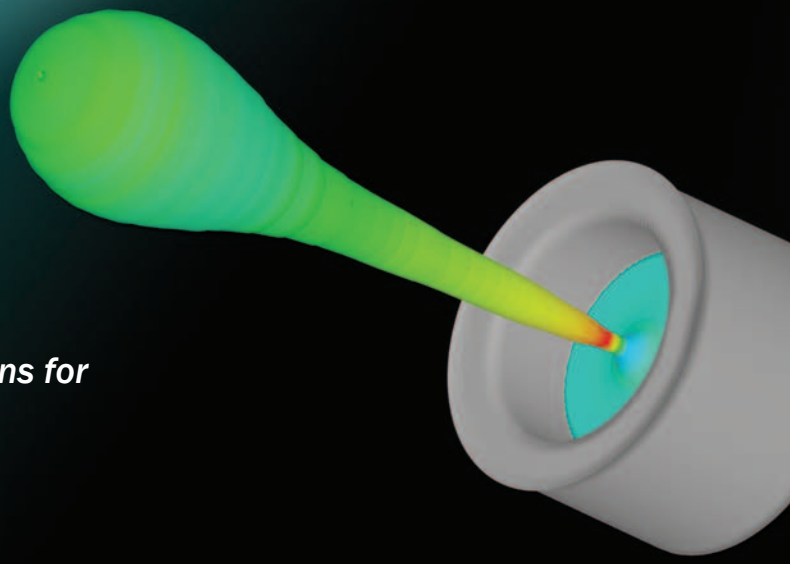
FLOW-3D
Inkjet Design



***FLOW-3D** provides the most accurate CFD solutions for surface-tension dominated inkjet simulations.*

APPLICATIONS

Thermal bubble jets • Pressure-driven inkjets • Piston-driven inkjets
Continuous inkjets • Acoustically-induced inkjets • Piezo-driven inkjets

HIGHLY-ACCURATE RESULTS

For inkjet manufacturers worldwide, ***FLOW-3D*** is a valuable tool for learning about and understanding inkjet designs. Our free-surface modeling accuracy combined with significant numerical efficiency provides quality results in a reasonable design cycle. ***FLOW-3D*** can be used to understand the impact of critical design parameters such as nozzle dimensions, ink properties, and the shape of driving waveforms.

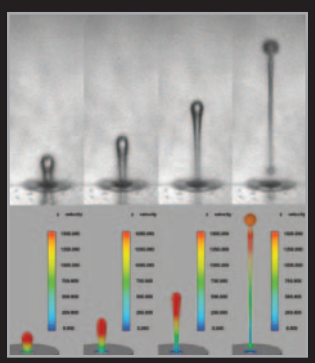
STREAMLINE DEVELOPMENT

- Determine the most efficient thermal, mechanical or pressure pulse required to eject a droplet.
- Ensure the formation and size of clean droplets and whether or not satellites form.
- Pinpoint meniscus oscillations and if they cause secondary droplets.
- Determine how quickly a new droplet can be formed.
- Discover effects of design changes in nozzle and chamber geometries.
- Simulate multiple firing systems to determine interaction.

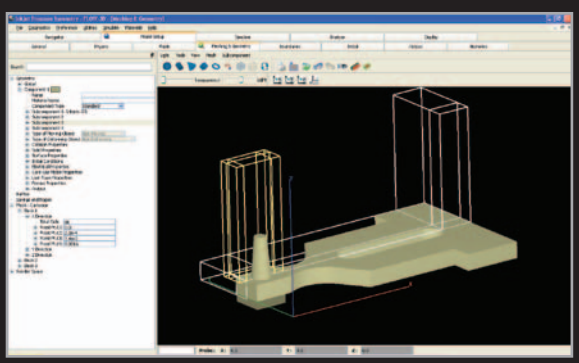
REDUCE COSTS & DESIGN TIME

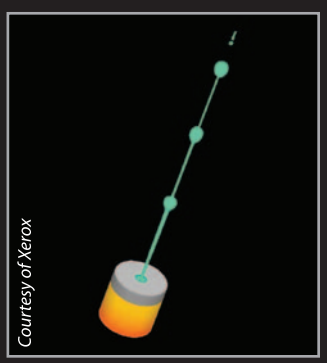
Design variations are quickly simulated with ***FLOW-3D***'s complete, easy to use and fully-integrated package, which includes graphical model building, powerful physical models and detailed post processing.

