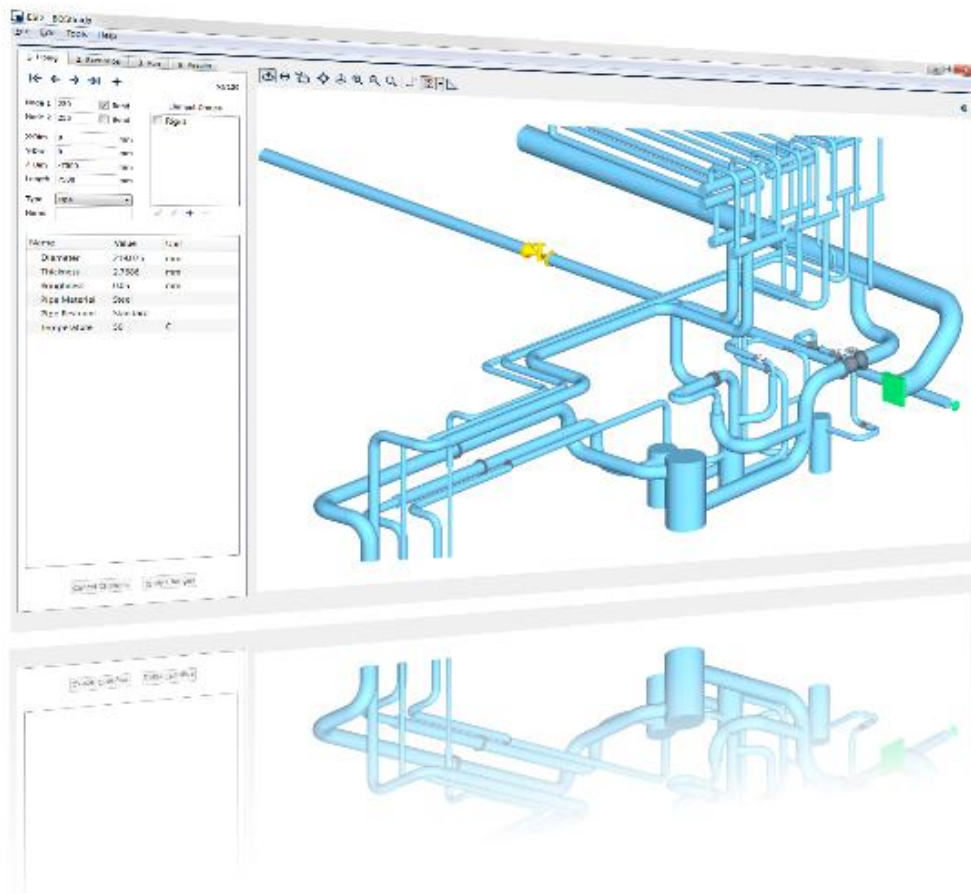


BOSfluids

Frequently Asked Questions



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1.0 About Intergraph

Intergraph Process, Power & Marine (PP&M) is the leading global provider of engineering software for the design, construction, and operation of plants, ships, and offshore facilities. Intergraph PP&M is one of two divisions of Intergraph Corporation. Intergraph is part of Hexagon.

1.1 Who Uses Intergraph Software?

Nine out of ten of the world's major engineering firms and corporate owner operators use Intergraph products. They know our products are accepted as industry standards for design and engineering, so they are assured of proven solutions that are used and accepted worldwide by their peers. For more information, please visit www.intergraph.com/ppm.

2.0 About BOSfluids

BOSfluids is an interactive computer simulation package that models steady state and transient flow in liquid or gas carrying piping systems. The software package analyses fluid transients and relates this information to the forces, pressures, flow rates and velocities experienced in the piping system with engineering accuracy.

Common problems in the Oil & Gas, Power and Water industry are addressed such as Jetty loading, tube rupture, fire water systems, cool water systems, oil transportation lines, slug analysis, in plant piping surges due to valve closure and pump trips. The software uses a clear and detailed 3D interface designed for strong interaction with typical Oil & Gas software packages such as pipe stress software.

2.1. BOSfluids General Information

- **How does BOSfluids® solve the governing flow equations in a system?**

BOSfluids® uses a 1-D, single phase, flow solver. It assumes that the pipe system is axisymmetric and the wave and flow fronts are assumed flat and perpendicular to pipe centreline. However BOSfluids® does also have the capability to solve multiphase problems with regard to cavitation, air inflow (air valves) and drainage.

BOSfluids® solves the governing flow equations equation through the method of characteristics. This reduces the set of partial differential equations to a matrix of ordinary differential equations, which can be solved using the initial boundary conditions specified by the user. The method of characteristics allows the system to be solved quickly, which reduces the BOSfluids® simulation time.

