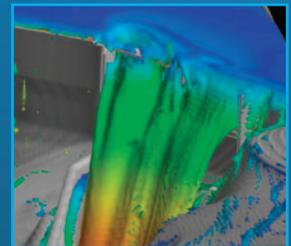
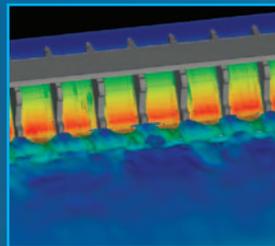
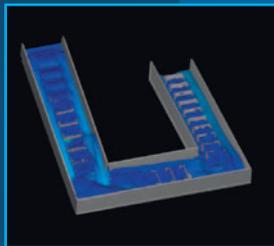
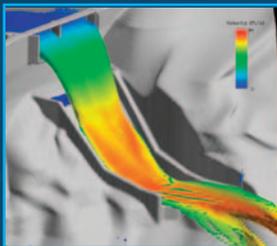


# FLOW-3D

Powerful computational fluid dynamics software for accurate flow modeling



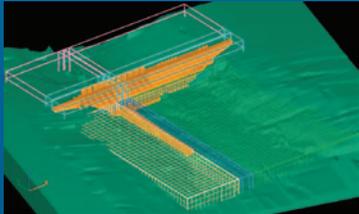
Easy-to-use CFD software to optimize the design and operation of your hydraulics projects

- Accurately predict dynamic surface profiles and flow patterns
- Analyze stresses and deformations on structures
- Improve the design of fish-friendly passages
- Reduce design time
- Ensure dam and spillway safety and performance
- Eliminate reduced-scale physical modeling
- Determine erosion and deposition around structures

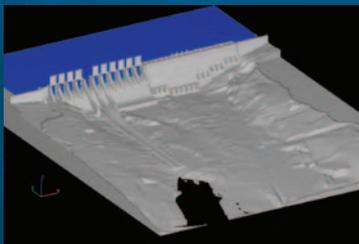
HYDRAULICS

## Advanced Modeling Features

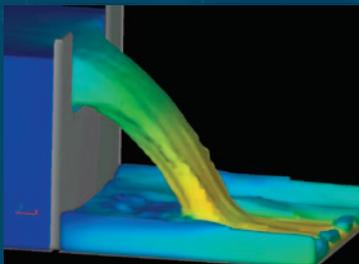
*FLOW-3D* predicts hydraulics performance, reducing cost in both the design process and the operation of the design.



Multi-Block meshing adds even more flexibility and efficiency to problem setup.



*FLOW-3D*'s FAVOR™ method makes accurate representation of complex geometries simple.



*FLOW-3D*'s TruVOF technique precisely simulates moving liquid fronts.

**FLOW-3D**  
from  
**FLOW Science**

[www.flow3d.com](http://www.flow3d.com)

## *FLOW-3D*: Exceptional Accuracy

Optimize your hydraulic designs and lower your costs with **FLOW-3D**, the powerful computational fluid dynamics software for more accurate modeling.

When designing a hydraulic structure, traditionally a physical model would be constructed and analyzed. **FLOW-3D** eliminates scaling issues associated with physical models by simulating the actual design.

**FLOW-3D** addresses a wide range of design problems in hydraulics engineering. Users can increase the capacity of existing infrastructure in hydropower plants, develop novel approaches to fish passages, design intakes that minimize head loss, develop improved forebay designs and tailrace flows, analyze scour and deposition and evaluate air entrainment.

**FLOW-3D** applies unique modeling principles that differentiate it from other applications and enhance the accuracy of your results. Traditional 1-D and 2-D codes don't provide a full detailed analysis of flow currents and flow surfaces. **FLOW-3D** simulates the entire flow process so that these important details are not neglected.

