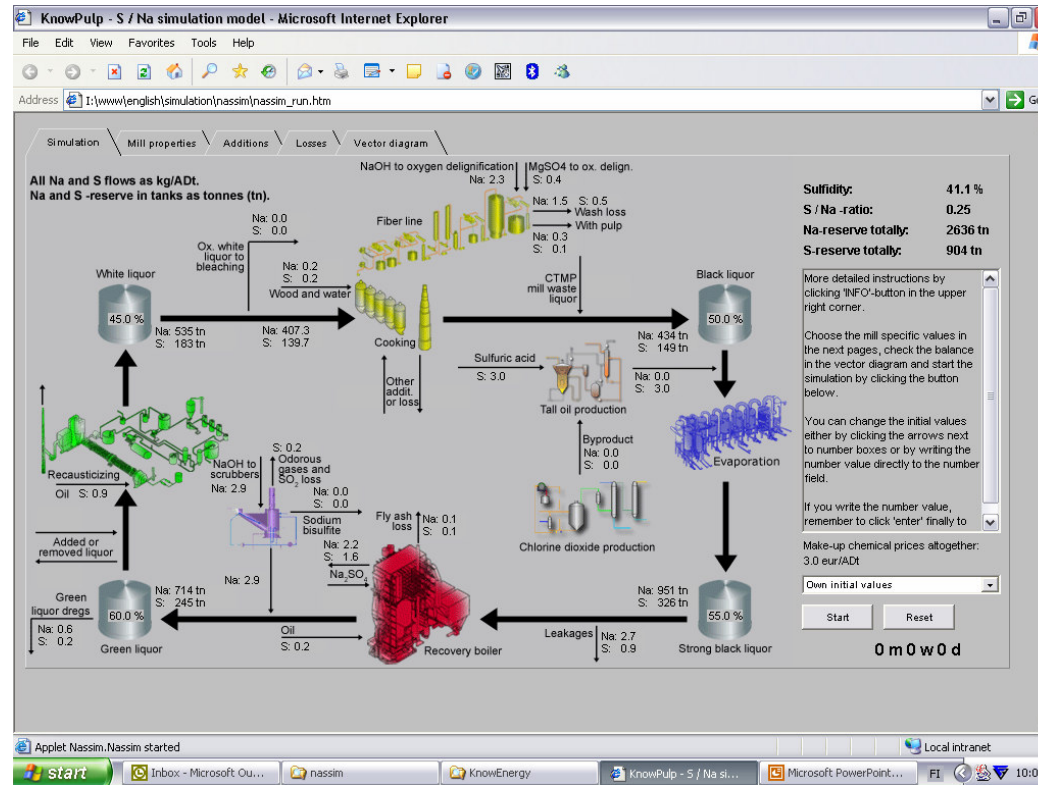


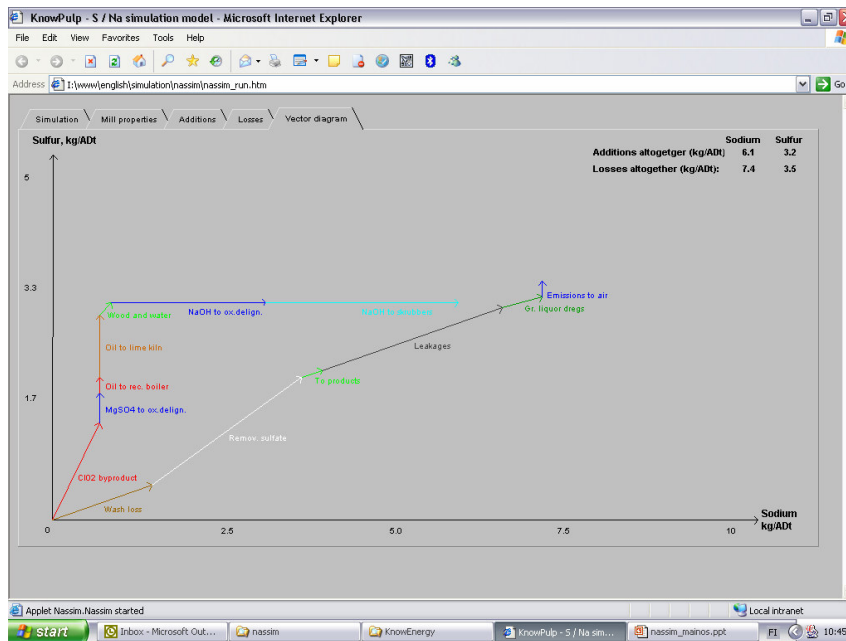
Sulfur / sodium simulation model



ProWledge Oy
 PL 35 (Teknobulevardi 3-5)
 01531 Vantaa, Finland
www.prowledge.com

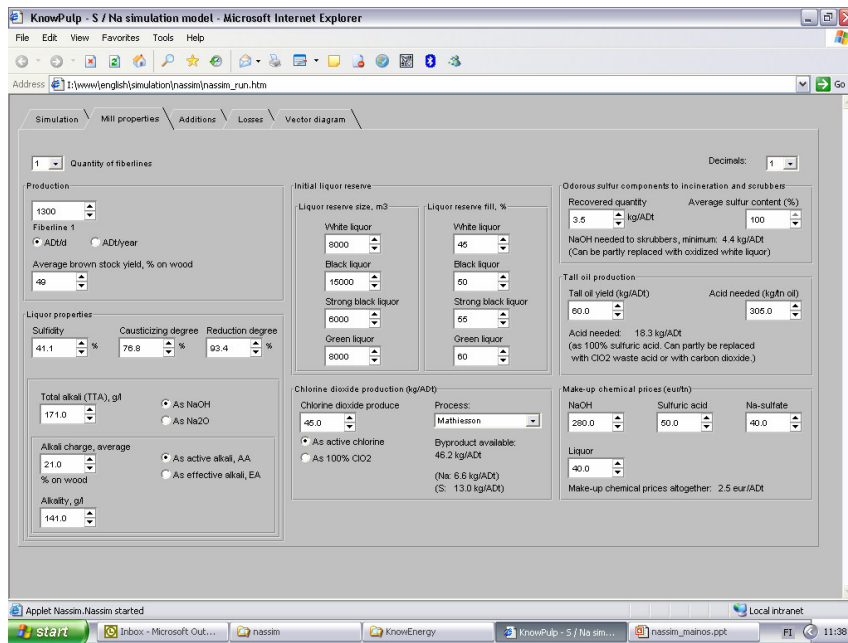


Sulfur / sodium simulation model