- **What types of analyses are able to be solved with BOSfluids®?**

BOSfluids® allows the user to study both steady state and transient simulations. It is an effective tool to study transient effects including:

- Water hammer
- Slugs and flashing
- Pump start-up and shutdown
- Valve closure transients
- Relief valve gas transients
- Column separation
- Pipe evacuation
- Tube ruptures
- Cavitation

- **Is BOSfluids® able to simulate cavitation?**

Yes. BOSfluids® allows the user to study cavitation in the piping system during the transient simulation by providing two cavitation models in the solver, CAP (concentrated air pockets) and VCM (vapour cavity model). The cavitation models are commonly used in the analysis of column separation associated with entrained gas, voids forming in the pipe section and slug flow or deluge fill loads when valves are instantly opened or during pump start-up.

- **How can the transient force-time profile between node pairs be exported?**

The unbalanced forces working on bend pairs can be exported using Tools -> Export Forces from the menu bar. The results can be exported in various text based or csv files. These files can be imported by a pipe stress program of choice. For example CAESAR II can be used to import the unbalanced forces and perform a full dynamic stress analysis.

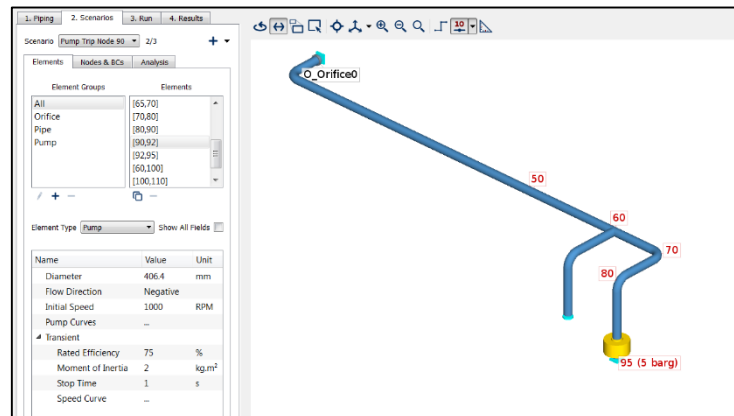
- **What are the limitations of the BOSfluids® demo version?**

A BOSfluids® demonstration version is available free of charge. In the demo version the new modeling interface can be experienced by setting up a complete piping system from scratch. But it is not possible to save and run a simulation, since the solver is not included in the demo version. However the new post-processing interface can also be reviewed by opening one of the pre-build models available in the models folder.

2.2. What Are the Main Benefits and Capabilities of BOSfluids?

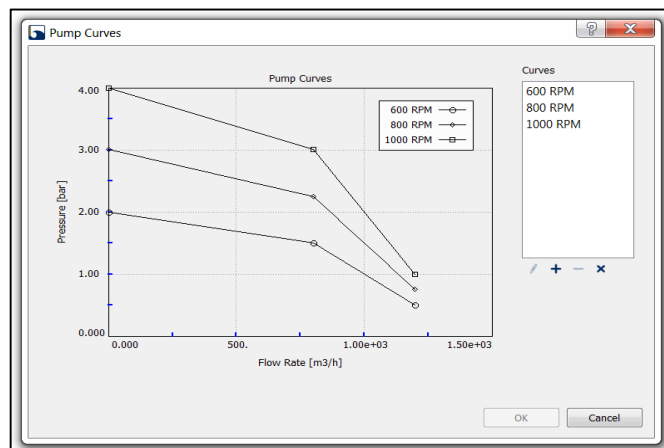
- A Pipeline Element can be used to simulate a combination of regular pipe elements, valves, bends, etc. This element can be useful when, for example, the exact routing of the piping is not available during the early stages of a project for initial analysis of the system (for pressure drops, flow rates, velocities, pipe sizing....).

- The BOSfluids user interface creates a streamline procedure for the input, output and analyses of the piping network.

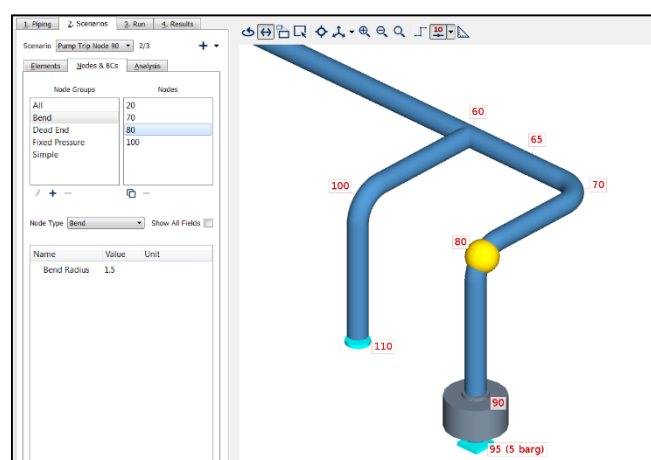


- The piping network is created through the user input of nodes and elements that are instantly illustrated in the 3D viewer.