Modeling droplet ejection using ***FLOW-3D*** helps confirm designs with fewer physical experiments.



Courtesy of Eastman Kodak





Courtesy of Xerox

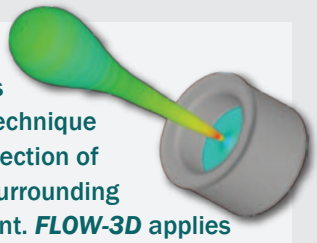
FLOW-3D Inkjet Design

MODELING CAPABILITIES

Electrostatics • Joule heating • Surface tension • Wall adhesion • Bubble dynamics
Heat transfer • Phase change • Fluid-structure interaction • Particle tracking

ADVANCED MODELING TECHNIQUES

TruVOF

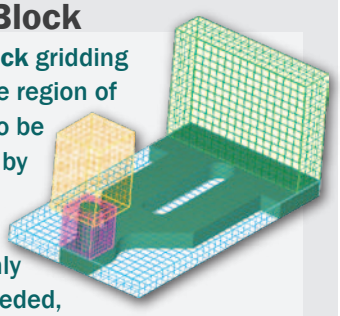


TruVOF is ***FLOW-3D***'s powerful technique for the advection of fluid in a surrounding environment. ***FLOW-3D*** applies proper dynamic boundary conditions to accurately simulate droplet formation in the computational grid.

FAVOR™

With **FAVOR™**, a simple structured grid results in a well-resolved geometry. ***FLOW-3D*** can be used to accurately and efficiently simulate inkjet flows.

Multi-Block



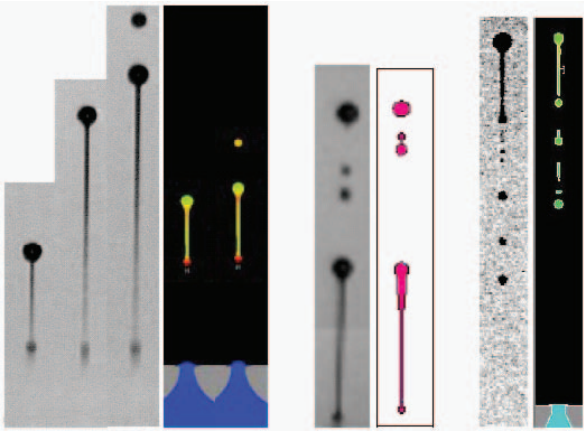
Multi-Block gridding allows the region of interest to be captured by placing mesh blocks only where needed, making simulations more efficient and reducing simulation times.

EXPERIMENTAL VALIDATION: MODELING DROP FORMATION

The initial stage of drop formation is highly affected by actuation force. The properties of the tail and droplet breakup are mostly determined by the inks' properties. Figure 1a shows both experimentally and numerically that a higher driving voltage does not affect the tail but ultimately forms a satellite droplet from the head.

Figure 1b shows satellite droplet formation at high repetition rate and Figure 1c shows the breakup of a very long tail into small droplets, the Rayleigh instability.

Image courtesy of Océ

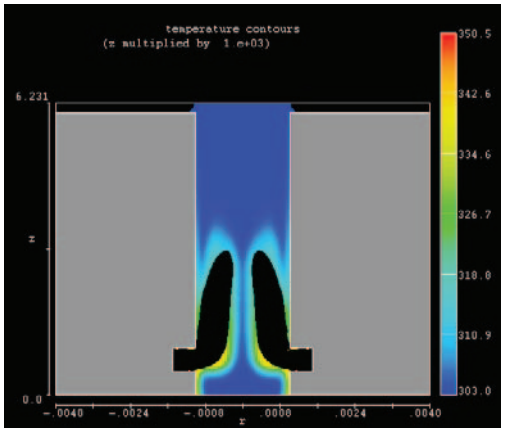


1a *1b* *1c*

THERMAL BUBBLE JETS

FLOW-3D can examine thermal bubble dynamics, enabling customers to model processes used in many inkjet devices.

FLOW-3D can simulate phase change and bubble nucleation created by heat sources to eject fluid from an inkjet printer head design.



Thermal bubble jet colored by temperature.

FLOW Science
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