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COMSOL Multiphysics 5.2 release highlights:
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Bringing Simulation to Everyone: COMSOL Releases the Latest Version of Software for Creating Simulation Apps

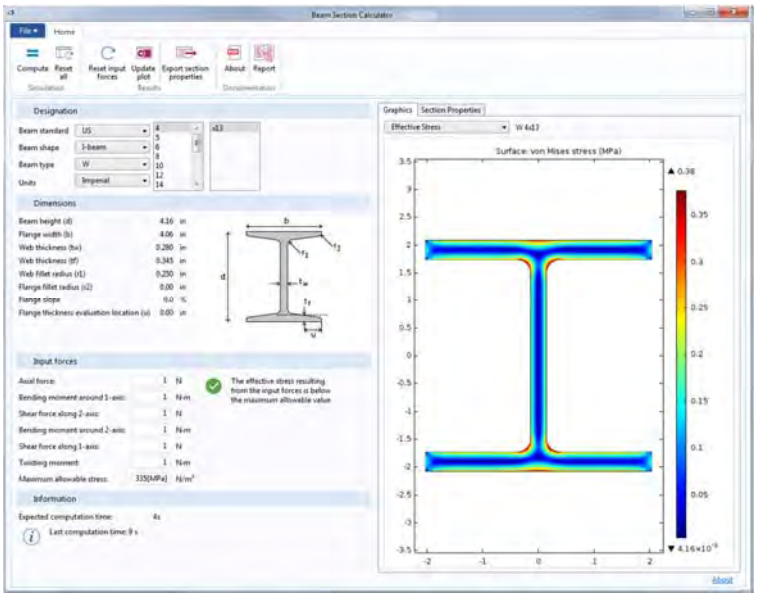
The release of COMSOL Multiphysics® 5.2, with the latest version of the Application Builder and COMSOL Server™ products, fosters collaboration within organizations by providing simulation specialists the tools to share their simulation work, from design and development to production and testing.

BURLINGTON, MA (November 16, 2015) — COMSOL, Inc. the leading provider of multiphysics modeling, simulation, and application design software, today announced the release of COMSOL Multiphysics® version 5.2 providing the simulation community the only fully integrated environment for creating simulation apps. This version of **COMSOL Multiphysics® and COMSOL Server™ simulation software environment** delivers new features, improved stability and robustness, and faster execution. Major upgrades to the Application Builder available in COMSOL Multiphysics include the new Editor Tools for easy creation of user interface components, commands for dynamic updates of graphics, and more control over the deployment of simulation apps. Running simulation apps using COMSOL Server in a corporate network or in the cloud is now up to five times faster. Many updates, new features and simulation application examples are also available for the add-on electrical, mechanical, fluid, and chemical products.

Clearly Communicate Designs with the Application Builder

In COMSOL Multiphysics® 5.2, the Application Builder features an optimized workflow. The new Editor Tools make the creation of user interface components easy and quick. Simulation specialists can now bring any model parameter, physics setting, and results, such as numerical data and plots into the user interface of an app with a few mouse clicks. This is one of several tools available to create practical simulation apps and share the power and accuracy of COMSOL Multiphysics throughout organizations.

The Application Builder allows companies to communicate across multiple departments, knowing that the simulation expert is able to maintain control, enforce quality standards, and ensure that the results can be trusted.



With this simulation app users can test different beams, materials, and loads to analyze the resulting stress, strain, and displacement.

"We leveraged the Application Builder to more efficiently communicate complex design ideas across multiple simulation and process departments, which has allowed app users to easily explore the outcome of proposed designs," said Borja Lazaro Toralles, Research Engineer on the Manufacturing Technology Centre (MTC)

simulation team. MTC used COMSOL products to model the shaped metal deposition (SMD) 3D printing technique and created a simulation app based on it.