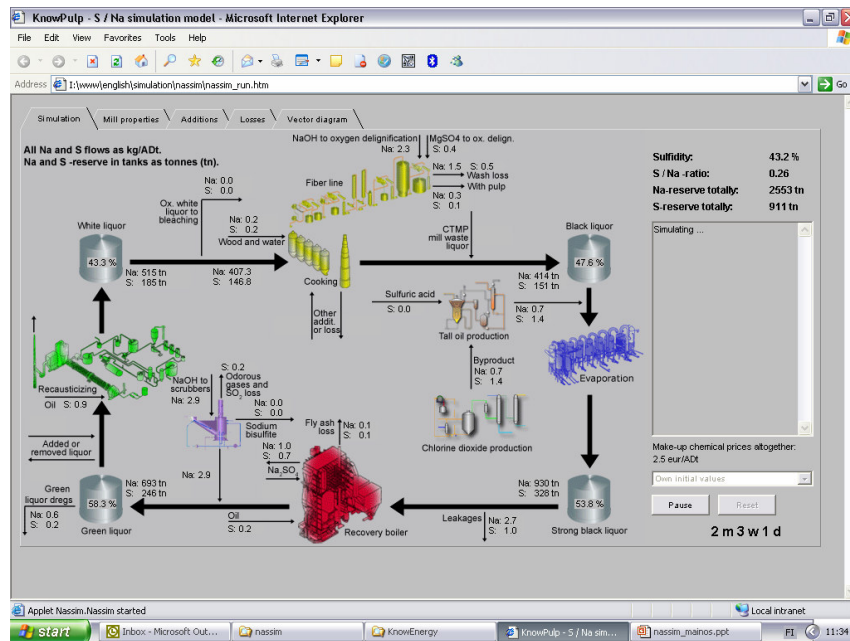
- Efficient tool to clarify factors affecting S / Na balance in a pulp mill
- Calculates stationary balance according to input and output settings and draws a vector diagram based on the balance
- Runs in standard web browsers, no installation procedures needed

