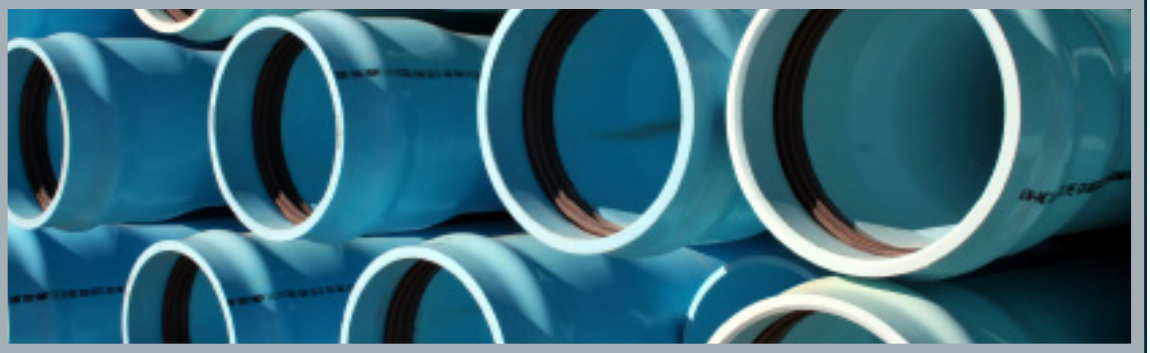
PRODUCT DATA SHEET

Bentley
Advancing Infrastructure

CONNECT Edition



OpenFlows™ HAMMER®

Transient Analysis and Modeling

If left unchecked in a water or sewer system, transient pressures can cause catastrophic damage to pipes and equipment, risk the safety of operators, allow intrusion of dangerous contaminants into the system, and interrupt service to customers. Over time, the increased wear and tear on pipes and pumps can lead to premature failure.

The most cost-effective approach for controlling transients is to perform a transient analysis to locate trouble spots and determine appropriate surge control strategies. OpenFlows HAMMER gives water professionals the power to successfully perform this critical analysis, even on high-profile projects. OpenFlows HAMMER takes advantage of Bentley CONNECT*services* by associating a hydraulic model with a CONNECT project.

Proven Transient Analysis Algorithm

OpenFlows HAMMER uses the method of characteristics (MOC) – the benchmark standard for hydraulic transient flow analysis. MOC computes results at intermediate points along the pipeline, accurately capturing critical outcomes such as mid-pipe negative pressures that could otherwise be overlooked.

Superior Interoperability

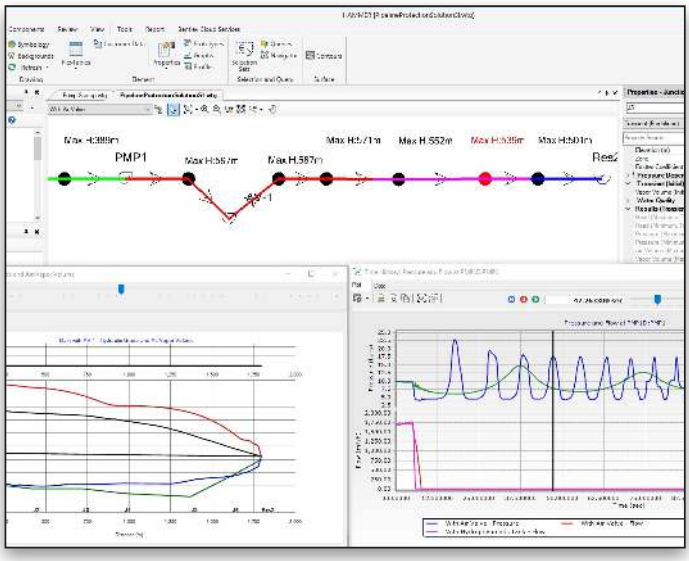
You can employ OpenFlows HAMMER out of the box as a stand-alone application or you can work from within ArcGIS or AutoCAD. Regardless of the platform used, OpenFlows HAMMER maintains a single set of modeling files for true interoperability across platforms.

Model Building and Management Made Easier

With OpenFlows HAMMER you can build your network from scratch using simple drag-and-drop layout tools, or import your network data from EPANet.

Alternatively, you can leverage geospatial data, CAD drawings, databases, and spreadsheets to jumpstart the model-building process. The included LoadBuilder and TRex modules help engineers allocate water demands and node elevations based on geospatial data to avoid mistakes from manual input and streamline the model-building process. OpenFlows HAMMER also provides drawing and connectivity review capabilities to guarantee a hydraulically coherent model.

You can even open models designed in OpenFlows WaterCAD® or OpenFlows WaterGEMS® directly in OpenFlows HAMMER (or vice-versa), eliminating any need to import or convert.



OpenFlows HAMMER can run from within ArcGIS and AutoCAD or as a stand-alone application.

A Wide Range of Hydraulic Components

OpenFlows HAMMER enables precise simulation of the impact of a wide range of surge protection devices and rotating equipment such as pumps and turbines. You can select from more than 20 devices and perform an unlimited number of operating scenarios to develop the most appropriate strategy for surge mitigation.

