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Research area: General aims

Production economy // Production planning

Key words:

Model based product and process design, innovative fiber based products

TITLE:**Integrative method for product and process development****Background/Problem area**

The paper industry is in a global process of change. The current situation is characterized by saturated markets with significant overcapacity in parts of the world, geographical shift of capacities and extremely high cost pressure due to rising energy and raw material prices. Moreover, the markets change by user behavior (e.g. print media vs. electronic media), increasing demand for packaging (global flows of goods), and increased requirements for product safety (food contact).

Increased commitment to the development of innovative products and manufacturing technologies in material, energy and environmental aspects is essential for the sustainability of the sector. A push of innovation is mainly expected in the development of entirely new fiber-based products. However, the development of new products requires the development of new or adapted production processes.

Today, many innovative industries (e.g. automotive, aerospace, plastics) use model-based design as a key technology for the design of new products. Concurrent use of simulation tools support the development processes. Modern design flows integrate all necessary data, information, methods and techniques to solve the development task. Conventional techniques and simulations are complementary.

Objectives/Research results

In paper industry, the model-based design is not yet established. The particular challenge in the development of materials is to control the dependencies of macroscopic properties on physical properties of individual fibers and fiber network structures and physical and chemical mechanisms of the micro- and nanoscale. Therefore, it is required to virtually complement the technical possibilities of real systems and equipment by integrating simulations into the tool chain of product development.

Advances in measurement and simulation technology now offer the chance to establish the model-based design in the paper industry. New testing methods provide opportunities for material analysis in micro- and nano-scale structure.

The aim is to develop a method for model based design of fiber-based products and their manufacturing processes by continuous integration of measurement and analysis technology, pilot plant and simulation throughout the entire product development cycle.

Progress of the development:

- an universal design flow was developed based on an innovative database concept matching the special requirements in the development cycle of complex fiber-based materials
- a modern platform for the integration of pilot plants, laboratories, measuring and analysis technology and simulation in product development cycle was implemented based on State-Of-The-Art web technologies
- a demonstrator "Virtual Product Design" to illustrate the model-based design method by using the product design platform was implemented
- an internet portal www.ptspaper.de/prometheus was implemented to share dedicated parts of the platform with customers and other research institutes

Application/Economic benefits

The intended method for model based design offers new and significant opportunities for optimization and development of new fiber-based materials for the PTS and their customers. The PTS serves the entire value chain of paper production. Within the scope of model-based consulting services the new method and the functional tool are offered for an increasingly large customer base of forestry, wood and paper sector. In the medium term, the project results shall be effective in the growing market segment of paper, cardboard and packaging.

Added value for PTS is created by shortened product development cycles (shorter time-to-market), the development of untapped industries and markets with new products and process design, the extension of the PTS consulting and service portfolio, increased quality of advice, the marketing of partial access to the product design platform and new educational products based on product and process engineering simulations.

Paper manufacturers, processors and suppliers benefit from project results due to new products and shorter product development cycles, saving of resources (fibers, additives, energy) and energy, enhanced effectiveness due to significantly higher number of variant tests and reduced trial costs and time, cost and time savings for the manufacturing industry through papers with optimal processing and machining properties.

Period of time: 01.01.2013 – 30.06.2015

Remarks

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