Sulfur / sodium simulation model



- Mill-specific information can be pre-programmed easily
- The initial situation of the mill can be set to the model and effects of different actions can be tested
- Can be used e.g. in teaching, trouble-shooting and testing alternatives

Sulfur / sodium simulation model



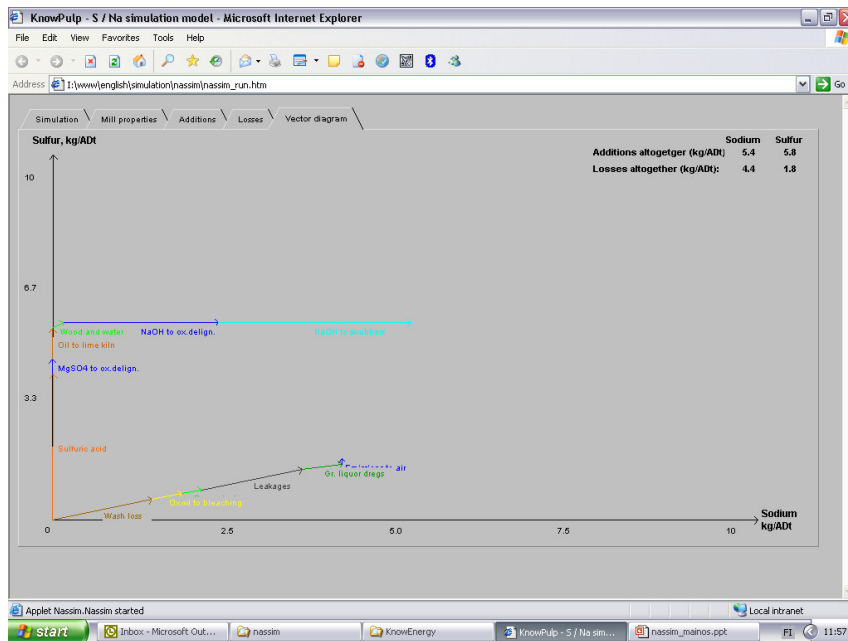
- Possibility to simulate the long-term behaviour of S/Na balance, liquor reserves and sulfidity
- Possibility to change input/output values during simulation
- 1-3 fiberlines



Sulfur / sodium simulation model

Example:

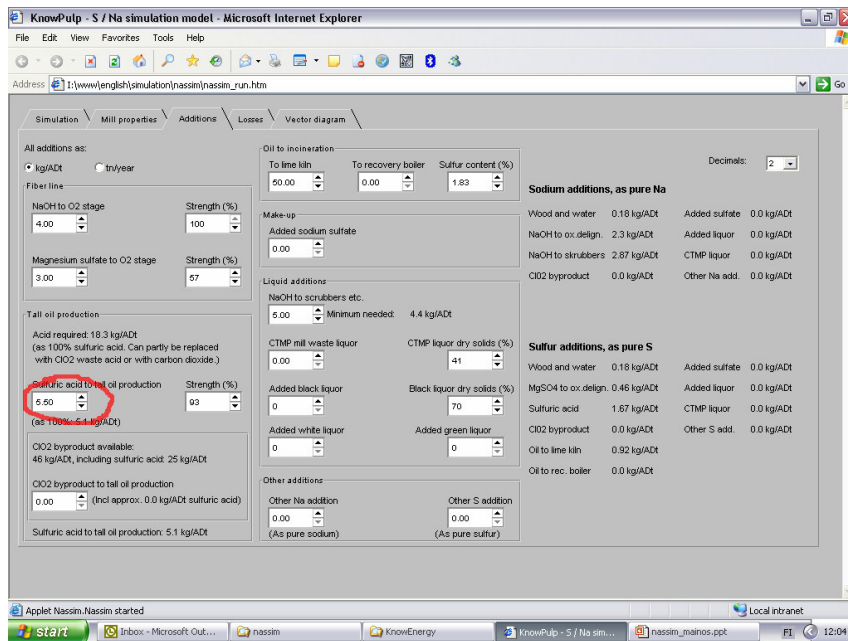
- Problems with too high sulfur input in a modern pulp mill with low emissions
- Sulfidity increases rapidly (can be verified by simulation)
- How to solve it?



Sulfur / sodium simulation model

Example - step 1:

- Decrease sulfuric acid usage in tall oil production - it can be partly replaced with e.g. carbon dioxide or sodium bisulfite from the mill
- You can feed all additions and losses either as kg/ADt or tons/year. The model transfers them to kg S and Na / ADt produced.

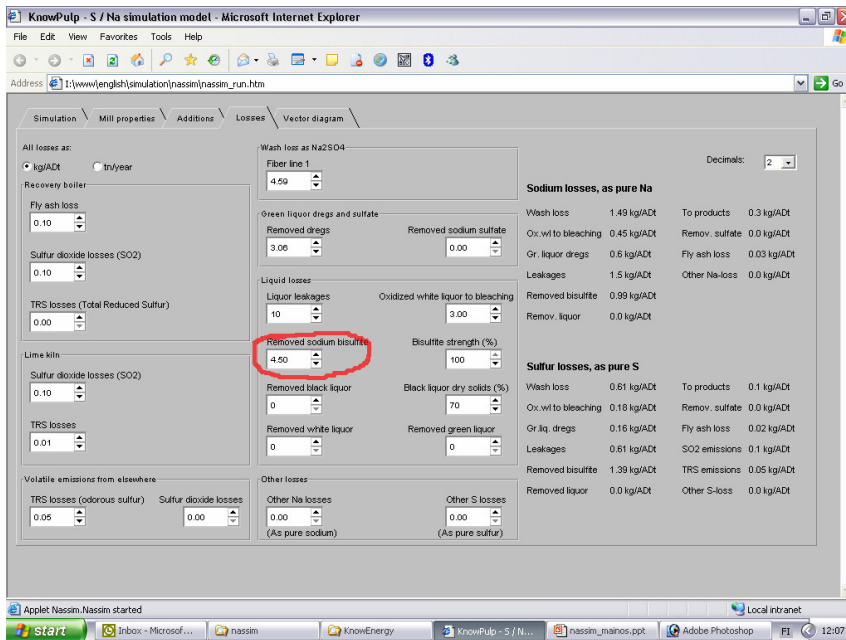


The screenshot shows the 'KnowPulp - S / Na simulation model' interface. The 'Sulfuric acid to tall oil production' field is highlighted with a red circle and contains the value 5.50. Below it, a note indicates '(As 100% SO₃ 5.4 kg/ADt)'. The interface also shows other parameters like 'NaOH to O₂ stage' (4.00 kg/ADt), 'Magnesium sulfate to O₂ stage' (3.00 kg/ADt), and various 'Sodium additions' and 'Sulfur additions'.

