

Integrated Simulation Solutions for the Biomedical Industry

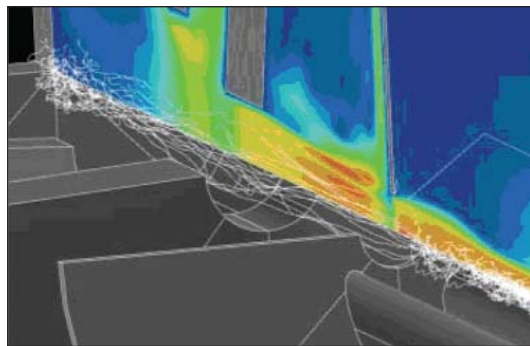
BIOMEDICAL

Physicians and other healthcare professionals open clogged arteries, restart hearts, restore breathing, replace damaged joints, help patients overcome physical disabilities and detect diseases earlier than ever before possible. These and a host of other routine operations and procedures described as modern medical miracles enable people to live longer and more productively, thanks to biomedical technology. Advanced products in this rapidly growing industry include diagnostic and monitoring systems, artificial joints and organs, cardiovascular stents and pacemakers, surgical tools, catheters, therapy equipment and a wide range of other devices and systems.

According to the Advanced Medical Technology Association (AdvaMed), the life-cycle of biomedical devices in this rapidly evolving and highly competitive market averages just 18 months, relatively short compared to the product lives in other industries measured in years

and decades. To meet this demand for a continuing stream of innovative designs, manufacturers stage aggressive product development efforts. AdvaMed statistics indicate that biomedical technology companies invest nearly 12 percent of sales revenue in R&D: more than four times the average for manufacturing companies overall.

As an integral part of these development efforts, biomedical technology companies use a wide variety of engineering simulation tools including structural analysis, multibody simulation, computational fluid dynamics, fatigue analysis, multiphysics, multi-attribute optimization and robust design. Companies are leveraging these tools in breakthrough product development efforts across the industry.



Ion trajectories with superimposed NS solution
(contour plot of gas flow velocity)

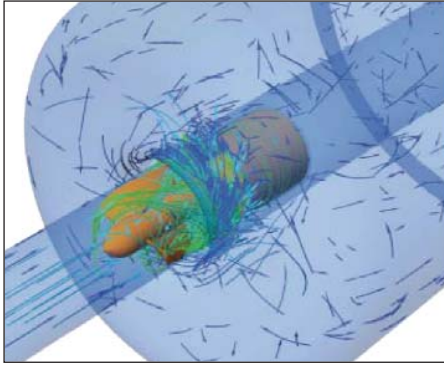
Image courtesy Dr. Andreas Hieke

ANSYS Simulation Solutions

- ▶ ANSYS® Multiphysics™
- ▶ ANSYS® CFX®
- ▶ ANSYS® Mechanical™
- ▶ ANSYS® ICEM CFD™

“ANSYS Multiphysics technology helps design highly sensitive protein ion sources used for research in detecting diseases such as cancer on a molecular level at very early stages ... Once more, ANSYS proved to be a nearly perfect vehicle in a tricky, highly specialized multiphysics adventure, specifically due to its well documented script-controlled read/write access to all relevant model and solution data.”

– **Dr. Andreas Hieke**
CEO
GEMIO Technologies, Inc.



Flow vectors demonstrate how blood flows through the impeller. The pump was designed to minimize shear stress levels and creation of vortices, which increase residence time of blood in the pump. Both shear stress and residence time can contribute to blood-cell destruction.

CASE-IN-POINT

Researchers at the Cleveland Clinic Foundation (CCF), the renowned Cleveland, Ohio, medical institution and one of the world's largest research hospitals, are using ANSYS CFX computational fluid dynamics (CFD) software to advance state-of-the-art catheter and rotary pumps for cardiac patients. As a result of today's work with CFD, tomorrow's artificial hearts will be both smaller and safer for patients. The analyses let engineers see what happens inside the pump so they minimize potential blood-flow problems, which can threaten patients' lives.

About ANSYS, Inc. Solutions

ANSYS designs, develops, markets and globally supports engineering simulation solutions used to predict how product designs will behave in manufacturing and real-world environments. Its integrated, modular and extensible set of solutions addresses the needs of organizations in a wide range of industries. ANSYS solutions qualify risk, enabling organizations to know if their designs are acceptable or unacceptable — not just that they will function as designed. ANSYS helps organizations achieve:

- Innovative and high-quality products and processes
- Fewer physical prototypes and test setups
- Faster return on investment due to reduced development time
- A more flexible and responsive information-based development process, enabling the modification of designs at later stages of development
- A front-end simulation strategy that offers a superior method for bringing products to market in less time and with fewer costs

About ANSYS, Inc.

ANSYS, Inc., founded in 1970, develops and globally markets engineering simulation software and technologies widely used by engineers and designers across a broad spectrum of industries. The Company focuses on the development of open and flexible solutions that enable users to analyze designs directly on the desktop, providing a common platform for fast, efficient and cost-conscious product development, from design concept to final-stage testing and validation. Headquartered in Canonsburg, Pennsylvania, U.S.A., with more than 25 strategic sales locations throughout the world, ANSYS, Inc. and its subsidiaries employ approximately 600 people and distribute ANSYS products through a network of channel partners in over 40 countries.

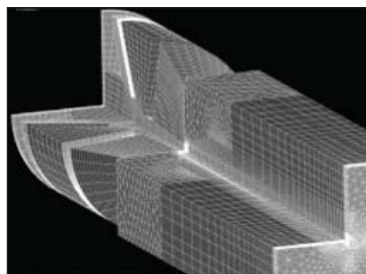
ANSYS products can be applied to a broad range of biomedical analysis types:

- ▶ Researchers use ANSYS CFX computational fluid dynamics software to design catheter and rotary pumps that maintain blood flow for patients awaiting heart transplants or other surgical procedures.
- ▶ ANSYS® Structural™ software is used in studies to determine to what extent artificial spinal discs help restore motion and how performance is affected by placement of discs relative to the center line of the spine nucleus.
- ▶ Stent designs can be used to determine how they can be inserted into blood vessels and expanded to their functional shapes.

The ANSYS Advantage

ANSYS software provides customers with a competitive advantage:

- ▶ Ability to factor in more than one physics
- ▶ ANSYS® Workbench™, which provides a unified product development environment offering integration across a wide range of design processes — ranging from geometry modeling and editing, meshing and pre-processing, advanced analysis (structural, thermal, electro-magnetics, CFD, etc.) and robust design optimization
- ▶ Providing industry's broadest range of physics capability in one integrated analysis environment
- ▶ Advanced meshing solutions to efficiently address high aspect ratio geometry commonly associated with microsystem devices
- ▶ Advanced material models and contact types for simulating bones, tissues and medical devices



Meshed 3-D model of a quadrupole coupled to an ion generation system; note the great range of used element sizes.

Image courtesy Dr. Andreas Fleke



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