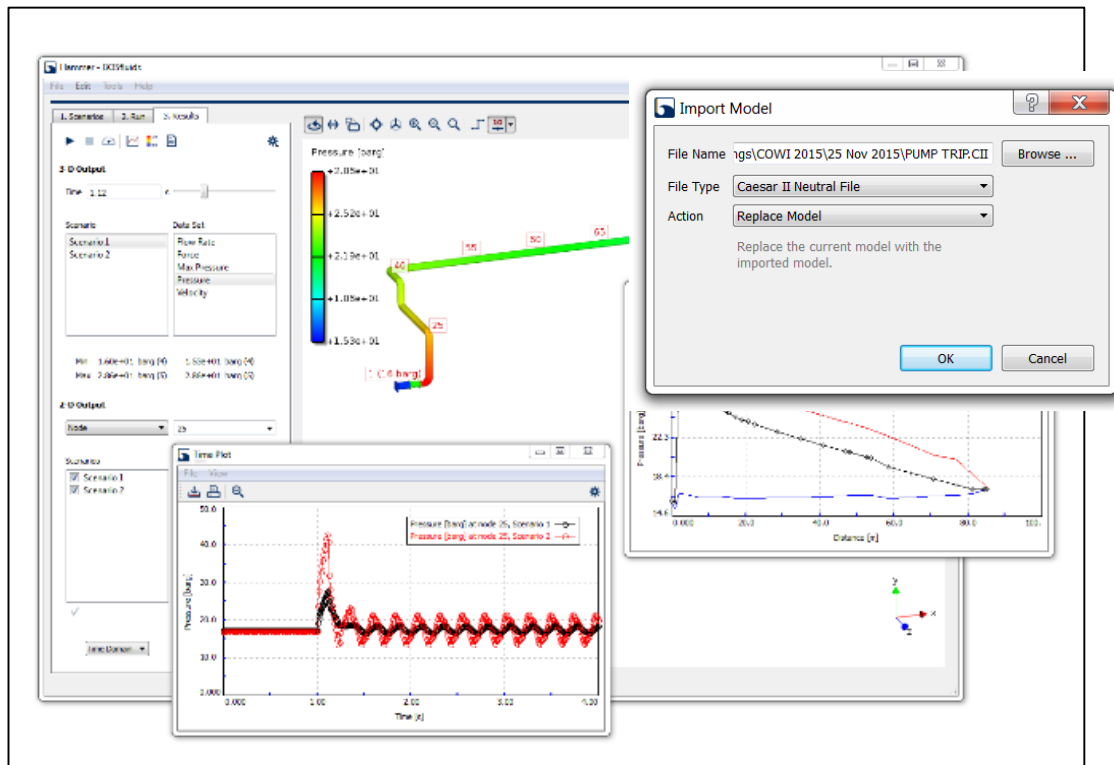
- The user selects the type of element from the list, (i.e. pipe, valve, pump or surge vessel), and fills the required parameters relating to that element, with the element displayed in the 3D viewer.



- The 3D viewer allows the user to visually inspect their piping network as they are creating it. This assists the user to observe any potential errors as they are creating the piping network. Likewise, the user can interact with the 3D viewer by rotating and panning the model, and selecting elements to modify the input parameters.

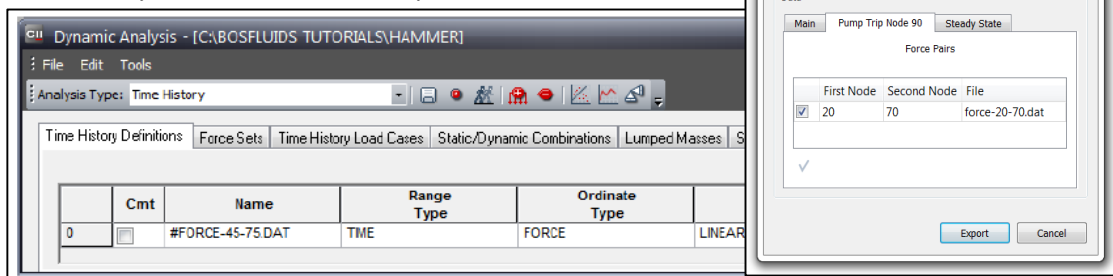


- Tabular information in addition to 2D plots and 3D representations provide a quick and easy view of the calculation results.



- The piping system may be imported from CAESAR II via the Neutral File interface. This preserves the original node numbering and allows stress engineers to use models built in CAESAR II in order to calculate the unbalanced forces induced (for example by water hammer or reciprocating equipment).