Sulfur / sodium simulation model

Example - step 2:

- Remove sodium bisulfite from scrubbers - it has high sulfur content. Bisulfite can be used e.g. in the bleach line.
- You can choose the additions and losses accuracy, 0-2 decimals



The screenshot shows the 'Losses' tab in the KnowPulp simulation model. The 'Removed sodium bisulfite' parameter is highlighted with a red circle and set to 4.50. The interface also displays various other loss parameters and their values, such as 'Wash loss as Na2SO4' (4.50) and 'Sulfur losses, as pure S' (0.00).

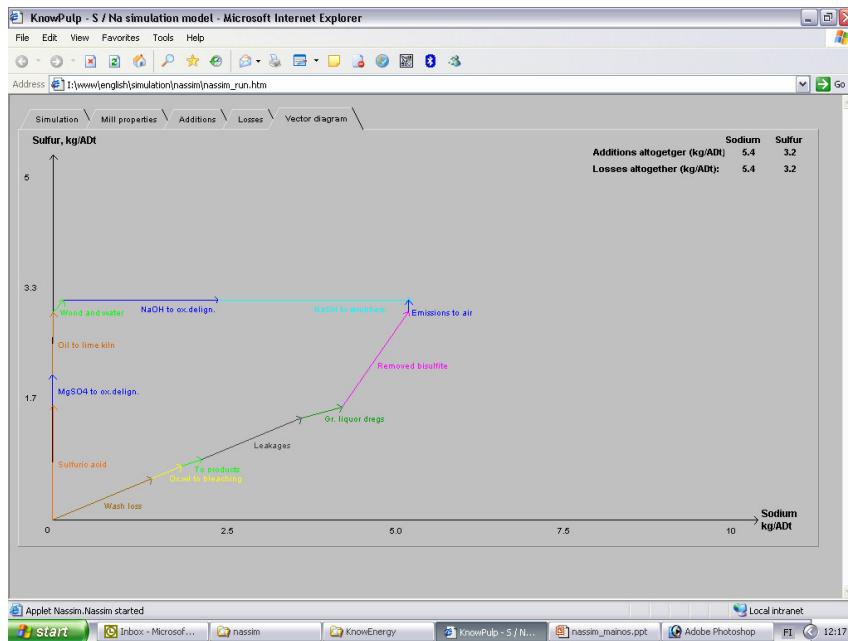
| Parameter | Value |
|--|-------|
| Wash loss as Na ₂ SO ₄ | 4.50 |
| Removed sodium bisulfite | 4.50 |
| Removed sodium sulfate | 0.00 |
| Removed black liquor | 0 |
| Removed white liquor | 0 |
| Removed green liquor | 0 |
| Other Na losses (As pure sodium) | 0.00 |
| Other S losses (As pure sulfur) | 0.00 |



