National Grid NG SINGAPORE

Distributed Numerical Modeling for Viscoelastic fiber Suspensions

Project Introduction

Objectives
Distributed Numerical Modeling for Viscoelastic Fiber Suspensions

Project Investigator / Manager
A/Prof. Khoo Boo Cheong
National University of Singapore
mpekbc@nus.edu.sg

Abstract
The project has 2 phases: The first phase involves the simulation of fiber suspension in Newtonian fluids which will be reported here. The second phase is on the simulation of fiber suspension in viscoelastic liquids.

Project Details

Description
The orientation of fibers under Couette flows has been observed through the simulation (Figures 1 & 2). At the initial state the fibers are randomly located in the channel. After 300 time units, the fiber are fully aligned to the flow direction.

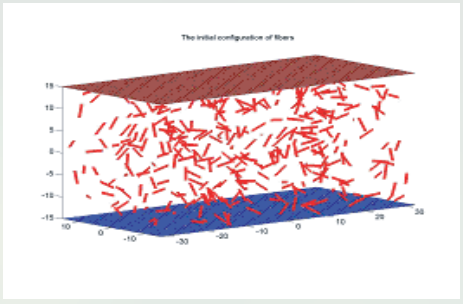

Figure 1. Initial configuration of fibers

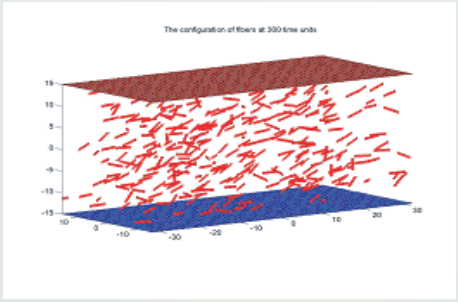

Figure 2. Configuration of fibers at 300 time units

The simulation can predict the reduced viscosity of fiber suspensions and the results (Figure 3) are very well aligned with experimental data (Gavani and Powell, 1986).

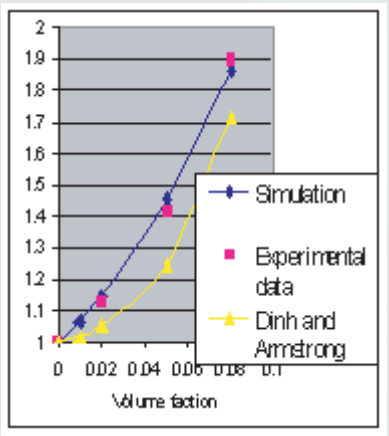

Figure 3. Reduced Viscosity

DPD simulation is a compute-intensive process. Grid Computing in this process enables each flow domain to be divided into several subdomains which is then assigned to compute resources in the Grid environment where the simulations of particle flows are executed concurrently – tapping unused resources over the Grid to provide the speed-up in simulation and accelerate analytical and decision making process.