

COST

Fibre suspension flow modelling

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

FP1005

Start date: 11/05/2011

End date: 10/05/2015

Year: 2

Cristian Marchioli

Chair

CISM / Italy



Scientific context and objectives (1/2)

- **Background/Problem statement:** CFD is far from being a mature research tool in the pulp and paper industry. The Action aims at showing how CFD can help to solve practical problems and decrease energy consumption of papermaking unit operations
- **Brief reminder of MoU objectives:**
 - Main: to promote and disseminate validated experimental and numerical techniques in paper-making industry.
 - Secondary: Knowledge Database for selected test problems, BPG for modeling fibre suspensions.



Scientific context and objectives (2/2)

- **Research directions:**
 - Promotion, dissemination and validation of CFD in paper industry will be achieved by joint meetings, written documents from meetings, public Knowledge Base repository.
 - The Action will enhance transfer of innovative solutions to industry, but also the flow of information from practitioners to scientists through STSMs, training schools, workshops.
 - The Action will offer a forum to solve test cases relevant to industry and to compare simulated results to experiments.

Working groups

- **WG 1: Experimental Methods (~40)**

Development of experimental techniques for measuring dilute/dense suspensions and non-Newtonian media

- **WG 2: Rheology Modelling (~20)**

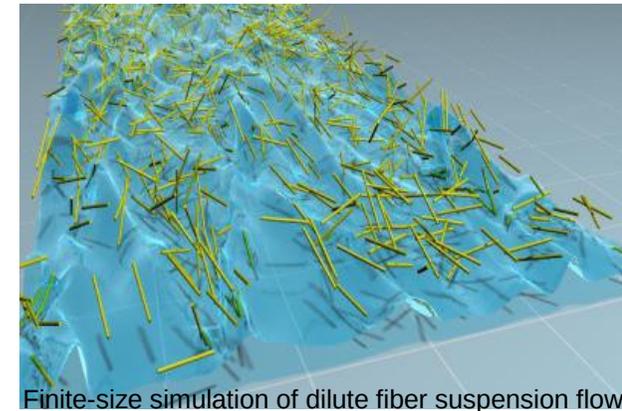
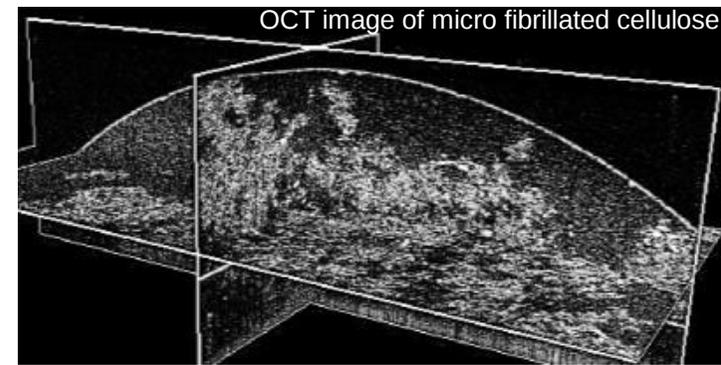
Predicting pulp behavior with single-phase continuum rheology (generalized-Newtonian viscosity models, fully non-Newtonian rheology models)

- **WG 3: Multi-Phase Flow Modelling (~50)**

Modelling fibre suspension flows with multiphase Euler-Euler and Euler-Lagrange models (averaged phase eqns, trajectory tracking)

- **WG 4: Knowledge Transfer (NEW!)**

Disseminate/transfer of know-why, know-what, know-how to industry



Finite-size simulation of dilute fiber suspension flow

Results vs. Objectives

- R1: Successful *networking* via WG meetings (work getting focused), STSMs (work getting done) and TS (knowledge transfer to ESRs)
- R2: Good level of *inter-disciplinarity*
- R3: Setup of *web infrastructure* for community building, document and data exchange.
- O1: Stimulate *scientific collaboration and scientific exchanges* among WGs
- O2: Allow *cross validation of tools* (access to at least one computer code and/or experimental equipment)
- O3: Increase *industrial participation*



