

Balas Introduction

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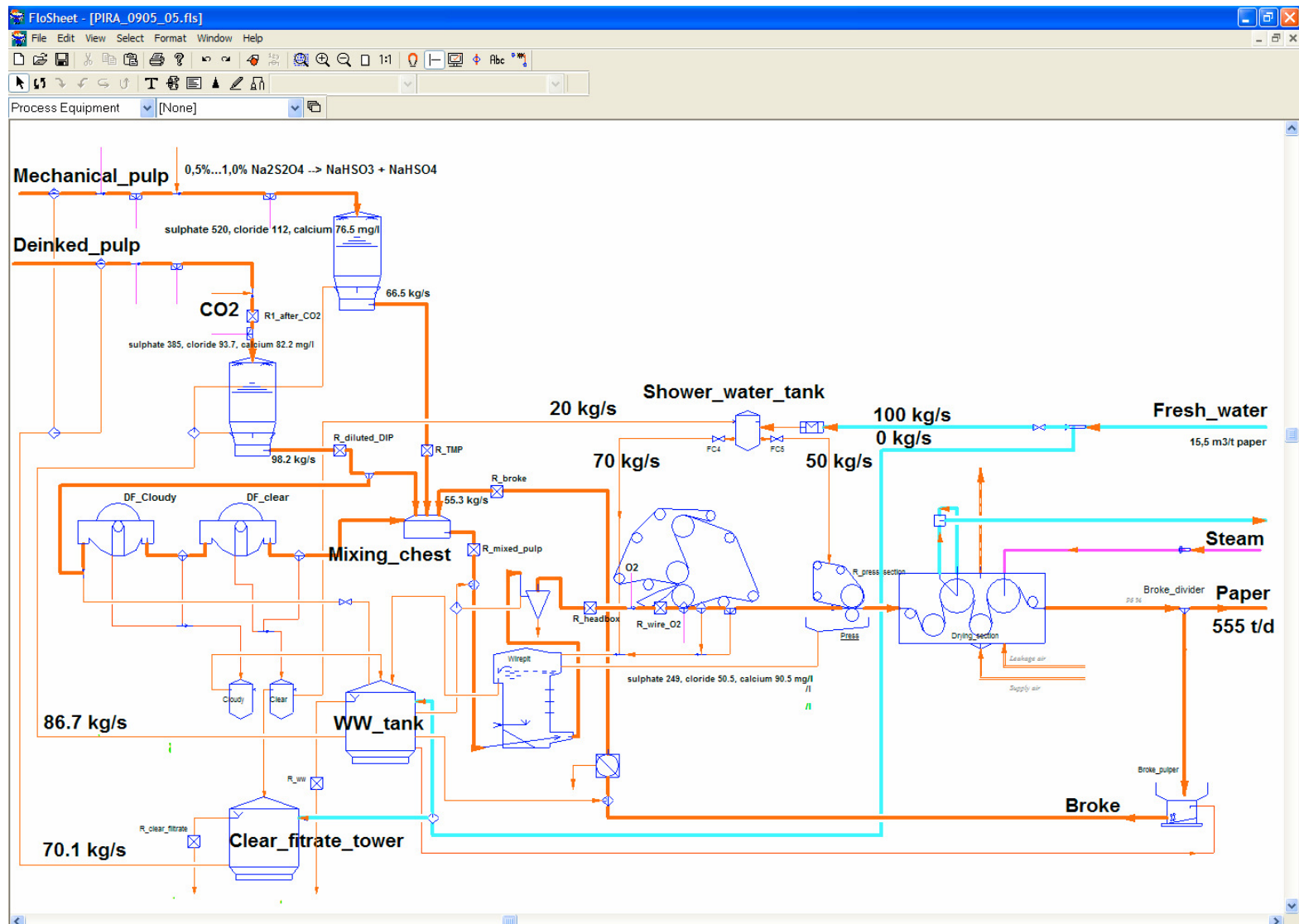
GTT Workshop, Herzogenrath, Germany, May 17-19, 2006



