BioLite, Inc.
www.biolitestove.com

Customer Success Story

Autodesk® Product Design Suite Ultimate
Autodesk® Simulation CFD
Autodesk® Simulation 360

By simulating many stages of product design and performance with Autodesk Simulation CFD and Autodesk 3ds Max Design software, we were able to evaluate the relative impact of different design directions, reduce the number of physical prototypes we had to construct, and avoid overbuilding. That helped us save considerable time and money.

—Jonathan Cedar
Founder, CEO, and Director
BioLite, Inc.

The Autodesk Clean Tech Partner Program supports clean technology innovators with design and engineering software they can use to accelerate their development of solutions to the world's most pressing environmental challenges. For more information visit **autodesk.com/cleantech.**

Not your average stove.

BioLite creates electricity-generating biomass stoves with Autodesk software to improve public health.

Image courtesy of BioLite, Inc.

Innovative Clean Tech Products

Co-founded by Alexander Drummond and Jonathan Cedar, BioLite develops and manufactures innovative, low-cost biomass stoves that make cooking with wood as clean, safe, and easy as with modern fuels. Using patent-pending technology, the company's stoves convert heat from burning wood into electricity, a portion of which powers an internal fan that creates airflow and dramatically improves combustion efficiency. Stove owners can use excess electricity to charge cell phones and other devices via a USB port on the stove's exterior power module.

While working full-time, Drummond and Cedar worked nights and weekends to develop a functional prototype of their initial product offering, the BioLite CampStove™, for recreational markets. Much to their surprise, that prototype won the top prize for lowest emissions at the 2009 ETHOS stove conference, a gathering focused on designing wood stoves for the developing world. "That experience opened our eyes to the larger potential impact of our technology," says Cedar, CEO and director of BioLite.

A World Health Crisis

"Every day around the world, roughly three billion people eat meals prepared over smoky, open fires," says Cedar. Smoke from these fires has disastrous health impacts, causing almost two million deaths per year. So serious is the problem that United States Secretary of State Hilary Rodham Clinton recently created a partnership led by the United Nations Foundation to distribute 100 million cleaner and more efficient stoves by 2020.

Some companies have tried to increase combustion efficiency—and, therefore, reduce harmful emissions and particulates—by adding fans to stoves, but their solutions required electricity from an external source, limiting their usefulness in the developing world, where rural electrification rates are quite low. To address these issues, BioLite designed the BioLite HomeStove. Designed to survive three or more hours of daily, family cooking for up to five years, the HomeStove can generate enough electricity to charge a basic cell phone and LED light, in addition to powering the stove's fan unit.

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The BioLite HomeStove consumes 50% less wood than traditional cook fires and reduces smoke emissions by 90%.

Balancing Cost, Performance, and Durability
Creating high-performance stoves requires the use of durable materials with high levels of embedded energy. However, when BioLite and the Stanford University Engineering School conducted a lifecycle analysis of one of the company's stoves, they found that its performance benefits far outweighed the energy usage associated with its manufacturing.

To balance performance, durability, and cost, BioLite performed multiple design iterations and initially created only physical prototypes, a process that is both time-consuming and expensive. To reduce costs and save time, BioLite used Autodesk® Simulation CFD software—a component of Autodesk® Simulation 360—to digitally simulate heat transfer within the CampStove and, later, the HomeStove. The design team also used Autodesk® 3ds Max® Design visualization software to create photorealistic digital prototypes of the stoves, allowing the team to evaluate stove aesthetics. "By simulating many stages of product design and performance with Autodesk Simulation CFD and Autodesk 3ds Max Design software, we were able to evaluate the relative impact of different design directions, reduce the number of physical prototypes we had to construct, and avoid overbuilding," says Cedar. "That helped us save considerable time and money."

"Autodesk Simulation 360 gives us the ability to run multiple simulation studies in the cloud in the same amount of time that it used to take us to run just one single-variable study," says Matt Nowicki, senior product engineer at BioLite. "That really opens up the game for us and helps us understand much more of the system, much faster. It's impressive how easy, valuable and seamless this capability is for our company."

BioLite acquired Simulation CFD and 3ds Max Design at a very low cost through its membership in the Autodesk® Clean Tech Partner Program. In future design cycles, BioLite plans to use other Autodesk software, including the Autodesk® Product Design Suite Ultimate and various simulation software products."

World-Changing Benefits
The BioLite CampStove is available on the company's website. BioLite plans to roll it out at large-scale retailers throughout the developed world in the near future. "We are investing revenue from our early sales in the recreation market into the development of a commercially viable business plan for the BioLite HomeStove in the developing world," says Cedar. "We intend to ship one million cook stoves over the next five years."

According to Cedar, each HomeStove can reduce smoke and particulate emissions by up to 90 percent when compared to cooking over open fires. Before rolling out the HomeStove on a commercial scale, however, BioLite is conducting global pilot programs.

In Ghana, BioLite is working with the Canadian government and Columbia University on a program funded by the National Institutes of Health that will quantify emissions reductions and attempt to better understand the relationship between smoke and particulate exposure and children's health. BioLite is conducting other pilots in India, Uganda, and Kenya. Eventually, BioLite hopes to expand into other areas, such as communications and refrigeration. "Our ultimate goal is to deliver clean, affordable energy access to people all around the world," says Cedar.

To learn more about the Autodesk Clean Tech Partner Program, visit **autodesk.com/cleantech.**

Image courtesy of BioLIte, Inc.

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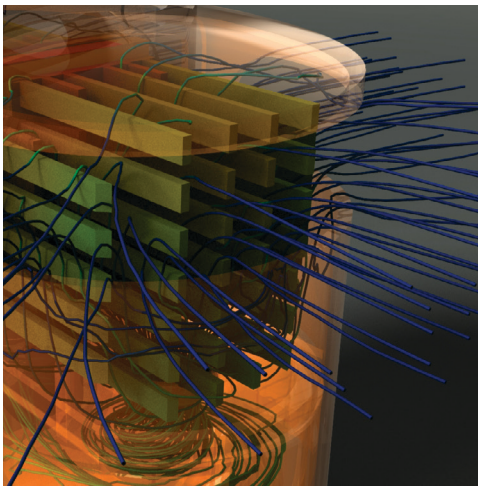

Image courtesy of BioLite, Inc.

Membership in the Autodesk Clean Tech Partner Program has allowed us to consolidate all of our design tools on a single, well-integrated platform.

—Jonathan Cedar
Founder, CEO, and Director
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