Two-Phase Module

Steady-state hydraulic analysis of simultaneous liquid and gas flow: pressure and temperature profiles, vapor quality, phase state, mixture properties, flow regime and velocity across a connected network.

1 FUNCTIONAL DESCRIPTION

The module solves pressure, temperature, fluid properties, vapor quality and flow regime together as local conditions change through the network, applying the liquid, gas or selected two-phase method according to the local phase condition.

2 CALCULATION BASIS

Analysis	Steady-state
Fluid	Simultaneous liquid and gas flow
Two-phase methods	Whalley criteria (default); Friedel; Chisholm-Baroczy; Lockhart-Martinelli; Müller-Steinhagen-Heck; Beggs-Brill; Drift-Flux; Homogeneous Equilibrium Model
Flow regime	Petalas-Aziz mechanistic map (default) or the Beggs-Brill pattern map
Heat transfer	Temperature, phase state and vapor quality follow heat gain or loss
Networks	One connected model can contain liquid, gas and two-phase regions

3 MODELING ELEMENTS

Categories	Pipes; boundaries; boosters; valves; controllers; check valves; general resistances; size changes; relief devices; heat exchangers
Database	Performance and pressure-loss characteristics held in the database, so definitions can be reused and shared
Defaults	Default values applied on placement and customizable
Non-standard	General Resistances model non-standard piping equipment

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4 MODEL INPUTS

Two-phase condition	Set inlet quality, let a stream change phase during the solution, or mix separate liquid and gas streams
Boundaries	Fluid and temperature defined at source; pressure or flow defined at destination or outlet boundaries
Pipes	Length, friction-loss model, surface roughness and scaling; size defined directly or from standard dimensions available in the database
Nodes and equipment	Elevation, applicable modeling correlation, and autosizing status, required parameters or manufacturer data
Note	*Simultaneous input definition across selected elements; default input data can be customized*

5 MODELING WORKFLOW

- Open a new flowsheet (File menu or CTRL+N).
- Place boundary nodes and define their conditions.
- Place equipment from the Component Palette and connect with the selected pipe material.
- Define pipe, node and equipment data in the Input Editor.
- Run the calculation (toolbar or CTRL+F8).
- Review results and messages in the Data Palette.
- View component charts in the Data Palette, or create component and flowsheet charts as required; charts can be placed on the flowsheet.

6 DESIGN CHECKS AND WARNINGS

Flagged	Vapor at high points and liquid at low points
Equipment	Phase state at pump and compressor suction; regime, velocity and momentum at separator inlets
Convergence	Messages tab reports convergence issues, data warnings and engineering hints
On flowsheet	Flow-direction arrows; red markers on warnings and errors

7 OUTPUTS AND REPORTING

Results	Per-component results including vapor quality, phase state, velocity and predicted regime
Charts	Flow-regime maps from the Chart tab, on either the Petalas-Aziz or Beggs-Brill map; component, flowsheet and composite charts
Messages	Convergence issues, data warnings and engineering hints

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8 APPLICATIONS

- Oil and gas facilities: gathering and transfer lines, separator inlet piping and LPG vaporizers
- Power generation: wet steam transfer, flashing condensate and condenser outlet piping
- Geothermal: two-phase steam-water gathering lines and reinjection systems
- Refrigeration and cryogenics: refrigerant suction and liquid lines, evaporator and condenser piping
- Chemical and process plants: vaporizer and reboiler outlets and knockout-drum inlet piping

9 DEPENDENCIES AND LICENSING

Requires	Liquid Module and Gas Module, both active
Scripting	Included at no additional cost
Licensing	Per seat

10 CAPABILITIES

- Automatic correlation application — applies the liquid, gas or selected two-phase method according to the local phase condition.
- Match the correlation to the service — Whalley criteria by default, or any of seven other named methods.
- Predict and chart flow regime — Petalas-Aziz or Beggs-Brill, charted from the Data Palette and placed on the flowsheet.
- Include heat transfer effects — temperature, phase state and quality follow heat flow.
- Screen for slug and churn flow — predicted regime reported for assessment of unstable locations.
- Check velocity against erosion limits — compare calculated velocity with your erosional criterion.
- Review suction and separator inlets — phase state at pump, compressor and separator inlets.

11 SCOPE AND EXCLUSIONS

General two-phase liquid-gas systems, including petroleum fractions defined from specific gravity and TBP or ASTM D86 curve data. Single-phase liquid and gas regions are solved by the Liquid and Gas Modules, both of which must be active.

Model two-phase flow in FluidFlow

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