Comprehensive Scenario Management

OpenFlows HAMMER's Scenario Management Center gives you full control to configure, run, evaluate, visualize, and compare an unlimited number of what-if scenarios within a single file. Additionally, you can easily make decisions by analyzing surge protection alternatives, or evaluating pump and valve operation strategies.

Result Interpretation Tools

The analysis and data visualization features in OpenFlows HAMMER allow users to capture fast-moving transient phenomena, determine their impact on the system, and select the most appropriate surge protection equipment for the job.

Thematic mapping, interactive animations, and contour plots, and a host of report-ready graph and profile options provide the information required in a format that makes sense.

System Requirements

Platform Pre-requirements
OpenFlows Hammer runs without platform restrictions as a stand-alone application.

It also runs from within ArcGIS and AutoCAD.
See: Platform Compatibility

Processor
As per minimum operating system requirements

Memory
8 GB minimum, 16 GB recommended

Operating System
Microsoft Windows 10, Windows 10 x 64, Windows 8, Windows 8 x 64 Windows 7, Windows 7 x 64

Note: Windows 7 operating system is supported only with its service pack (SPI) installed

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Advancing Infrastructure

OpenFlows HAMMER At-A-Glance

Interface and Graphical Editing

- Ability to run from within three compatible platforms:
  - » Windows
  - » ArcGIS (ArcMap license required)
  - » AutoCAD (AutoCAD license required)
- Element morphing, splitting, and reconnecting
- Scaled, schematic, and hybrid environments
- Automatic element labeling
- Ability to track model changes by user, date, and element
- Unlimited undo, redo
- Element prototypes
- User data extensions
- Aerial views and dynamic zooming
- Named views manager
- Multiple background layer support
- Ability to add online Bing Maps as background

Interoperability and Model Building

- Complete compatibility with OpenFlows WaterCAD and OpenFlows WaterGEMS
- EPANet import/export
- Spreadsheet, database, ODBC, shapefile, DXF and DGN file, geodatabase*, geometric network*, and SDE* connections (*when running from within ArcMap)
- GIS-ID property to maintain associations between records in the data source/GIS and elements in the model
- Graphical SCADA element
- Customer meter element
- Automatic demand allocation from geospatial data
- Geospatial demand allocation from customer meters and lump-sum geospatial data
- Geospatial-based water consumption projection
- Daily, weekly, monthly, and superimposed patterns
- Composite demands with global editing
- Area, count, discharge, and population-based loading
- Pipe-length-based demand loading
- Elevation extraction from DEM, TIN, shapefiles, CAD drawings, and surfaces
- Lateral link (no need to split pipes)

Model Management

- Unlimited scenarios and alternatives
- Active topology
- Global attribute tabular editing
- Sorting and persistent filtering on tabular reports
- Dynamic and static selection sets
- Customizable engineering libraries
- Global engineering units management
- Sub-model management
- Network navigator for automatic topology review and connectivity consistency
- Automatic element validation
- Automated model skeletonization
- Orphaned nodes and dead-end pipe queries
- Complete flexibility for project options (pressure wave speed, liquid specific gravity and vapor pressure, and run duration)
- Support for ProjectWise®

Hydraulics

- Methods of characteristics for transient analysis
- Wave speed calculator
- Built-in, steady-state, and extended period simulation engines
- Transient force computation
- Turbine modeling: load acceptance and rejection
- Types of friction methods (steady state using Hazen Williams, Modified Hazen Williams, Darcy Weisbach or Mannings, quasi-steady, and Unsteady Vitovsky)
- Rule-based or logical controls
- Variable-speed pumping
- Transient analysis batch run

Results Presentation

- Thematic mapping
- Advanced dynamic profiling
- Contour plots
- Profile plots along a path
- Time history graphs at a point
- Synchronized maps, profiles, and point histories visualization
- Advanced tabular reporting with FlexTables
- Publish iModels in 2D or 3D, including to Bentley Map® Mobile
- Ability to record AVI video of time analysis

Hydraulic Elements

- Reservoir
- Pump: shut down after delay, constant speed (no curve), constant speed (with curve), variable speed
- Turbine
- Pressure regulating valve
- Flow sustaining valve
- Loss element (including orifice)
- Sprinkler
- Check valves
- Gate valve
- Globe valve
- Butterfly valve
- Needle valve
- Ball valve
- User-defined valve
- Dead end
- Constant flow draw-off
- Periodic head/flow

Transient Sources

- Valve closure (including partial closure) and opening
- Pump, controlled shutdown, trips, startup
- Rapid demand change; rapid pressure change
- Multiple transient sources supported simultaneously

Surge Protection Devices

- Surge tank: open, spilling, one way, variable area, differential, with orifice, with bladder
- Hydropneumatic tank (sealed, vented, dipping tube)
- Pressure relief valve
- Surge anticipation valve
- Rupture disk
- Air valve: single-acting, double-acting, slow-closing, triple-acting
- Discharge to atmosphere