

JaSim[®] Model J1030

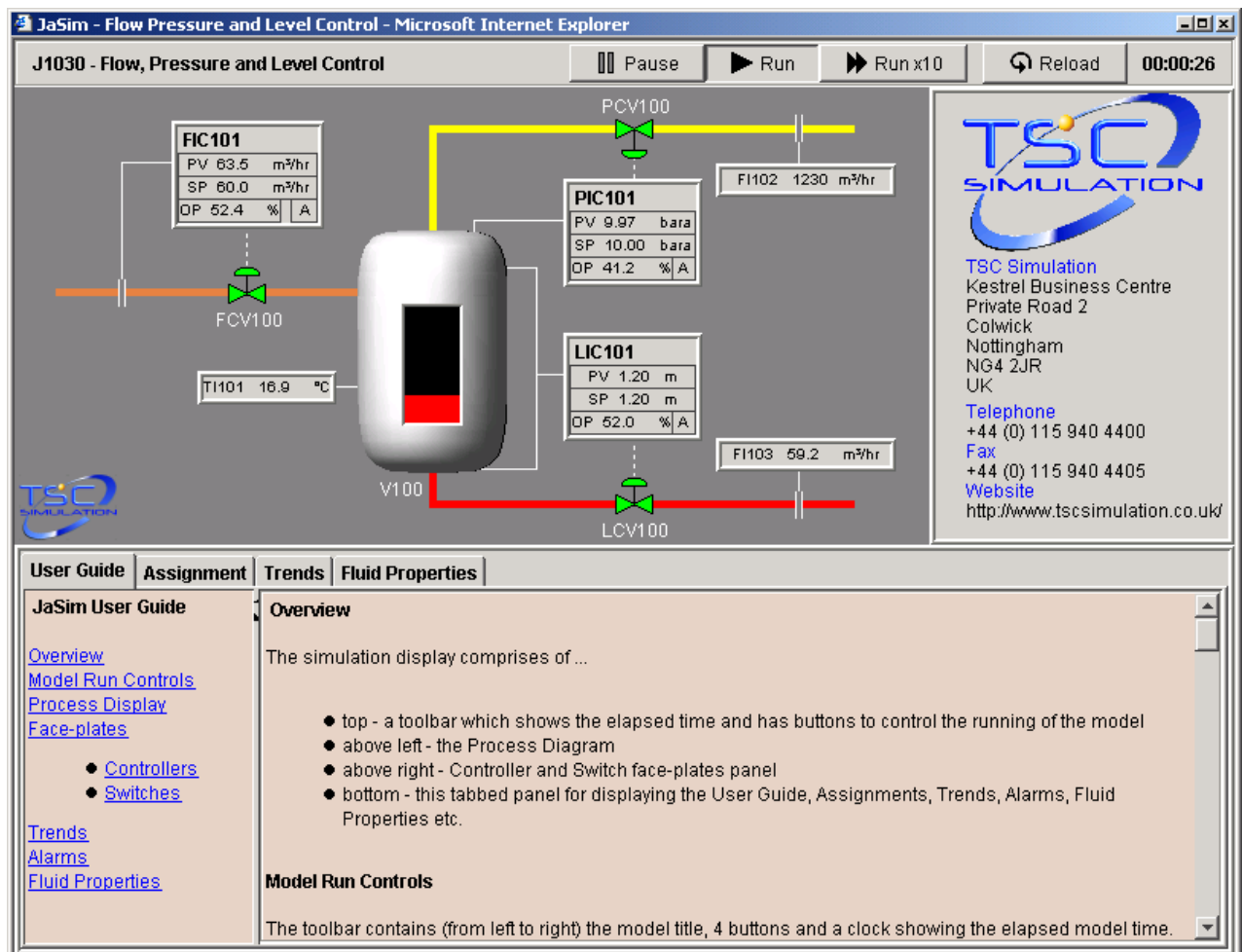
JaSim[®] is a brand-new range of web-enabled Dynamic Process Simulation Models written in Java Software, for training in process and control, using engineering level mathematical algorithms.