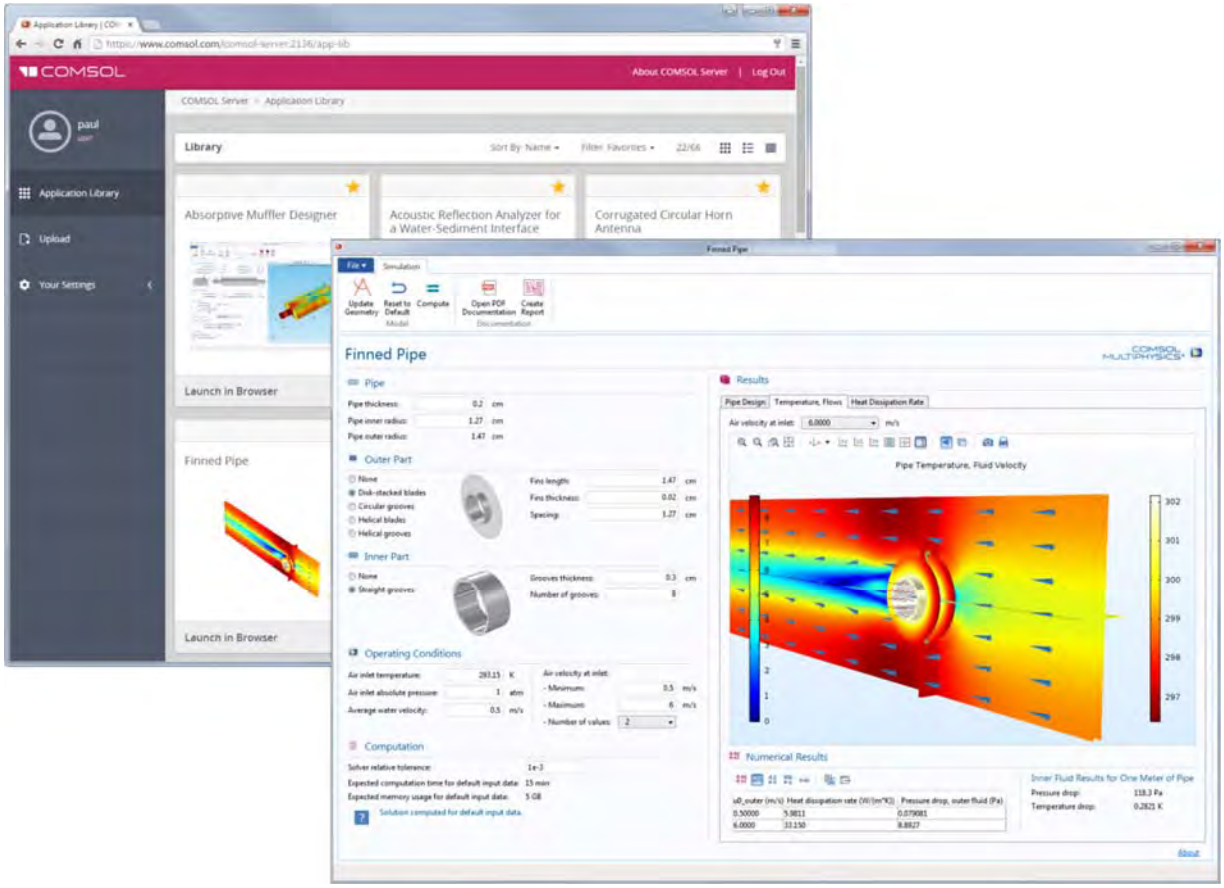
Among the new user-inspired features is the ability to update graphics while running an app. The app designer can present app users with different plots while solving; this takes them through the progression of the solution process and presents them, for example, with geometry, mesh, and solution plots. The app designer can also customize the graphics toolbar with new buttons and include camera movements.

Collaborate with COMSOL Server™ Software

The new features in version 5.2 of COMSOL Server™ are designed to facilitate collaboration between users and departments while simplifying administration tasks. “A new caching function allows applications to start five times faster or more; additionally, administrators can assign a single application to be launched instantaneously when users log in,” said Ed Fontes, CTO of COMSOL. “These are just few of the many new features and concepts introduced with version 5.2.”

COMSOL Multiphysics version 5.2 provides simulations experts with a cutting edge user experience in simulation app design and sharing by integrating highly productive model building, app design, and deployment tools that allow their simulation applications to be used by users everywhere.

“We’ve been creating simulation apps that our field engineers can apply directly without having to go through R&D,” said Brice McPherson, Senior Engineer at Wolfspeed. His team at Wolfspeed uses simulation in the design of high-performance, extreme environment wide band gap power semiconductor packages. “I can foresee simulation apps becoming the primary tool used by our engineers.”