### *Advanced Fluid Surface Modeling*

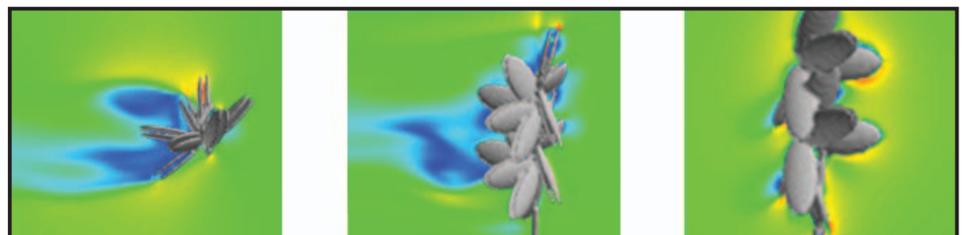
TruVOF, **FLOW-3D**'s method for modeling fluids goes beyond the traditional Volume of Fluid (VOF) techniques to achieve the most accurate tracking of fluid surfaces to capture waves and hydraulic jumps.

### *FAVOR™ Makes Modeling Flow in Complex Structures Easy*

A unique feature of **FLOW-3D** is the FAVOR™ (Fractional Area/Volume Representation) method, which permits true representation of complex geometry in a simple Cartesian mesh. As a result, **FLOW-3D** can be used to simulate flow in complex hydraulics structures accurately and efficiently.

### *Enhanced Modeling of Detailed Regions*

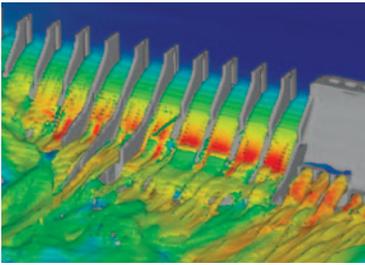
With Multi-Block meshing capabilities in **FLOW-3D**, you can easily and quickly capture complex geometries and apply varying degrees of resolution for sharper modeling.



Simulation of flow around a mussel clump. Images courtesy of Blue Hill Hydraulics. Postprocessing by FieldView.

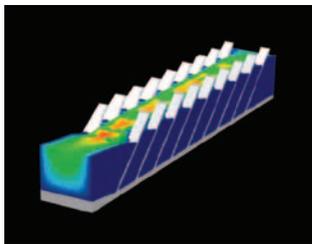
## More Precise Simulation

**Improve Dam and Spillway Performance** by optimizing designs. **FLOW-3D** can quickly simulate a multitude of configurations to best determine flow of spillways, stilling basins and energy dissipaters.

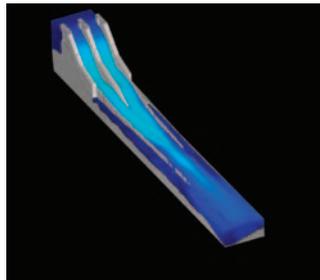


**Dam and Spillway Safety** is an essential component in the design process. **FLOW-3D** enables engineers to predict flow

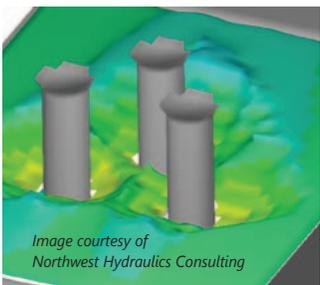
rates at Probable Maximum Flood conditions, determine cavitating regions and pressure loading on gates.



**Fish Passages** are a critical component in the design of hydraulic structures. **FLOW-3D** aids in the design of safe and effective passages by capturing their complex flow characteristics.



**Air Entrainment** may help sustain growth of microorganisms and cause detrimental downstream bulking and overtopping structures. **FLOW-3D**'s air entrainment model determines quantities of air entrained and its volumetric bulking effects.



### **Multi Sediment Scour & Bedload Transport**

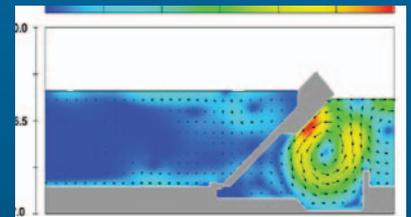
Scour and deposition is an important consideration in the design of bridges, dams and reservoirs. The sediment scour model in **FLOW-3D** enables users to study the erosion and deposition of multiple sediments including

bedload transport caused by complex flow patterns.