Complete with Training Assignments, the Models are suitable for both individual and class training, using most modern computers, not just including PC, but also Mac, Sun, and HP.

Each model may be installed from a website download or from CD ROM.

- **Full engineering level algorithms**
- **Suitable for e-learning or whole class teaching**
- **Dynamic simulation for the most memorable process training**
- **May be used for both theoretical and practical training in plant and process**

JaSim[®] Model J1030 – Flow, Pressure and Level Control



Simulation Data:

Controller	PV	SP	OP	Units
FIC101	63.5	60.0	52.4	m ³ /hr
PIC101	9.97	10.00	41.2	bara
LIC101	1.20	1.20	52.0	m

Process Variables:

Variable	Value	Units
TI101	16.9	°C
FI102	1230	m ³ /hr
FI103	59.2	m ³ /hr

User Guide Overview:

The simulation display comprises of ...

- top - a toolbar which shows the elapsed time and has buttons to control the running of the model
- above left - the Process Diagram
- above right - Controller and Switch face-plates panel
- bottom - this tabbed panel for displaying the User Guide, Assignments, Trends, Alarms, Fluid Properties etc.

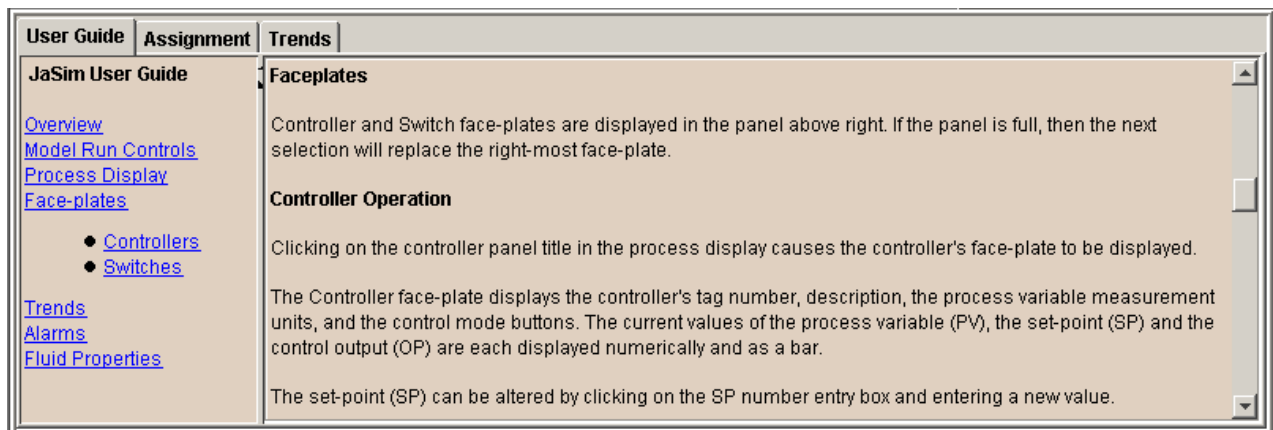
Model Run Controls:

The toolbar contains (from left to right) the model title, 4 buttons and a clock showing the elapsed model time.

The **JaSim** display comprises:

