environmental impact solutions for composite prepregs (fabrics pre-impregnated with resin)
- Innovative prepregs provide a potential solution
- PFA: fire retardant, eco friendly alternative to phenolic resins
Business Case

Aims of the innovation challenge:

- Improve understanding and control of process
- Improve quality of end products
- Reduce development time and costs
- Create model-based approach for future product developments

APP4 Composite Prepreg (CompEvo)
1) Good understanding of the business case
2) Good understanding of the industrial case
3) Analysis of the experimental (and modelling) data available within the client
4) Translation to (preferably more than one) workflow(s)
5) Propose to the client modelling executor(s) and strategy for model validation
6) Translation of the modelling results to information that is understandable and usable by the client

translator acting as a „surrogate“ customer
EMMO Compliant Application Ontology

Full EMMO description of industrial process

..including properties
Innovation Challenge

APP4 interface designed to take into account both following problems:

Case 1:
- Input: new process parameters (temperature, pressure, geometry)
- Output: expected mechanical properties

Case 2
- Input: required mechanical properties
- Output: suitable process parameters

KPIs (measurable)
- Time-to-market (months)
- Number of tries (#)
- Mechanical performance
  - Interlaminar shear strength (MPa)
  - Tensile strength (MPa)
Data and Metadata Curation

Clients’ Proprietary Data
- Internal measurements
  - Viscosity
- Resin formulation
- Tools geometry
- Manufacturing price

Clients’ Publicly Available Data
- Product data sheet
  - Mechanical properties
  - Fibre content
  - Density
- Product sell price

Additional Data
- Benchmark values
- Reference values of mechanical properties
  - Tensile strength
  - Interlaminar shear strength

Data, data format, metadata

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Process Model

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APP4 Composite Prepreg (CompEvo)

- Temperature profile
- Pressure profile
- Geometry

TGA-Measurement → Raw Output 1 → Weight-temperature profile

Input 2 → Data-Driven Model → Raw Output 2 → Resin content

Input 3 → FEA-Driven Model → Raw Output 3 → Expected Mechanical Properties

KPI 1
KPI 2
Model Validation

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APP3 GUI of OTE
APP3 ESS
Advantage from OntoTrans

- Data-driven approach allows for a faster integration of new materials/processes
- Data-driven approach allows the prediction of composite laminate properties
- Faster response by manufacturer to customer requests
- Time-to-market can be reduced based on data-driven approach
Advantage from OntoTrans

OntoTrans: Open Translation Environment (OTE)

Translator

End User

...running simulations
...data provenance
...define suitable KPIs
...guidance during translation

Interface with OSPs
OntoKB
ESS
Interface with BDSS
Ontological specification
APP-specific GUIs
Recommendation System (OntoRec)