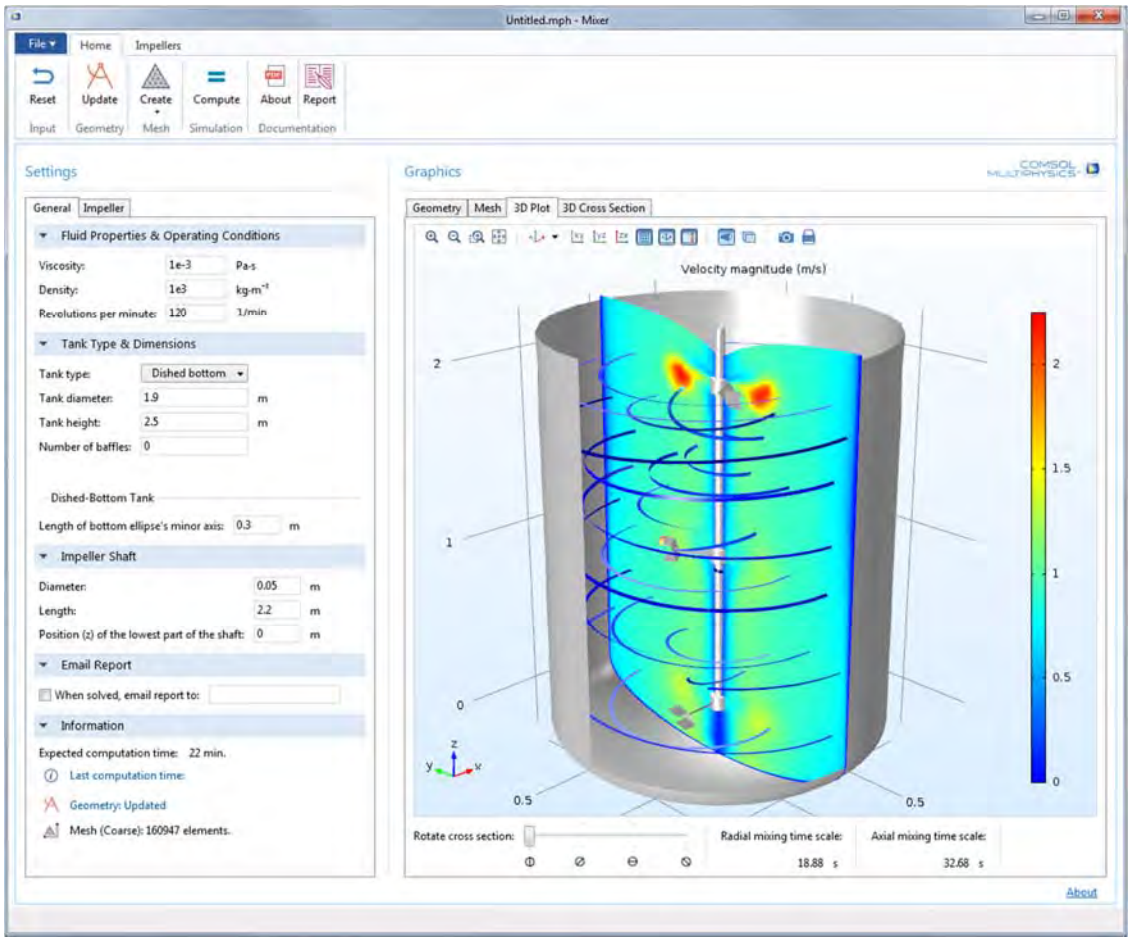


The thermal properties of a finned pipe are derived from the results of a conjugate heat transfer simulation. The app user can change aspects of the design such as the arrangement of the inner grooves and outer fins.

Extensive Library of Apps in Version 5.2

To demonstrate the power of the Application Builder, a plethora of new apps have been added to the extensive Application Libraries showcasing the capabilities of the Application Builder. The Application Libraries include apps ranging from membrane dialysis, water treatment, thermoelectric cooling, heat exchangers, touchscreen design, magnetic prospecting, piezoacoustic transducers, muffler design, MEMS sensors, and pressure vessels.