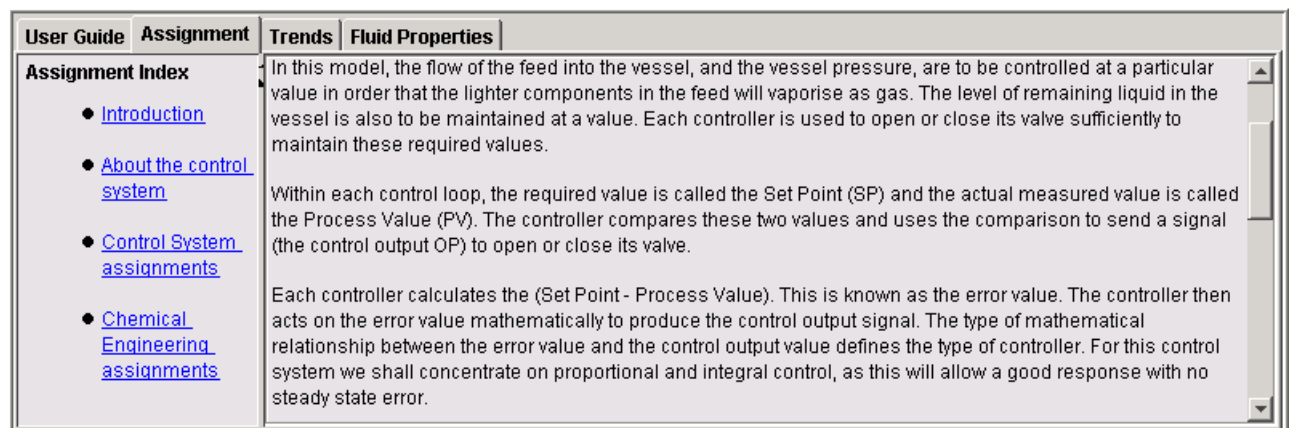
- Top - a toolbar which shows the elapsed time and has buttons to control the model to run at real time, or at a higher speed, and to pause. The start-up conditions may also be reloaded from this toolbar.
- Above left - the Process Display, laid out as a modern DCS Graphic Screen.
- Above right - Controller and Switch scratch-panel (Shows the TSC logo on start-up)
- Bottom - a tabbed panel for displaying the User Guide, Assignments, and Trend Charts. More advanced models include tabs for Alarms, ESD systems, Fluid Properties etc.

The **JaSim** User Guide includes a hotlink index, for example clicking on the “Controllers” index will scroll the Guide to the correct heading:

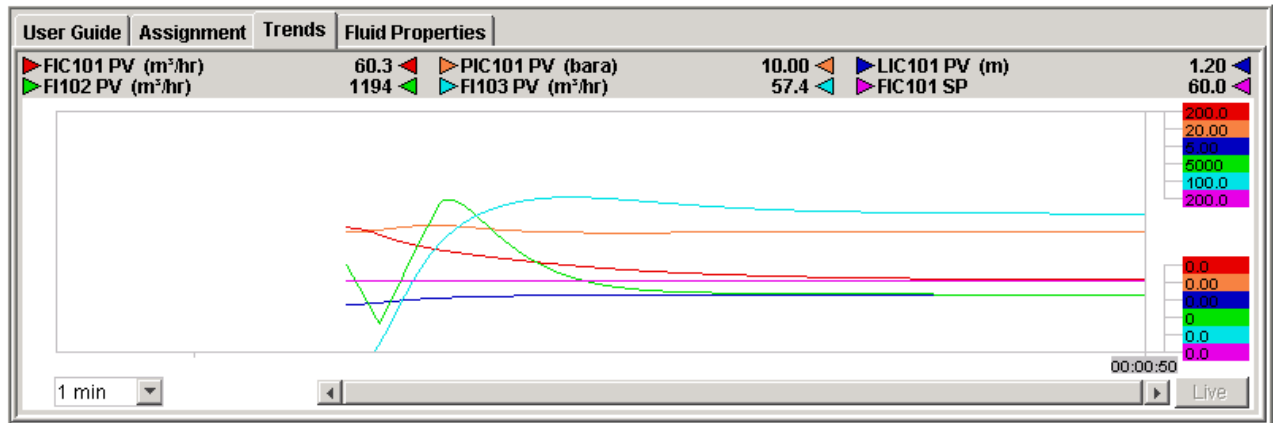


An **Assignments** page is also selected by a tab, scrolls down in the lower half of the display screen, and also includes a hotlink index.

