

Graphical User Interface GRADES

APROS simulation model is configured graphically through the CAD-like user interface GRADES by drawing diagrams and filling in parameters through property sheets. GRADES has a net editor with dialogs to edit property values, define trends etc., and editors for modifying the graphical looks of nodes, terminals and connections.

GRADES is a registered trademark of Process Vision Ltd

Building up the simulation model

The APROS simulation model is built up by adding nodes, drawing connections and entering property values. This is done through the net editor of GRADES.

The node types available are displayed on GRADES organised in model libraries. To add a node, select the node type and drag and drop the node on the net canvas. Similarly, to draw a connection, select the connection type, then select the start terminal, the corner locations and the end terminal

To complete the model definitions, enter model parameters: physical dimensions, boundary conditions and initial state. This is done for each node and connection through a dialog.

The configuration is passed to the simulation engine on-line, and the simulation can start immediately after the configuration has been done. At any time, the model can be saved into a snapshot file that contains the complete model configuration, parameters and state. At any time, one can revert to a previously saved snapshot.

Organising the model

The number of nets in a model is unlimited, and they can be grouped in net groups. Each net can be printed in a neat form, comparable to that available in a CAD-system.

To create model libraries and hierarchical models, one can create composite components:

1. select a collection of nodes and connections on the net
2. pack the selection into a component
3. define interface terminals
4. draw a symbol on the node editor

After that, the new symbol is displayed as a node type in the model libraries, and one can use it like any predefined node type.

Typically, a simulation model contains several nets organised hierarchically. The complete model or a part of it may be exported and imported. This enables the exchange of models between projects and the storing of models in libraries for future use.

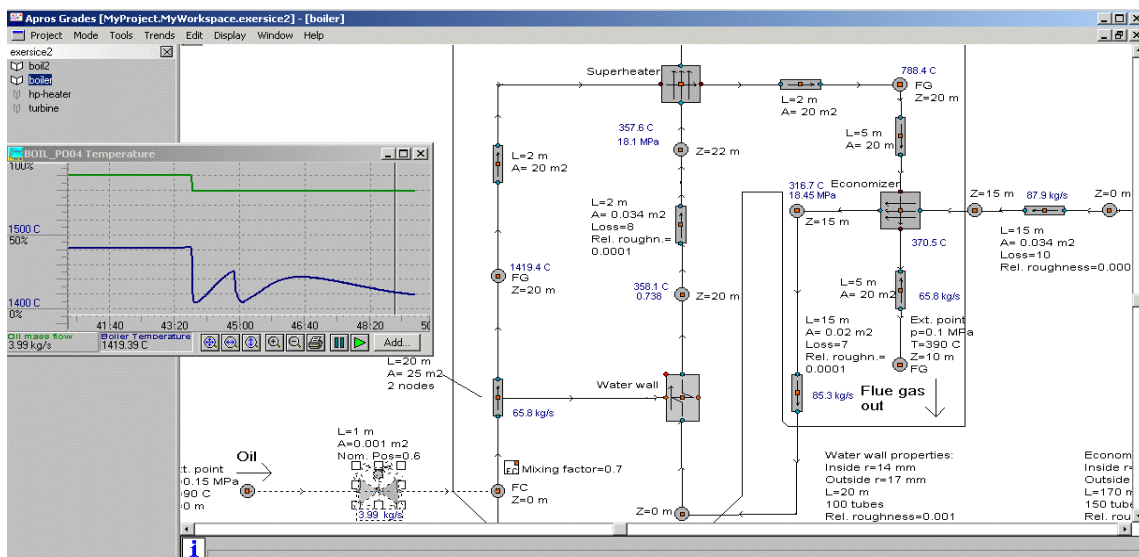


Figure 1 Grades net editor

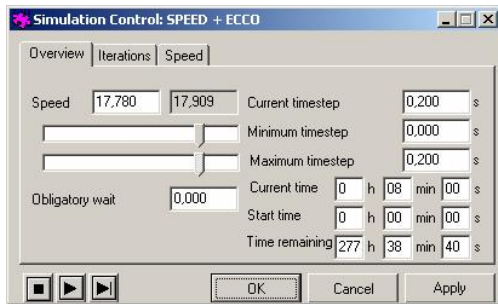


Figure 2 Simulation control dialog

Running simulation

A simulation control dialog can be opened through GRADES. Through the dialog, one can start and stop simulation, view and set the simulation speed, time step etc.

GRADES provides versatile tools for monitoring the dynamic behaviour of the simulation model either as trend graphs, numerical values (monitors), or dynamic forms.

The values displayed in any monitoring feature are picked simply through the net editor.

One can collect several trend variables on the same trend window. The trend window has a number of easy-to-use features for viewing the trend: scrolling, zooming and printing.

Together with the monitor value, one can have the unit and a free-format text printed on the net canvas. At copy-paste of the node or connection, the monitors are copied, too.

Dynamic forms can be used for monitoring e.g. the liquid level in a tank.

Typically, trend graphs are used for demonstrating the longer-term behaviour of the system, while the monitors and dynamic forms provide instantaneous values of each component's most essential properties.

One can also select that the logic connections in the automation system pictures are automatically coloured according to their states, when the simulation is stopped or run stepwise.

During simulation, the graphical picture elements can be used just like between simulation runs for changing component properties on-line, e.g. set point values and controller parameters. One can also define new monitors and trends at any time.

Help system

APROS has a comprehensive help system that consists of general guides, user's guides and reference guides. The guides are partly in html and partly in pdf format.

The general guides provide information on the possible configurations of the system, on the use of GRADES, on external interfaces and other features common to the model libraries. The guides also give a tutorial on building a simple simulation model.

The user's guides of different domains give solutions to most frequent modelling problems.

The reference guides describe all component types and give information on their properties. From every node on GRADES, there is a link to the appropriate location in the reference guide.

Control GRADES

To enhance the features needed in control system planning, Control GRADES has been made available. Control GRADES is an add-on product to GRADES, and it has e.g. following features:

- improved documentation features: page templates and system texts, e.g. company name, project name
- signal cross-reference tables for net interconnections, an alternative way to the one available in GRADES

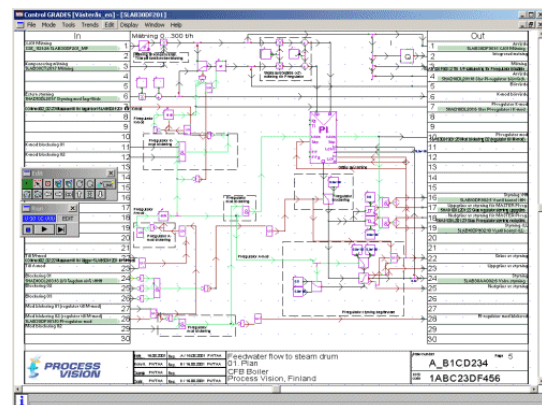


Figure 3 Control Grades