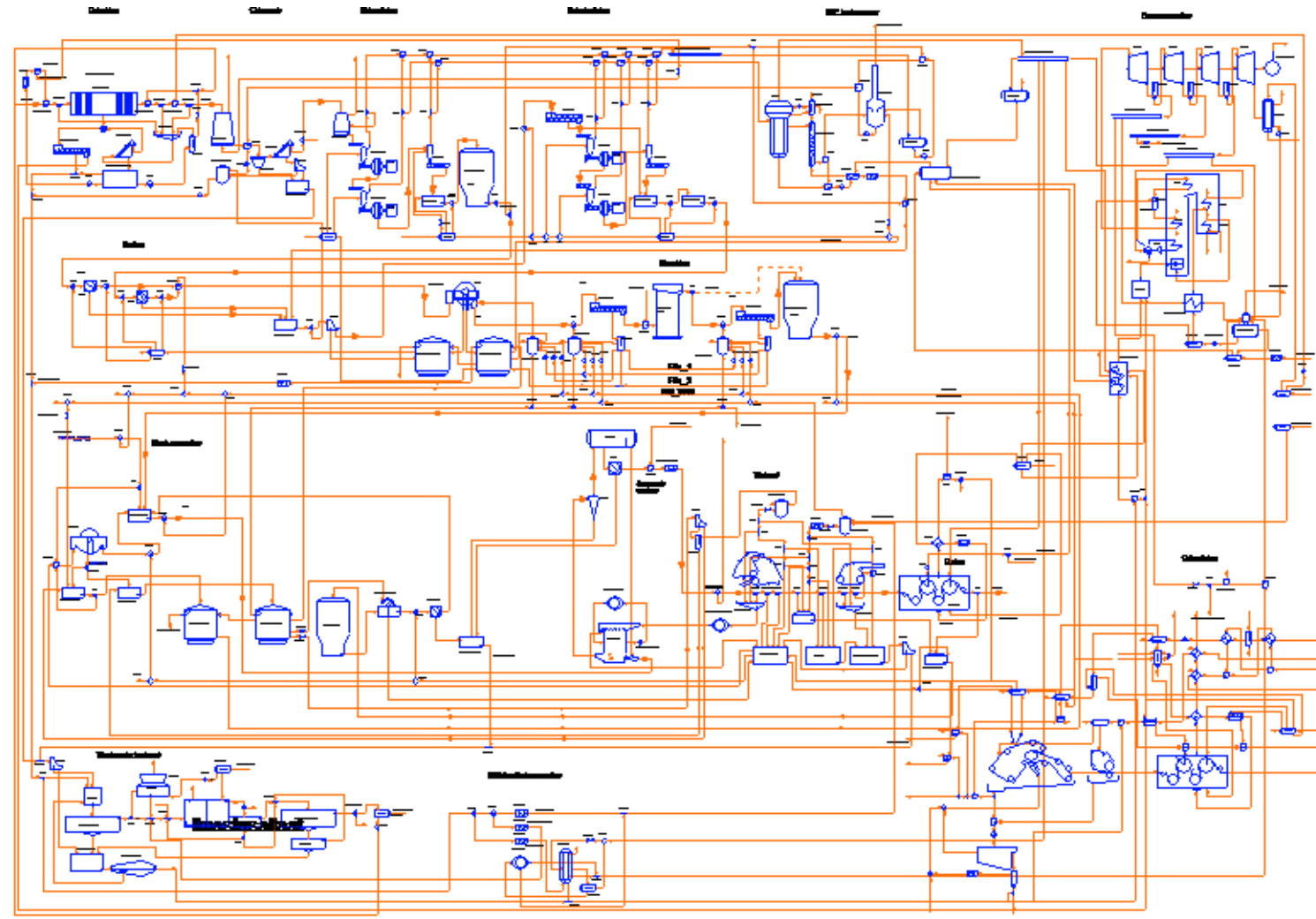
Introduction

- A steady-state simulation package for pulp and paper mills
- Extensive selection of unit operation modules for
 - mechanical pulping
 - paper machine line
 - heat recovery
 - water and wastewater treatment
 - power plants
- Applications
 - site-wide material and energy balances
 - heat recovery and heat integration analyses
 - modelling of dissolved and colloidal substances
 - process optimisation and fitting process model to measured data
- Easy MS Excel interface
 - import and export any process parameters and run the process model within Excel
 - visualisation of process data
 - tailored report sheets