For **JaSim** Model J1030 Flow, Pressure and Level PID Control, the Assignments guide the Trainee through a control system where each of the loops is inter-related by the change in the gas/liquid proportion in the vessel, as the pressure or flow is changed. The Assignments also consider the implications on the gas and liquid proportions, of the pressure in the vessel.



A comprehensive **JaSim Trends Display** is also supplied, selected by a tab, and is displayed in the lower half of the screen. The Trend Display allows both Time-base and Channel selection, Channel ranging, and full historical value recording. This display shows the settling of the J1030 model during the first few minutes:



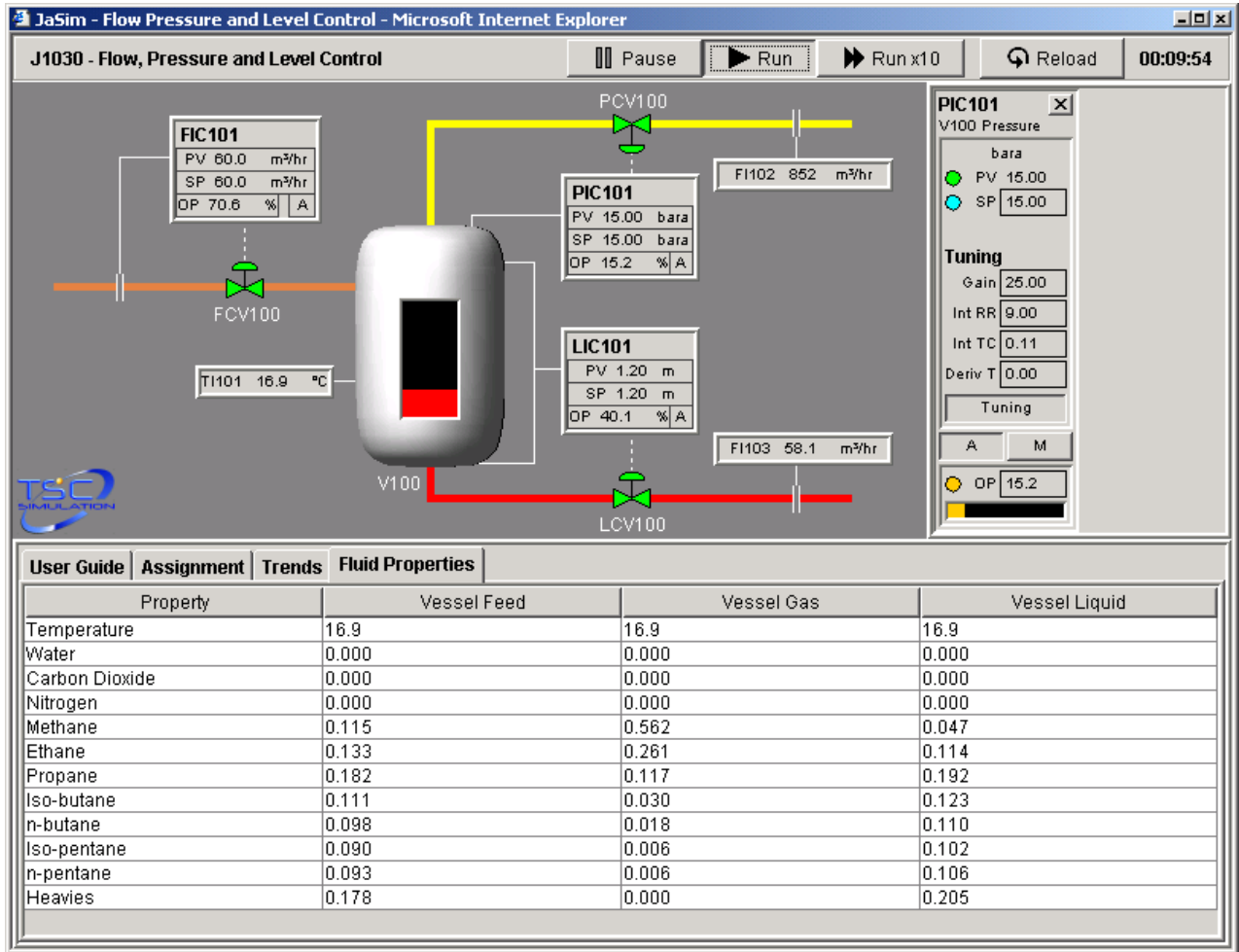
The models use **Full Engineering Level Mathematical Analysis**.