Significant Highlights in Science or Networking

- The COST FP1005 website is the reference scientific resource of data, documents and updates on “Fiber suspension flows” on the web
- Knowledge Base: database of raw scientific data from CFD and experimental studies. Action FP1005 is putting a lot of effort in its development
- New collaborations with Action MP0806 and the ERCOFTAC community



Significant Highlights in Science or Networking

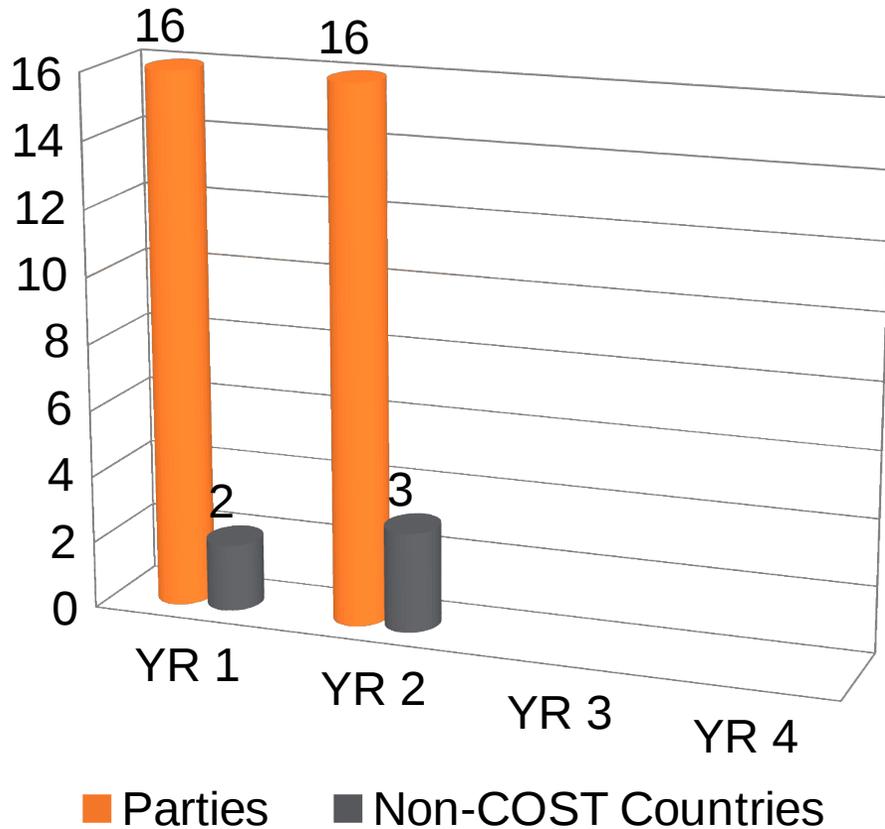
- STSM #9129, Applicant: Carla Cotas (ESR)
- Title: Using Ansys Fluent to Simulate Turbulent Flow of Fibre Suspension in Pipes
- *Scientific advancement*: new UDF for homogeneous Newtonian pulp suspension flow to take into account fiber-induced drag reduction
- *Networking*: collaborative study among WG1, WG2 and WG3 participants
- *Dissemination* of research results within the "particle and powder technology" community (PARTEC 2013)



Challenges

- No significant deviations from work plan expected
- Critical phases to be implemented or topics to be addressed during the 2nd/3rd year:
 - Produce further experimental measurements and simulation data for the Knowledge Base
 - Increase participation of industrial practitioners
 - Stimulate production of scientific collaborations/papers through WG meetings
 - Stimulate further STSMs
 - Stimulate submission of joint project proposals

Action Parties



Grant Holder:

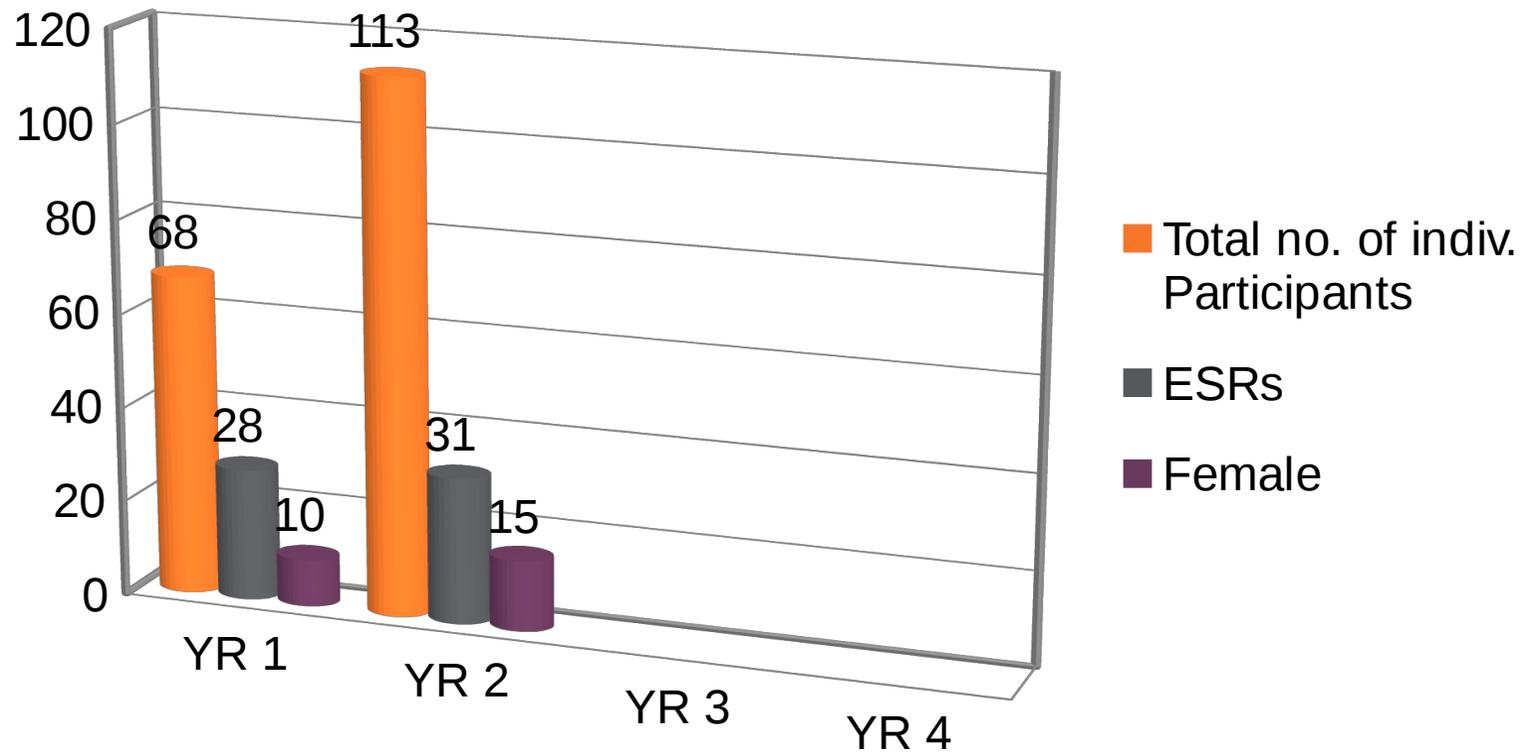
CISM

Scientific Representative:

Cristian Marchioli

GH Country: Italy

Action participants



Use of COST Instruments

Activity (No.)	Year 1	Year 2	Year 3	Year 4
MC/WG Meetings	2	2	-	-
STSMs	5	7	-	-
Training Schools	1	1	-	-
Workshops or Conferences	1	2	-	-
Joint Publications	2	8	-	-