- The calculated results can easily be transferred back to CAESAR II to evaluate the mechanical effect on the piping structure. The unbalanced forces are exported by selecting *Tools* → *Export Forces*. By selecting File Type: Caesar II, the time history results for each node pair.



3.0 Why is Intergraph selling BOSfluids?

3.1 Design Workflow

Intergraph considers that BOSfluids has an excellent synergy with the existing portfolio of solutions. Whilst our solutions cover the aspects of 2D design, 3D design, analysis and detailed engineering, process design and fluid flow is not within our area of expertise. The BOSfluids solution adds this missing link providing excellent integration with CAESAR II for the provision of geometry and also for transient results data.

4.0 Hardware and Software Platform

4.1. What Are the Suggested Computer Requirements?

- Processor: 3.0 GHz Intel Pentium IV or higher AMD Athlon dual-core processor or higher
- Memory: 4 GB RAM or higher (Windows 7/8/8.1/10), Citrix XenApp 6.0 required on Windows Server 2008 R2 Enterprise. For licensing: Local/Network Dongle.
- Display: 1280x1024 or higher, with True Color
- Video Card: 256 MB or greater video RAM, OpenGL 1.1 or later, DirectX 9.0 or later, drivers updated with the latest manufacturer's drivers (Motherboard-integrated video cards not recommended for desktop systems)

5.0 Evaluations and Demonstrations

5.1. Can I Try a Free Evaluation?

Yes, free demo versions are available to prospective customers to facilitate informed decisions. Please consult your local sales representative.

5.2. Can I Schedule an Online Demo?

Yes. Please consult your local sales representative.

5.3. Can My Local Reseller or Intergraph Sales Representative Give a Live Presentation?

Depending on your geographic location, your local sales representative will qualify your requirement and arrange a presentation accordingly.

6.0 Licensing

6.1. Can I Purchase or Lease BOSfluids?

No, BOSfluids is offered as a purchased perpetual license. The license may be local (Type CS) used within a particular geographic region (12 hours per 24 hour period) or global (Type CX) used 24/7 unlimited anywhere in the world.

6.2. Which Software Security Systems Are Available?

BOSfluids is immediately available using the ESL (or dongle) security system.

6.3. Are BOSfluids Licenses Perpetual?

Yes, see 6.1.

6.4. Can Licenses Be Purchased for a Single User?

Yes. Single user standalone (individual PC) and network licenses may be purchased.

6.5. Can Multi-seat Licenses Be Purchased?

Yes. Single user standalone (individual PC) and network licenses may be purchased.

7.0 Support and Training

7.1. What Are the Benefits to Choosing Support?

BOSfluids maintenance includes program updates and qualified technical support from Intergraph and/or the developer.

7.2. Does Intergraph Offer Local Support?

Not at this time. Support would be either via a centralised Intergraph location or from the developer.

7.3. Do Local Resellers and Representatives Host Training?

No, not at this time. Training would be offered direct via the developer.

7.4. Can Customers Receive In-house Training?

Yes. In-house training for BOSfluids is offered to all customers.

8.0 Product Enhancements

8.1. Will BOSfluids Continue to Be Updated and Maintained?

All users with current maintenance contracts have access to the latest updates. BOSfluids will be updated and maintained. Customer feedback will be important in shaping how the solutions evolve. Please check back with us from time to time for more information on product cross-compatibility.

9.0 Get Involved with Intergraph and BOSfluids

9.1. Can Customers Submit Product Enhancement Requests Directly to Intergraph?

Yes. Everyone may submit product enhancement requests. Intergraph interacts with and listens to customers, then responds by developing new solutions, in conjunction with third party developers as required, and enhancing current products to address customers' needs in ways that improve their work processes. This customer-centric focus helps us to grow our product line to serve an ever broader base of users and applications, which in turn further increases opportunities for our clients to enjoy the benefits of interdisciplinary collaboration with other departments and organizations.

10.0 Online Resources

10.1. How Can I Connect with Intergraph on Social Networking?

Stay updated on the latest news from Intergraph through your favourite social networking sites:

- LinkedIn
 - Intergraph CADWorx & Analysis Solutions <https://www.linkedin.com/company/113184>
 - Intergraph CADWorx and Analysis Group <https://www.linkedin.com/groups?gid=2475768>

Insider Blog <http://coade.typepad.com/coadeinsider/>

Facebook <https://www.facebook.com/intergraphcas>

Twitter <https://twitter.com/CADWorxAnalysis>

YouTube <https://www.youtube.com/playlist?list=PL2431A59651C9FC3C>

11. More Information

For more information about any of these topics, please email us at query.icas@intergraph.com.