- a) increased fidelity displays may be selected by holding the cursor on a variable value. This automatically brings up a greater precision display of the value, usually to 8 significant digits.
- b) The fluid properties of multiple component fluids is shown as a table at each key element of the process. Click on the Fluid Properties tab to show:

Property	Vessel Feed	Vessel Gas	Vessel Liquid
Temperature	16.9	16.9	16.9
Water	0.000	0.000	0.000
Carbon Dioxide	0.000	0.000	0.000
Nitrogen	0.000	0.000	0.000
Methane	0.115	0.497	0.031
Ethane	0.133	0.285	0.099
Propane	0.182	0.143	0.191
Iso-butane	0.111	0.037	0.127
n-butane	0.098	0.023	0.115
Iso-pentane	0.090	0.008	0.108
n-pentane	0.093	0.007	0.112
Heavies	0.178	0.000	0.217

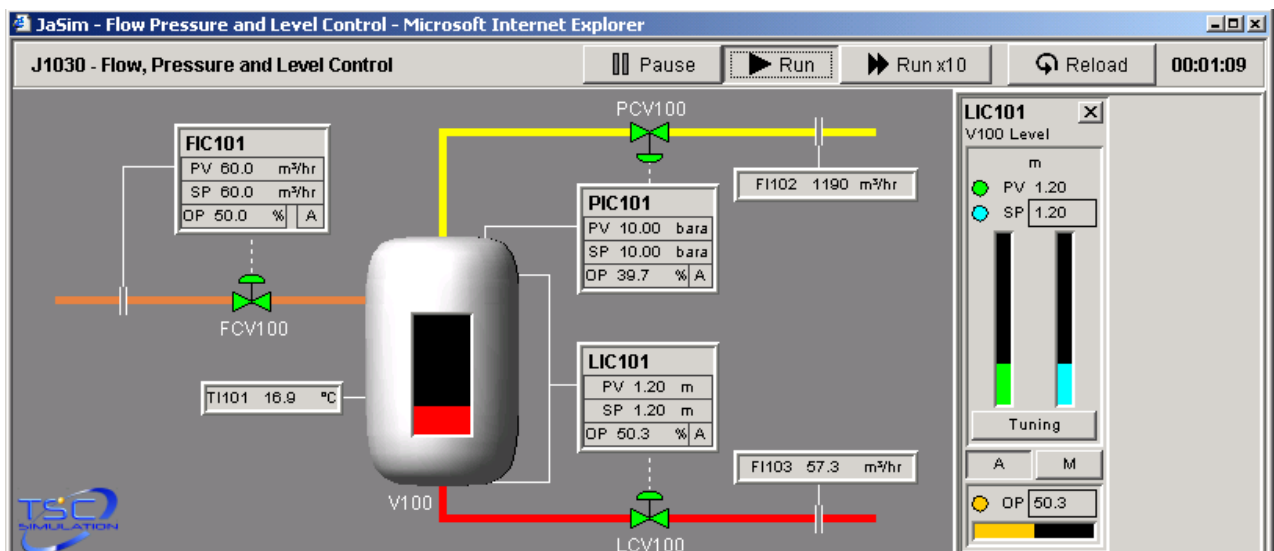
The Fluid Properties tab is a dynamic display of the compositions at each point. As the process variables are changed, the composition will change (the rate of change will depend on the amount of that particular fluid in the vessel)

The picture below shows the changes that occur about 10 minutes after a change to 15.00 bara in the vessel. Compare the vessel gas compositions with the table above. And also note that the output level control valve has automatically closed a little to maintain about the same flow at a higher vessel pressure compared to the start-up status shown on Page 1 above.

