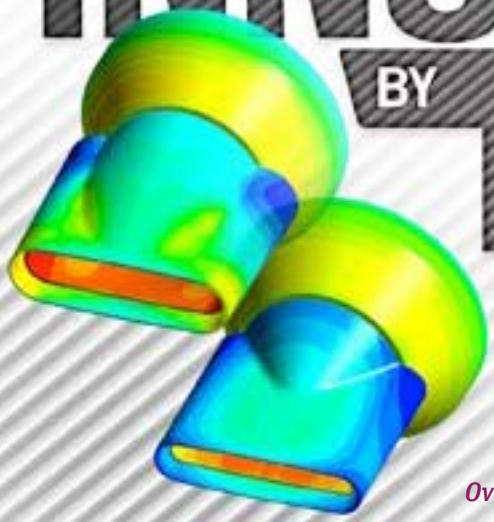
dyson

INNOVATIVE BY DESIGN



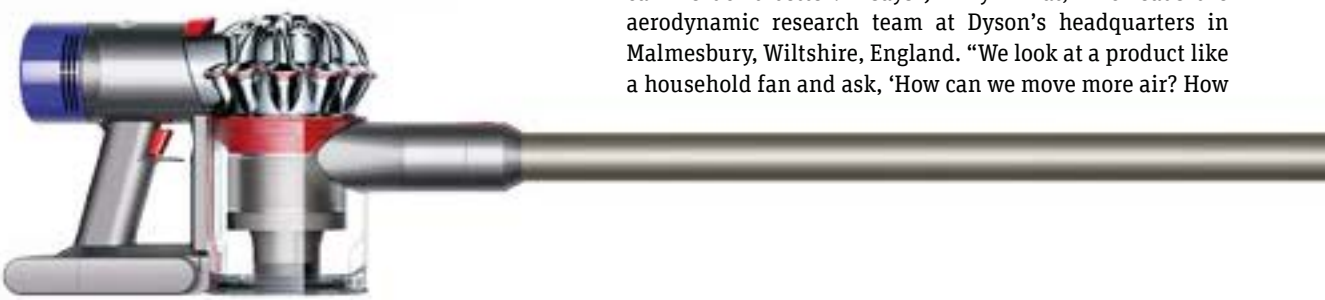
by ANSYS Staff

Over the past decade, the name "Dyson" has become synonymous with product innovation. This privately held British company has revolutionized many familiar household products, from vacuum cleaners to hair dryers, by questioning their most foundational design principles. How does this phenomenally successful company maintain the energy and drive of a startup? And how has Dyson created a culture of risk-taking and innovation? **Dimensions** ***spoke with Jimmy Lirvat, who heads the aerodynamic research team at Dyson, about these and other topics.***

The story behind Dyson's incredible global success has become the stuff of legend. In 1978, frustrated with the performance of his household vacuum cleaner, James Dyson disassembled it — then set out to create a better design. While touring a sawmill, he saw the air being cleaned by industrial-sized centrifugal separators and wondered if this same "cyclone" technology might be applied to household vacuums. Five years and 5,127 prototypes later, Dyson had revolutionized an entire product category by inventing the world's first bagless vacuum cleaner. To date, Dyson has sold more than 10 million vacuum cleaners (corded and cordless) in 70 countries.

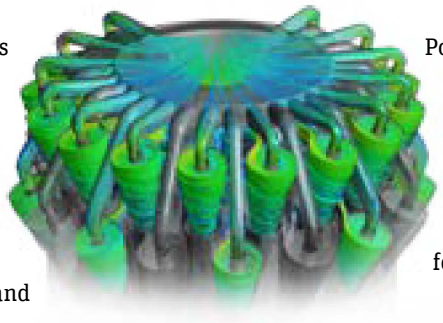
But that's not the whole story. Dyson has also broken new ground with its innovative designs for self-activated commercial hand dryers and bladeless residential fans. In 2016, Dyson rewrote the engineering rules for hair dryers with its Dyson Supersonic, which delivers an enormous amount of drying power in a sleek, lightweight design. The company has reinvented and reenergized many common household appliances whose designs had remained unchanged for decades.

