Liquid Module

Steady-state hydraulic analysis of single-phase Newtonian liquids: pressure and temperature profiles, flow distribution, fluid properties and equipment duties across a connected network.

1 FUNCTIONAL DESCRIPTION

The module balances mass at every junction and energy along every pipe, linking pressure, velocity, elevation and equipment duty. Pipe friction, pump curves and valve data are combined to solve flow distribution together with the pressure, temperature and fluid property profiles.

2 CALCULATION BASIS

Analysis	Steady-state
Fluid	Incompressible Newtonian liquid, single phase
Friction loss	Moody; Hazen-Williams; Fixed Friction Factor; Shell-MIT
Conduit	Cylindrical; rectangular; annular
Pipe condition	Can model clean and aged pipes
Networks	Series, parallel, branching, open and closed-loop

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

Liquid Module

continued

4 MODEL INPUTS

Boundaries	Fluid, temperature, and pressure or flow 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 STANDARDS APPLIED

Pump	Centrifugal pump curve viscosity correction per ANSI/HI 9.6.7
Control valves	Sizing and performance assessment per ISA 75.01.01-2007
Orifices and nozzles	Thin orifice and in-line nozzle sizing per ISO 5167
Relief valves	Pressure relief valve sizing per API RP 520
Affinity laws	Applied for variable-speed operation or impeller size modification

7 DESIGN CHECKS AND WARNINGS

Flagged	Flashing; cavitation; vacuum points; low NPSH; freezing risk
Convergence	Messages tab reports convergence issues, data warnings and engineering hints
On flowsheet	Flow-direction arrows; red markers on warnings and errors

Liquid Module

continued

8 OUTPUTS AND REPORTING

Results	Per-component results in the Data Palette Results tab, or on the flowsheet
Charts	Pump curve and system curve from the Chart tab; component, flowsheet and composite charts, including energy and hydraulic grade lines (EGL/HGL)
Messages	Convergence issues, data warnings and engineering hints

9 APPLICATIONS

- Water and utilities: potable, cooling-water, district-heating and mine-dewatering networks
- Fire protection: fire-water piping, sprinklers and hydrants
- Chemical and process plant: transfer through pumps, control valves, filters and heat exchangers
- Oil and gas: liquid hydrocarbons, heavy-crude and heated-liquid pipelines, liquid-phase LNG services
- Industrial distribution: open and closed loops with parallel branches and multiple destinations

10 DEPENDENCIES AND LICENSING

Required by	Two-Phase Module; Slurry Module
Scripting	Included at no additional cost

11 CAPABILITIES

- Size pipes and equipment — autosize pipes; size pumps, valves, orifices and nozzles.
- Match the friction method to the service — Moody, Hazen-Williams, Fixed Friction Factor or Shell-MIT.
- Model pipe geometry and condition — cylindrical, rectangular, annular; aging and scaling.
- Build any network layout — series, parallel, branching, open and closed-loop networks.
- Evaluate pump performance — test pump curves against your system, with NPSH checks and viscosity correction (ANSI/HI 9.6.7).
- Assess control valves — check pressure drop and control range (ISA 75.01.01-2007).
- Balance flow and compare options — find over- and under-supplied branches; compare balancing, valve and elevation options in one model.
- Catch problems early — flags flashing, cavitation, vacuum points, low NPSH and freezing risk.
- Model non-standard equipment — define proprietary equipment by its flow versus pressure loss.

12 SCOPE AND EXCLUSIONS

General Newtonian liquid systems. Where freezing or vapor formation is indicated the liquid result may be invalid; for vapor formation continue with the Two-Phase Module. Non-Newtonian and settling flow is handled by the Slurry Module.

Model liquid flow in FluidFlow

Start a free trial, or learn the workflow first with Free Basic Training.

Free Trial | Free Basic Training

fluidflowinfo.com

Flite Software N.I. Ltd