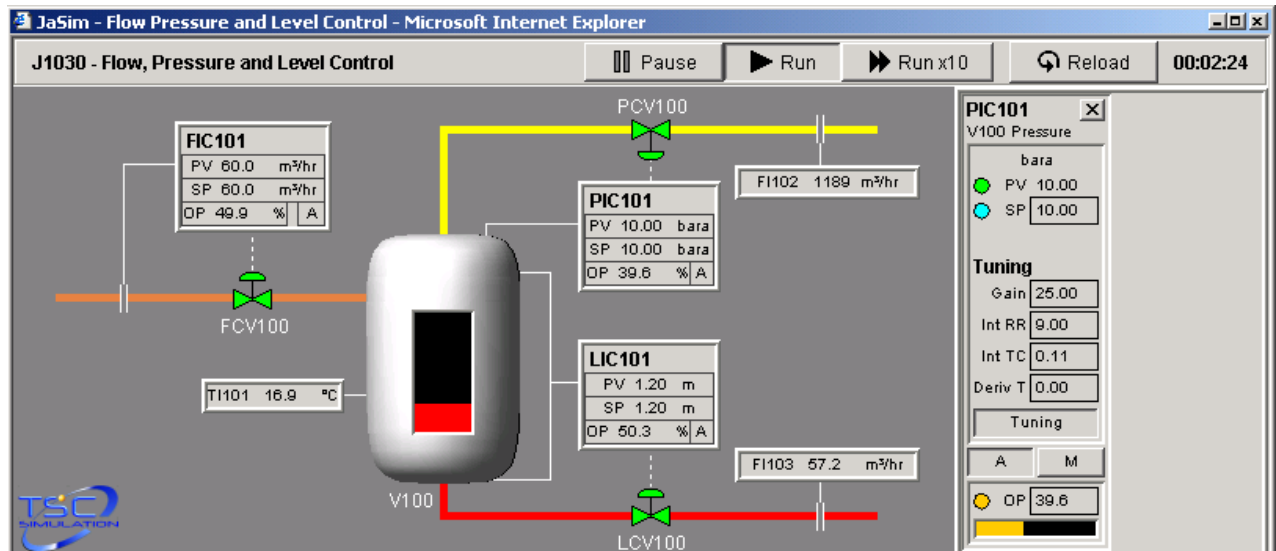


JaSim® Controller

Clicking on a **Controller** label brings up a generic style controller on the scratchpad faceplate area to the right. The controller Set Point and Output are adjusted by selecting and replacing the value shown. The faceplate also allows Manual or Auto selection, and a visual bar graph of the three variables:



Within the controller faceplate, clicking on the **Tuning** button allows the P I and D values to be displayed and changed:



Changing the Gain, the Integral Time Constant (or the Reset Rate) and the Derivative Time Constant is as simple as entering a new value through the keyboard.

Assignments for Dynamic Simulation J1030

The Assignments which are defined for JaSim® Model J1030 are available by clicking on the Assignments tab, and cover:

- An introduction to the control systems,
- The tuning of the controllers using Zeigler Nichols values calculated from measurements of the Ultimate Gain and Ultimate Period in each control loop
- Observation of the interaction between controllers
- Observation of the restriction in controller operating range, when other loops are interacting
- An introduction to the chemical engineering reasons for the changes in fluid compositions at differing process conditions
- Observation of the fluid composition changes as the process conditions are changed.

The Assignments are arranged to include a series of 20 numbered questions, which the Trainee is able to work through. The Questions may be answered using the simulation model.

The model may also be used to demonstrate many other aspects, including the effect of the pressure and liquid head on the flow, and the limiting effect on the available Set Point range of each valve C_v and C_g at different conditions.