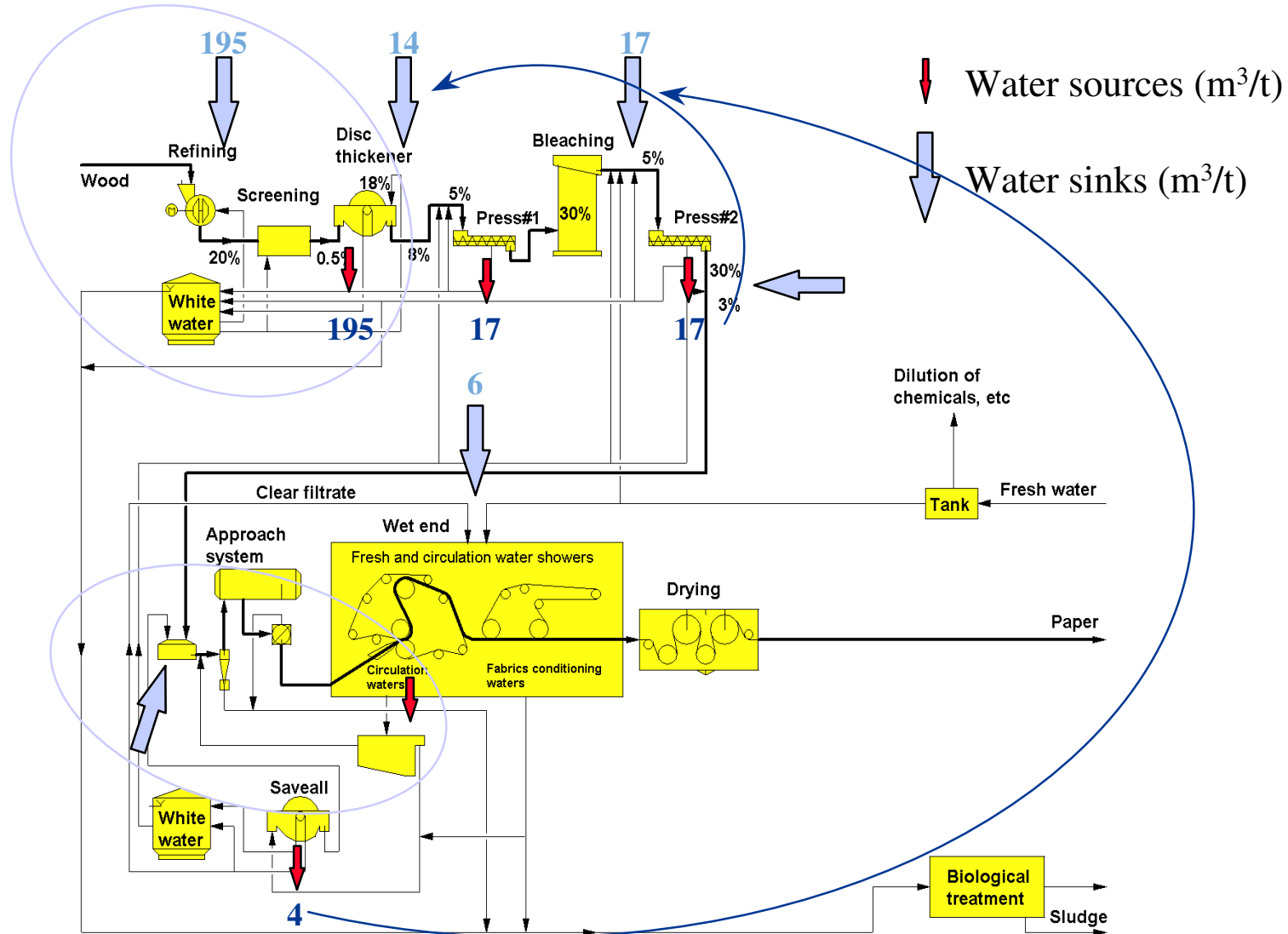
Small Scale Process Flowsheet



Large Scale Process Flowsheet



Water Management

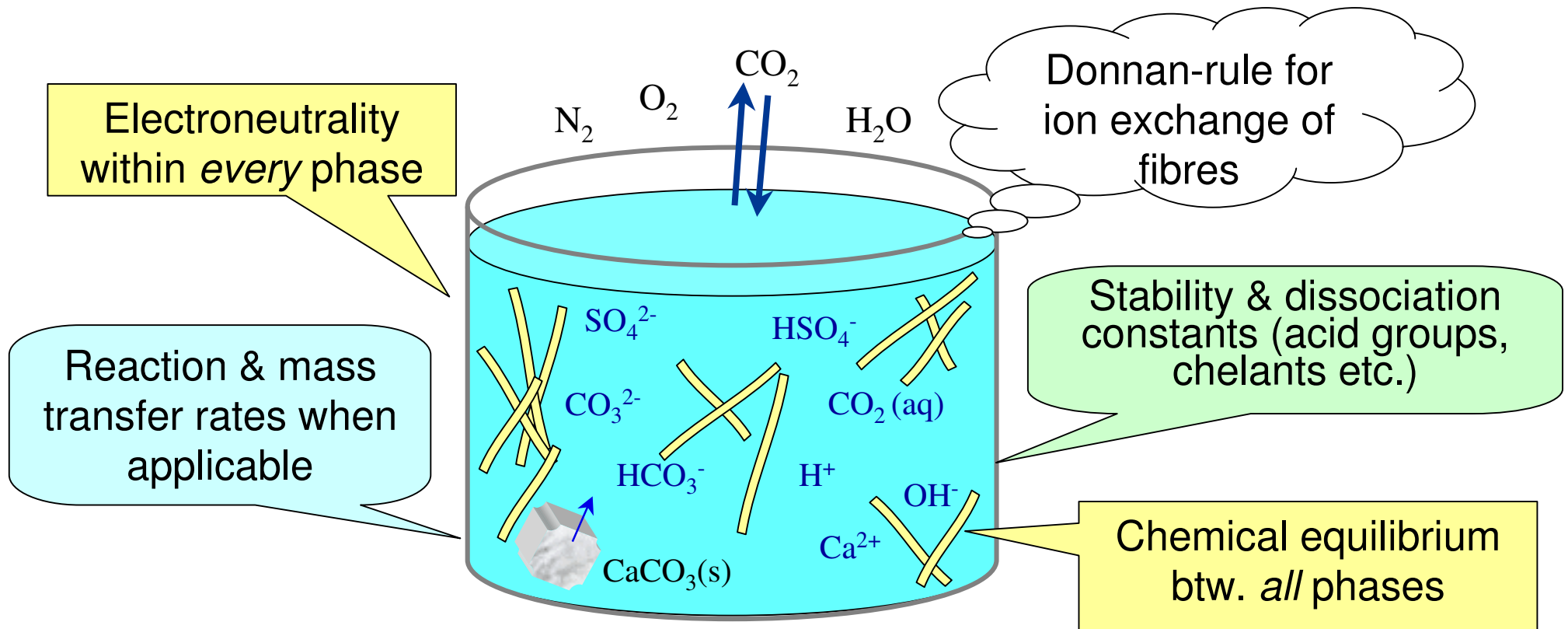


Present Situation

- 1998 - 2000 development work has been done as a part of CACTUS technology programme financed by (TEKES) Technology Development Agency and the industry
- First beta version for wider testing in the industry was released in 1998
- 20 training courses for industrial users arranged since the release of the first beta version
- About 70 licences out in the industry

- Multi-phase and multi-component (gas, water, fiber, pure solids) module added 2005. Uses ChemApp.