"With version 5.2 we ship about 50 apps demonstrating the depth and power of the Application Builder and the COMSOL Server," said Svante Littmarck, CEO of COMSOL. "These apps are meant to provide COMSOL users with examples that can be easily inspected, edited, and used as a starting point for their own applications. We had a lot of fun building these apps and love the new Application Builder functionality! For example, if we take a look at the Mixer app, which ships with the Mixer Module, we are presented with a sophisticated application that can be used to simulate almost any type of mixer without requiring expertise in differential equations or CFD. This takes modeling and simulation to a whole new level."



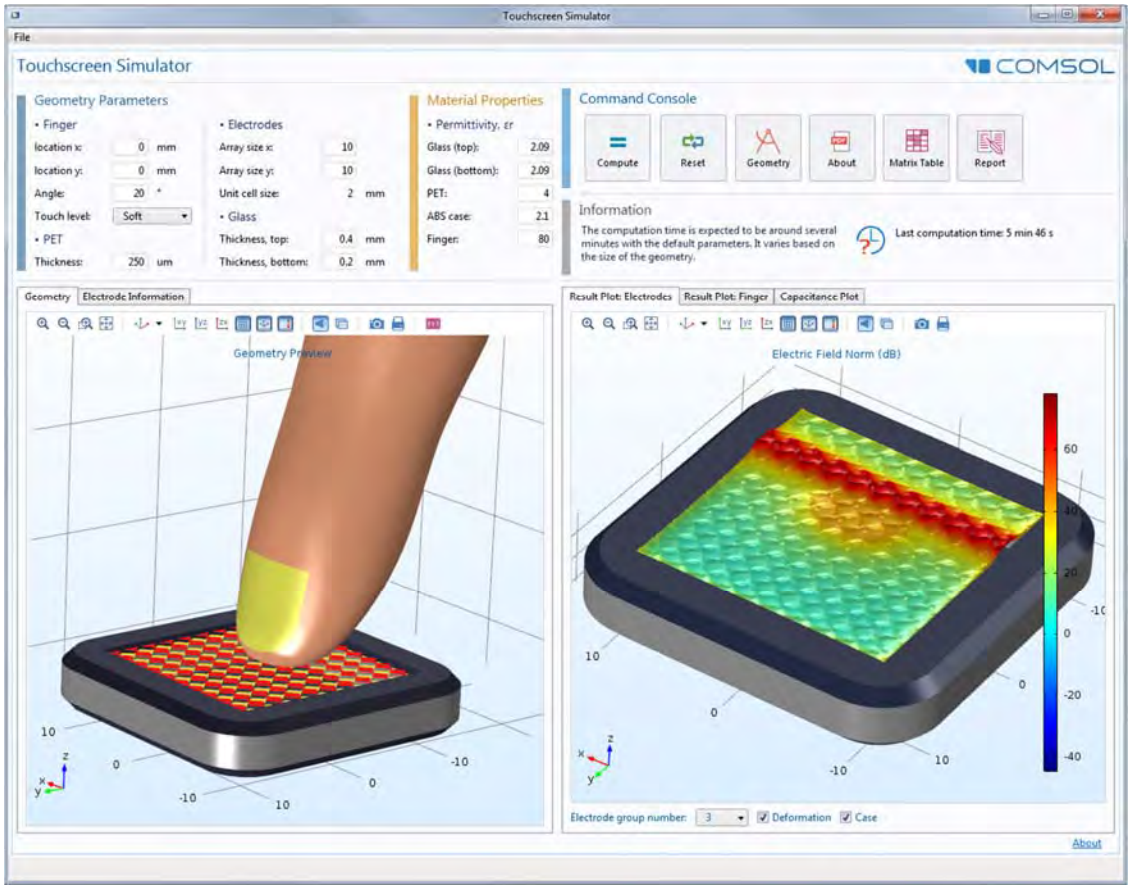
This simulation app is intended for the simulation of mixers equipped with axial or radial impellers. For a given geometry, the application computes the efficiency of the mixing process. The vessels, which are available in three different shapes, can also be equipped with baffles and any of eleven different types of impellers.

Hundreds of Updates to COMSOL Multiphysics®, COMSOL Server™, and Add-On Products

Version 5.2 provides new core functionality features inspired by feedback from the growing COMSOL Multiphysics user community. For example, users can now add annotations to 3D and 2D plots. A new tetrahedral meshing algorithm minimizes the need for manual interactions when meshing large CAD models. Mesh Parts are introduced for integrating STL surface meshes and NASTRAN volumetric meshes into the geometry building work flow. The use

of selections is expanded upon and can now be used for singling out which parts of a solution should be used in results processing and visualizations.