"While Dyson has brought innovation to many product categories, the process always begins with asking, 'How can we do it better?'" says Jimmy Lirvat, who leads the aerodynamic research team at Dyson's headquarters in Malmesbury, Wiltshire, England. "We look at a product like a household fan and ask, 'How can we move more air? How



can we eliminate air turbulence? How can we reduce the number of mechanical parts that might eventually fail?' Our engineers are not constrained by any accepted design principles — such as the notion that a fan needs to have blades. That's how we arrive at game-changing innovations. When you throw out everything you think you know about a product like a fan, there's no telling what might happen. That philosophy gives our product development team incredible freedom."

According to Lirvat, nearly two decades after James Dyson noticed problems with his vacuum cleaner, his company still encourages engineers to deconstruct existing products and question their underlying concept. With a worldwide staff of 2,000 engineers, Dyson is constantly pushing the boundaries of product development and exploring new areas of innovation.



Case in Point: The Dyson Supersonic

For example, the Dyson Supersonic hair dryer began with a couple of simple questions: Why do all hair dryers look alike? And how could the Dyson product development team radically improve a design that has been unchanged since the 1960s?

Dyson engineers began by studying the science of hair. They analyzed exactly how human hair dries, how it becomes shiny, and how it can be subjected to heat and air without being damaged. They consulted with hairdressers. They bought more than 1,000 miles of human hair samples — creating a global hair shortage — and tested them in labs that were built from scratch. Four years and £38 million (about $47 million US) later, the Dyson Supersonic hair dryer was launched to global acclaim.

Powered by an approximately one-inch V9 digital motor and an air compressor that is positioned in the dryer's handle, the Supersonic is capable of delivering 13 liters of air per second. But it is incredibly lightweight and easy for both consumers and professionals to use.

"If you look at the Supersonic, it looks nothing like previous product incarnations, which is business as usual for Dyson," says Ludovic Desvard, who heads the aero/acoustics/compressor research department. "By beginning with a surprising design concept — moving the compressor to the dryer's handle — Dyson has been able to rethink the size, weight and efficiency of the conventional hair dryer."

Desvard notes that more than 100 engineers, including many from his department, worked on the Supersonic's design over a four-year period. The company also partnered with aerodynamics and acoustics experts at leading universities. "At Dyson, we're committed to devoting the appropriate human resources to a design project that we believe in," states Desvard. "If specialized expertise is needed, it will be found and leveraged to bring a new product to market successfully."

Product Innovation via Engineering Innovation

That commitment extends to engineering technology investments as well. "Because we're an innovative company, Dyson has an appreciation for leading-edge technology," Desvard explains. "Dyson tends to seek out and apply the most advanced engineering solutions, including engineering simulation."

While James Dyson built 5,127 physical prototypes of his original vacuum cleaner design, since 1998 the company has relied on simulation software from ANSYS to design and test products in a virtual space. Not only has engineering simulation helped reduce the time and cost involved in product development, but Lirvat notes that it also supports the idea of "reinvention" that's so central to Dyson's commitment to innovation. Simulation allows for the multiple, rapid-fire design iterations that are needed to achieve a complete redesign of a traditional product.

"If we're talking about a radical concept — like removing the blades from a residential fan — that's much easier to visualize and accomplish in a simulated environment. As engineers, we can quickly assess and reject dozens of ways to achieve this, without any degree of risk or financial exposure," Lirvat states.

"Pushing the limits of design can be time-consuming and expensive when you're talking about building a physical model," Lirvat continues. "But, with ANSYS software, we can come up with crazy ideas and make mistakes quickly, without any significant consequences. That frees our engineering team to be extremely creative."

"Simulation helps us investigate numerous degrees of freedom and minimize the time involved in optimizing our designs."

When Dyson does produce a physical prototype, the company relies on advanced prototyping technologies such as 3-D printing. "While simulation is invaluable, building stuff is in the DNA of Dyson," says Lirvat. "Thanks to 3-D printing, we can now make a prototype in less than a week. We can test that product, experience what the user will experience, then feed that back into the engineering simulation process."

Adds Lirvat, "Physical prototypes will always have value, because we're not just concerned with whether products work on a mechanical or aerodynamic level — we're trying to create an entirely different consumer experience. But today, prototyping and simulation work closely together in a back-and-forth process. We create a design using simulation, we quickly make and test a prototype, then we take our findings and apply them to the next simulation."