## Fluid-Structure Interaction (FSI)

### GENERAL MOVING OBJECTS

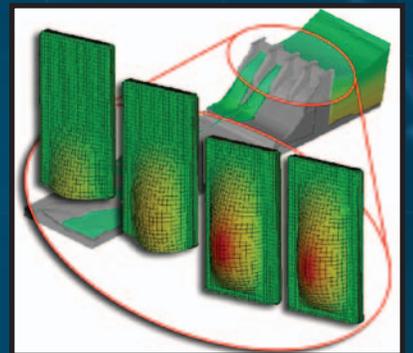
Engineers often need to model flows that include moving solid components. With **FLOW-3D**, the motion of these objects can be fully coupled or coupled with constraints making it possible to determine and improve a design quickly and reliably.



A tsunami control device.

### STRESS MODELING

The new FSI model enables users to predict stresses and deformations of solids under load by using a coupled solution between fluids and solids. Stress prediction provides valuable information to determine whether a design meets safety criteria or may ultimately fail.



Magnified displacements of closed spillway gates from the background image of the spillway.

*"FLOW-3D is a powerful tool for solving complex hydraulic issues related to planning, design and operation of our hydraulic system, as well as associated environmental studies. I am also impressed with Flow Science's customer support and product development."*

*Kevin Sydor, M.Sc., P.Eng.  
Senior Hydrotechnical Studies Engineer, Manitoba Hydro*

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# FLOW-3D MP

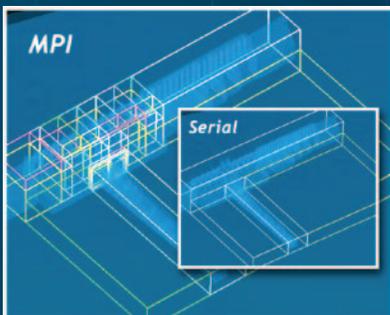
FLOW-3D/MP  
High Performance  
Computing

FLOW-3D/MP enables engineers to take advantage of the scaling potential of the software on clusters. Now combining Message Passing Interface (MPI) and OpenMP paradigms, Hybrid architecture achieve greater parallelization.

FLOW-3D/MP offers users a substantial increase in performance with possible scaling up to 256 cores and runtime improvements of as much as 60x over the serial version.

## Automatic Decomposition Tool

FLOW-3D/MP includes an Automatic Decomposition Tool (ADT) making meshing easier. ADT finds the most efficient way of dividing the domain to take advantage of Hybrid architecture, removing all the guess work from simulation setup.



ADT decomposes the domain for balanced processor loads.

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## An All-Inclusive Application

**From Model Setup to Simulation to Detailed Results Analysis**

**FLOW-3D includes all the functionality you need in one simple-to-use application, driven by an intuitive graphical user interface.** Users can easily set up a model and quickly mesh it through its graphical model builder, screen out model incompatibilities and configuration errors, and perform detailed analysis through extensive post-processing capabilities.

### Hydraulics Data Output

FLOW-3D has a complete postprocessor capable of outputting data graphically in 1-D, 2-D and 3-D views or numerical data for import to other analysis packages. The postprocessing includes specific data, such as: flow tracers, fluid residence time, fluid elevation, depth-averaged velocity, and velocity at an offset from the bottom.

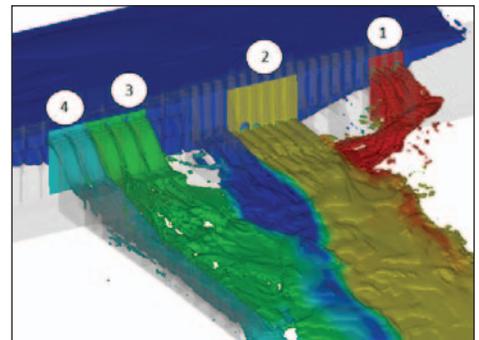
### Dedicated Support

The professionals at Flow Science work closely with customers to understand their needs and ensure the software continuously meets their real-world challenges. Flow Science offers valuable training to help customers maximize their use of **FLOW-3D**. Most importantly, Flow Science provides accessible, responsive technical support.

Call **505-982-0088** or email [sales@flow3d.com](mailto:sales@flow3d.com) for more information about how **FLOW-3D** can enhance the reliability and quality of your hydraulics designs and help you reduce overall costs.

### Flow Tracers

FLOW-3D can simulate tracers at arbitrary locations to show where fluid fluxing from a particular location ends up. This can be useful for many purposes including the balancing of flows. Shown are fluxes from various spillway gates.



### Flow Science, Inc.

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