Version 5.2 also introduces enhancements to the existing functionalities of COMSOL Multiphysics® and its add-on products. Users will benefit from more flexible license management, allowing them to work on their designs knowing that if the connection to the license manager is disrupted they have the option to save their files and resume once a connection is reestablished. Users of the Structural Mechanics Module and the AC/DC Module will benefit from the new External Materials functionality allowing materials to be algorithmically defined by shared library files written in the C language. The most prominent use of this new functionality will be for nonlinear materials that include hysteresis (history dependency) and irreversibility effects.



Simulation app based on a model of a capacitive touchscreen. The user can control the position and orientation of a finger pressing the touchscreen, and then compute the capacitance matrix.

Highlights of New Features and Tools Available in Version 5.2

- **COMSOL Multiphysics®, Application Builder, and COMSOL Server™**: Streamlined workflow in the Application Builder with Editor Tools for bringing any model parameter, physics setting, and results such as numerical data and plots into the user interface of an app with a few mouse clicks. Enhancements to user experience with the customization of graphic toolbar buttons, plot while solving, dynamics updates of graphics, improved copy-paste between applications, and more. A more powerful COMSOL Server™ with applications launching up to five times faster, the ability to reconnect to running applications, and launch of single dedicated applications upon login. More robust license management with better handling of lost connection and licenses released during a session.

- **Geometry and Mesh:** Mesh Parts are introduced making it easier to import surface and volume meshes for use in geometry building. More robust tetrahedral meshing. An additional geometry operation, Partition Domains, to extend the reach of hexahedral meshing.
- **Mathematical Modeling Tools, Studies, and Visualization:** Annotations for displaying customized texts and results in 2D and 3D plots. Users can choose to store only a selected part of the solution for postprocessing purposes. PARDISO solver for clusters. Improved FFT studies. Residual operator that can be used to plot the residual in each point in space to get an intuitive visualization of where the error is largest.
- **Apps**: More than 50 app examples demonstrating the power of the Application Builder for electrical, mechanical, fluid, and chemical simulations.
- **Multipurpose:** The Particle Tracing Module supports model particle-matter interactions for simulating high-energy physics and powerful particle counters for counting the number of particles in domains and on boundaries.
- **Electrical:** The AC/DC Module features an effective nonlinear constitutive relations formulation for approximating nonlinear magnetic materials in the frequency domain. Shared library files can be used to create magnetic materials that include hysteresis and irreversible effects. Smith plots are available in the RF Module.
- **Fluid:** Laminar three-phase flow multiphysics interface in the CFD Module based on the phase-field method. More turbulence support for rotating machinery and a free surface tool for frozen rotor studies. With the Pipe Flow Module users can model compressible flow in pipes and expansion and contractions due to sudden changes in the cross-section area of the pipes.
- **Chemical:** The Chemical Reaction Engineering Module allows catalytic particles of different particle shapes (spheres, cylinders, flakes, and user defined based on area and volume). The Corrosion Module supports the modeling of thin beam structures.
- **Mechanical:** Shared library files can be used to create nonlinear structural materials. Contact robustness improvements in the Structural Mechanics Module for curved surfaces and small relative displacements. The Heat Transfer Module has a symmetry plane for surface-to-surface radiation and external temperatures for thin layers. The Acoustics Module includes octave and 1/3rd octave plots.

Availability

To watch the release highlights video and download COMSOL Multiphysics® version 5.2 now, visit www.comsol.com/release/5.2

About COMSOL

COMSOL is a global provider of simulation software for product design and research to technical enterprises, research labs, and universities. Its COMSOL Multiphysics® product is an integrated software environment for creating physics-based models and simulation apps. A particular strength is its ability to account for coupled or multiphysics phenomena. Add-on products expand the simulation platform for electrical, mechanical, fluid flow, and chemical applications. Interfacing tools enable the integration of COMSOL Multiphysics® simulations with all major technical computing and CAD tools on the CAE market. Simulation experts rely on the COMSOL Server™ product to deploy apps to their design teams, manufacturing departments, test laboratories, and customers throughout the world. Founded in 1986, COMSOL employs more than 400 people in 22 offices worldwide and extends its reach with a network of distributors.

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