EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

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COST Action FP1005

Fibre suspension flow modelling

A key for innovation and competitiveness in the pulp & paper industry

2011 | 2015

Objectives

- Main objective: to promote and disseminate validated computer modelling approaches and simulation techniques in papermaking industry.
- Other objectives: Production of a Knowledge Base for simulated and measured data of industrially-relevant test case problems.
- Preparation and publication of Best Practice Guidelines for modelling fibre suspension flows (including a review of experimental methods).
- Survey of state of use of CFD and other numerical methodologies in industry.
- Training for young researchers via workshops, STSMs, training schools.
- Joint projects launched by Action members
- Exchange of experience, sharing good practice in using simulation software, experimental methods, development of research tools.

Main Achievements

- Successful consolidation of effective WG activity through workshops and meetings.
- Production of data for the Knowledge Base Repository in each Action's focus area.
- Continuous improvement of the Action's website which includes (among its features) a dedicated "Knowledge Base Repository" section and a "Job Opportunities" section.
- Development of multi-disciplinary working groups with strong involvement of ESRs.
- Diffuse awareness of expertise and scientific knowledge covered within the Action.
- Rapid set-up and consolidation of networking among participants, especially ESRs, through meetings, workshops, STSMs and training schools.
- Production of joint scientific publications in peer-reviewed journals and conferences
- Submission of joint projects launched by Action members to Horizon 2020

Working Group 1 - Experimental Methods

- This WG shares information between research groups developing experimental methods for dilute/dense fibre suspensions and non-Newtonian media, combining the best features from different experimental methods to improve measuring techniques.
- Measurements also provide valuable data for: I) non-Newtonian viscosity and multi-phase flow modelling in a wide range of consistencies; II) correlations between fibre properties and pulp macro properties (apparent viscosity); use of non-invasive techniques to evaluate fibre suspensions flow characteristics (Tomography, Ultrasonic Doppler Velocimetry, Nuclear Magnetic Resonance, High Speed Imaging).

Working Group 2 – Rheological Modeling

- This WG investigates pulp behavior using single-phase continuum rheology.
- Critical scientific challenges are: I) development of generalized-Newtonian viscosity models and fully non-Newtonian rheology models; II) evaluation of model parameters; III) link fibre-level properties to pulp properties; IV) modeling turbulence damping and modifications caused by fibres and flocs; V) application of the single-phase models to complex suspensions made up of fibres, fillers, retention aids and gases.

Working Group 3 – Multiphase Modeling

- This WG investigates pulp behavior using multi-phase models
- Critical scientific challenges are: I) prediction of fibre orientation and fibre flocculation via Lagrangian simulations; II) production of reliable data for validation of Eulerian models; III) development of Eulerian models for fibre-level and floc-level simulations; IV) assessment of the influence of fibre properties (shapes, surface, stiffness) on model parameters; IV) modelling of fibre-fibre, fibre-wall, fibre-turbulence interactions.

Forests, their Products and Services (FPS)

Participating countries

AT, CH, DE, DK, ES, FI, FR, IT, IL, NL, NO, PL, PT, RO, SI, SE, UK

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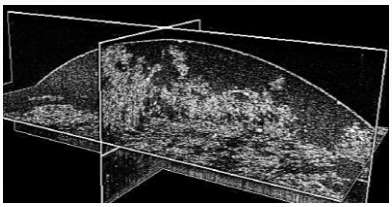
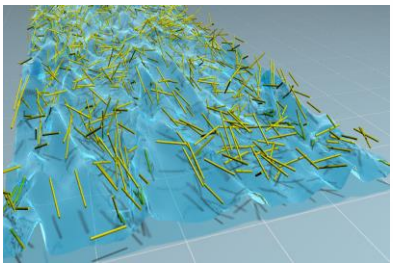


OCT image of micro fibrillated cellulose (by S. Haavisto, VTT)



Finite-size simulation of dilute fiber suspension flow (by M. Do-Quang, KTH)

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