Dyson tends to seek out and apply the most advanced engineering solutions, including **engineering simulation.**

Dyson at a Glance

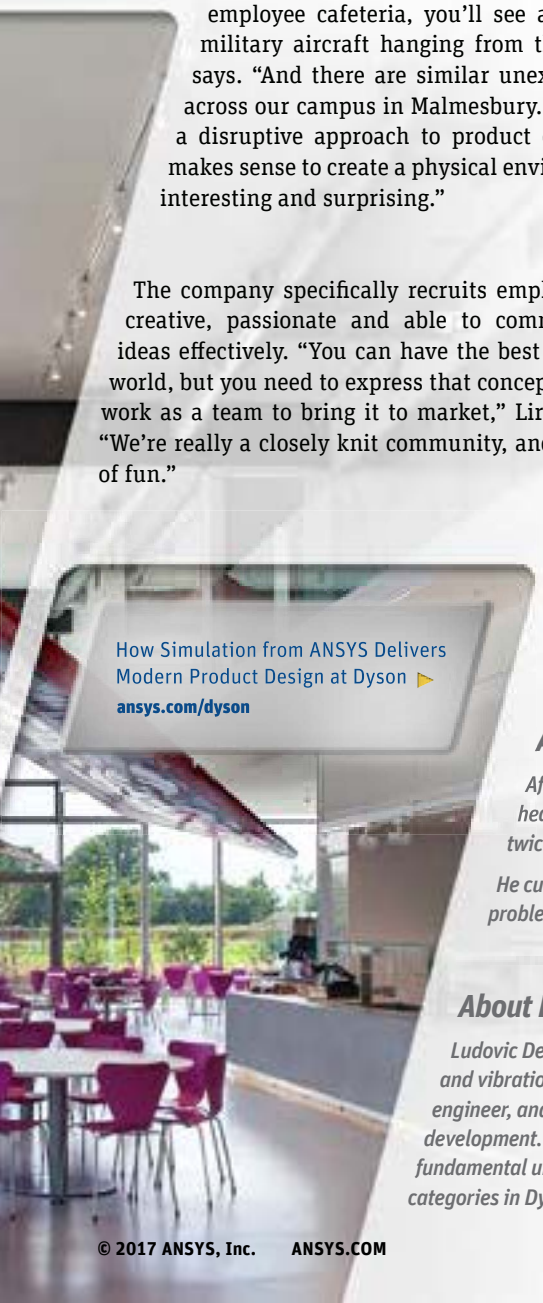
2015 revenues: **£1.74 billion**
Number of employees: **7,000**
Headquarters: **Malmesbury, Wiltshire, England**

Fostering the Creative Spirit

Lirvat points out that Dyson's commitment to innovation doesn't end with the engineering department. Founded with a spirit of creativity, the company clearly places an emphasis on the unconventional. "If you visit our employee cafeteria, you'll see a World War II military aircraft hanging from the ceiling," he says. "And there are similar unexpected objects across our campus in Malmesbury. If we're taking a disruptive approach to product design, it only makes sense to create a physical environment that's interesting and surprising."

The company specifically recruits employees who are creative, passionate and able to communicate their ideas effectively. "You can have the best concept in the world, but you need to express that concept to others and work as a team to bring it to market," Lirvat points out. "We're really a closely knit community, and we have a lot of fun."

One unexpected, but regular, occurrence is catching a glimpse of founder James Dyson. "While many executives of James' stature might be enjoying some time off, James is very much a presence here at Dyson today," notes Lirvat. "He is still passionate, still in meetings, still rolling up his sleeves and working alongside us. His commitment to entrepreneurship and innovation is really an inspiration for every engineer who works here. He ensures that, even with 7,000 global employees, this company still feels like a disruptive startup."



How Simulation from ANSYS Delivers Modern Product Design at Dyson ▶
ansys.com/dyson

About Jimmy Lirvat

After graduating as an aerospace engineer in Toulouse, Jimmy Lirvat joined the Oxfordshire headquarters of the Renault F1 team where he used modeling and simulation to develop the twice World Champion car. He later worked with Renault on more traditional road cars.

He currently manages the aerodynamics research team of Dyson and looks after a variety of problems that includes all categories of Dyson products.

About Ludovic Desvard

Ludovic Desvard graduated as a mechanical engineer in France before completing a Ph.D. in acoustics and vibration in collaboration with Renault. He joined Dyson seven years ago as a noise and vibration engineer, and now leads a team of experts in the fields of acoustics, fluid dynamics and compressor development. The main focus of the team is to ensure the steady delivery of new technologies, fundamental understanding and lean methodologies to fuel the pipeline of new products across all categories in Dyson.