Multi-Phase Theory for Pulp Suspensions



Multi-Phase Theory for Pulp Suspensions

$$\mu_i^\alpha = \mu_i^\beta = \mu_i^\gamma = \dots$$

Chemical equilibrium
btw. *all* phases

$$\sum_i z_i n_i^\alpha = 0$$

Electroneutrality
within *every* phase

$$\lambda = \left[\frac{a_f^i}{a_s^i} \right]^{\frac{1}{z_i}}$$

Donnan-rule for
ion exchange

Reaction & mass
transfer rates when
applicable

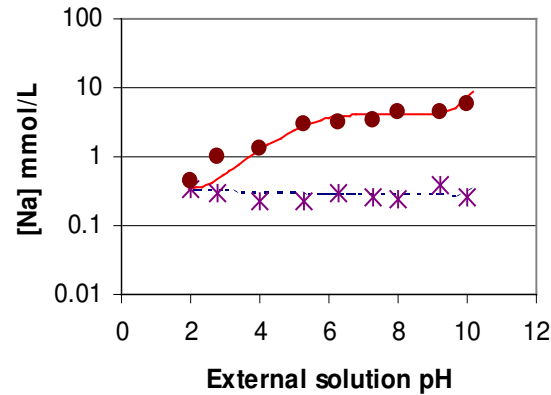
Stability & dissociation
constants (acid groups,
chelants etc.)

$$\ln K_a = -\frac{\Delta G^0}{RT}$$

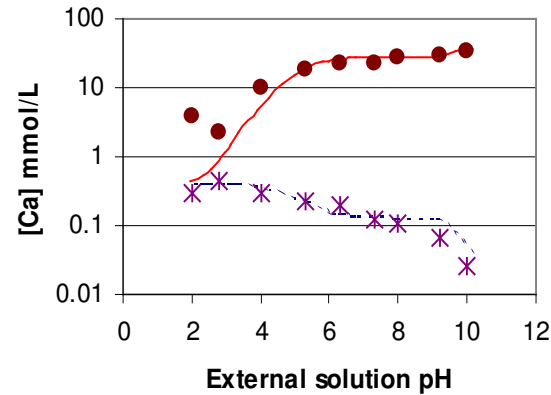
$$r = k \prod_i a_i^{v_i} \left[1 - \frac{Q}{K} \right]$$