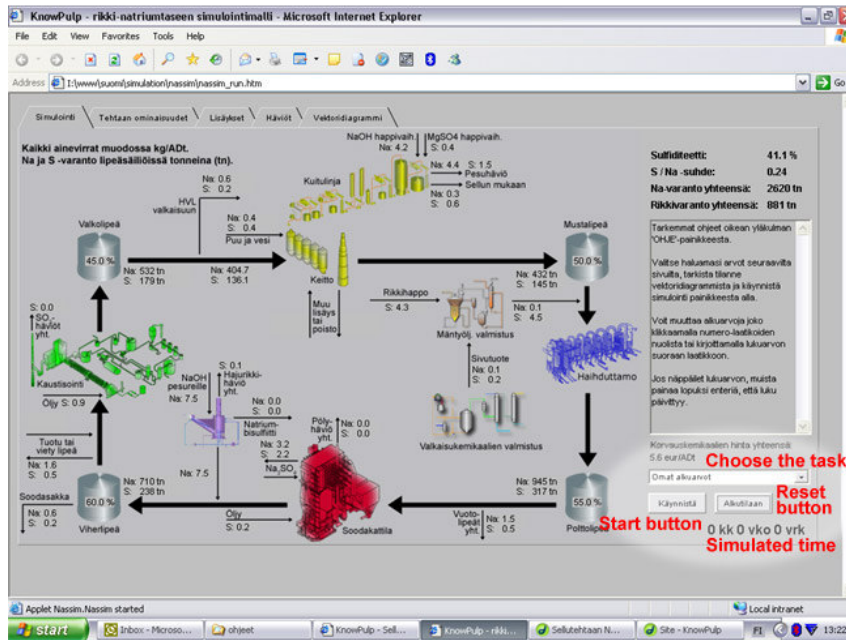
Sulfur / sodium simulation model

Example

- Problem solved!
- This can be verified by simulating



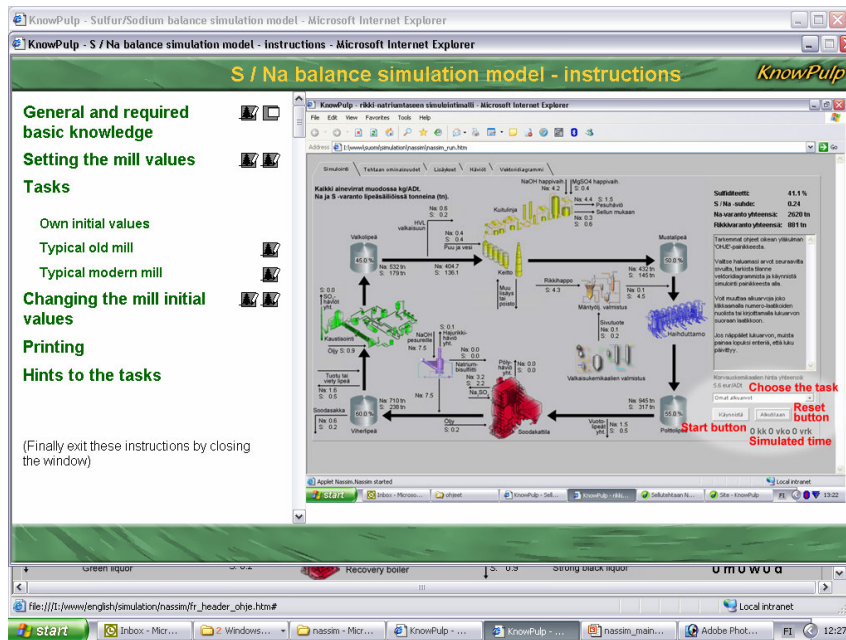
Sulfur / sodium simulation model



The model has three pre-programmed tasks:

1. Own initial values:
 - The simulation loads the mill-specific situation which you can install
2. Typical old mill
3. Typical modern mill

Sulfur / sodium simulation model



The screenshot shows a web browser window displaying the 'S / Na balance simulation model - instructions' page. The page has a green header with the 'KnowPulp' logo. On the left, there is a sidebar with several sections: 'General and required basic knowledge', 'Setting the mill values', 'Tasks', 'Own initial values', 'Typical old mill', 'Typical modern mill', 'Changing the mill initial values', 'Printing', and 'Hints to the tasks'. The main content area shows a detailed flowchart of the simulation model, including various units and parameters. A 'Start button' and 'Reset button' are visible at the bottom right of the simulation area. The browser's address bar shows the URL 'file:///I:/www/english/simulation/nassim/fr_header.htm#'. The Windows taskbar at the bottom shows several open applications, including 'Inbox - Mic...', 'Windows...', 'nassim - Mic...', 'KnowPulp - ...', 'nassim_main...', and 'Adobe Phot...'. The system clock shows '12:27'.

- Extensive and understandable instructions included
- Very easy to use; you don't need to be a "professional" to be able to use this



Sulfur / sodium simulation model



- The simulation model have been tested with several existing mills and is found to be corresponding
- We are happy to put your mill-specific data into the model in order to make it ready-to-use for your purposes!

Prowledge Oy
contact@prowledge.com
www.prowledge.com