Validation

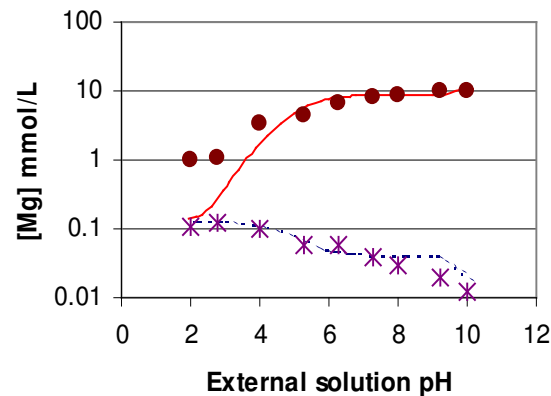
Sodium - Pulp1



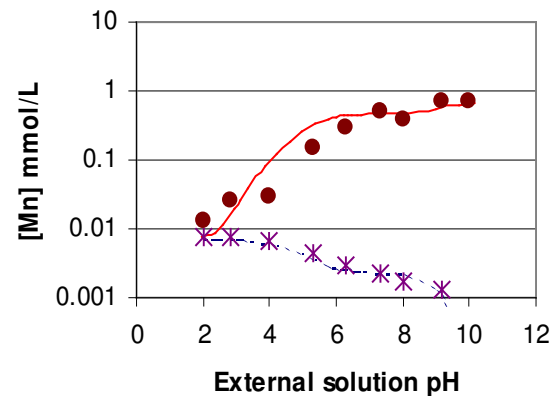
Calcium - Pulp1



Magnesium - Pulp1



Manganese - Pulp1



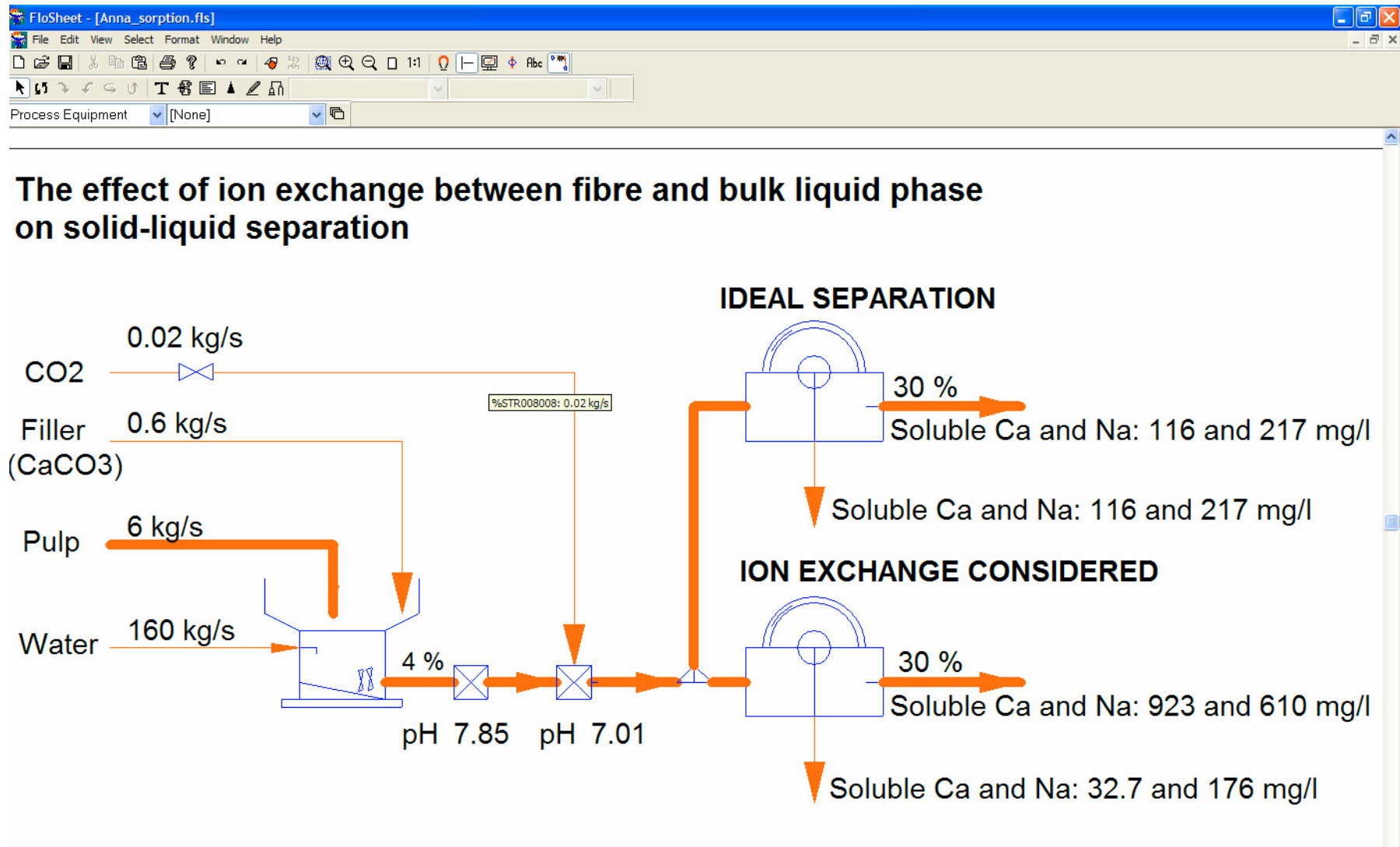
- [M]f - model
- [M]f measured
- - - [M]s - model
- * [M]s measured

➤ Experimental results from Towers & Scallan, J. Pulp Paper Sci., 1996

$$\lambda = \left[\frac{a_f^i}{a_s^i} \right]^{\frac{1}{z_i}}$$

➤ quantifies pH, ion content vs. fibre type

ChemBalas Model



ChemBalas Model

