Ansys

ENVIRONMENTAL SUSTAINABILITY IN FOCUS

/SIMULATION PRODUCT HANDPRINT:

HEALTHCARE

Simulation Supports Sustainability

Ansys is committed to the conservation and sustainability of the planet's resources by operating our business in ways that reduce our environmental impact and carbon footprint. As part of Ansys' environmental sustainability efforts, we submit to the Carbon Disclosure Project (CDP) annually and are committed to taking steps to measure and mitigate the carbon footprint of our operations.

As the global leader in simulation software, Ansys is well positioned to also provide technology solutions that support and enable the sustainability goals of our customers across diverse industries. Our solutions can have a positive impact on the environment by helping our customers to reduce their use of resources while increasing their efficiency and productivity. Discovering and implementing efficient and innovative product design and operation — with minimal use of physical resources — is at the very heart of our vision of pervasive simulation.

While measuring and reducing our own environmental impact is essential, the benefits from this process are finite. By contrast, our product handprint — the use of simulation by customers to reduce their own carbon footprint and the footprint of their products — is nearly infinite. Here, we present research findings and a series of use cases that illustrate how Ansys simulation creates these handprint benefits.

Lending a Helping Hand to Healthcare

The global healthcare industry has been estimated to emit more greenhouse gases than all but four countries.[1] That means if the healthcare industry were a country, it would be the fifth largest emitter of CO_2. In recent years, the United States and United Kingdom healthcare sectors have accounted for around one-tenth of each country's annual greenhouse gas emissions.[2] Due to these numbers, the healthcare industry is under significant pressure to lessen its environmental impact. Investors, employees, and the broader community are pushing the industry to pursue more sustainable processes, generate less waste, and reduce emissions.

To meet these initiatives, many drug manufacturing companies are prioritizing sustainability efforts throughout the product life cycle, from production to packaging. Producing pharmaceuticals consumes vast amounts of water, energy, and ingredients to determine the right mixtures, equipment configurations, production setup, and packaging properties.

"Simulation software helps us determine the most effective use of our products, reduce waste, and create reworkable products where applicable. We can reduce raw materials needed, which significantly reduces carbon through manufacturing of new products and then the disposal and recycling of used products."

— HEALTHCARE INDUSTRY SURVEY RESPONDENT

The conventional approach of build, test, and repeat is poorly tailored to help companies achieve their sustainability goals. Whether scaling up and running production, identifying packaging needs, or managing operations and facilities, the conventional approach wastes significant amounts of resources.

Computer modeling and simulation (CM&S) solutions offer a more effective alternative. These solutions enable drug manufacturers to reduce waste by digitally optimizing configurations and equipment before using any physical resources.

Like every Ansys customer, healthcare companies benefit from the increased development speed and efficiency gained by using simulation software. By replacing manual, paper-based analysis and material-intensive physical prototypes with engineering simulation, companies can reduce waste, save on utility costs, and shorten the overall development cycle.

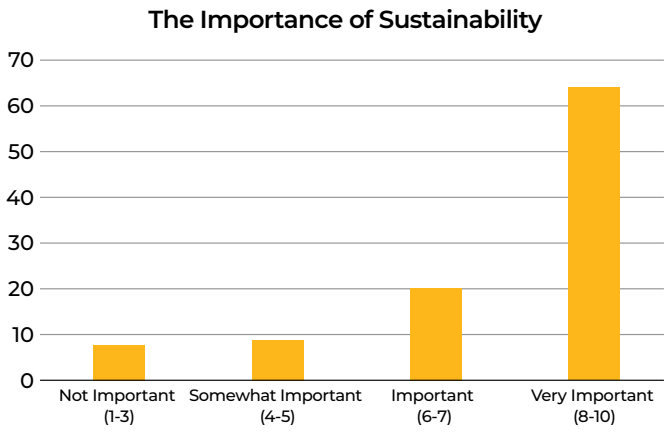


Figure 1. Survey respondents ranked the importance of sustainability to their organizations on a scale of one 1 to 10, with 1 being the least important.

Simulation and Sustainability: Ansys Survey Results

Recently Ansys partnered with Digital Engineering 24/7 to commission a survey of engineering professionals, including representatives of the healthcare industry. The survey asked respondents to describe the sustainability benefits their companies gain from simulation-driven product development. The following are some of the key findings.

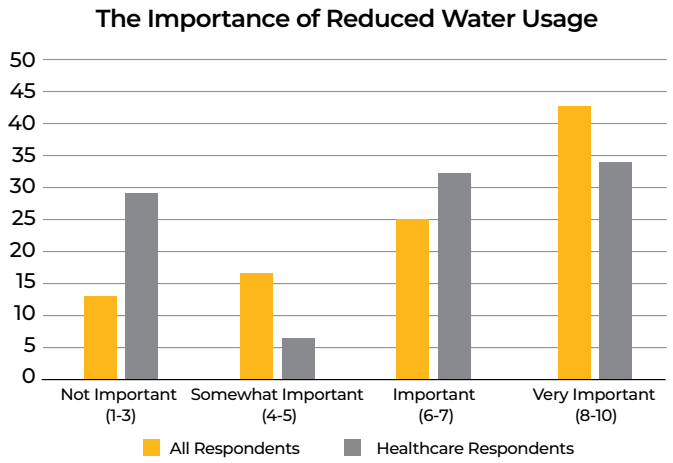


Figure 2. Water usage was ranked as important or very important by most respondents.

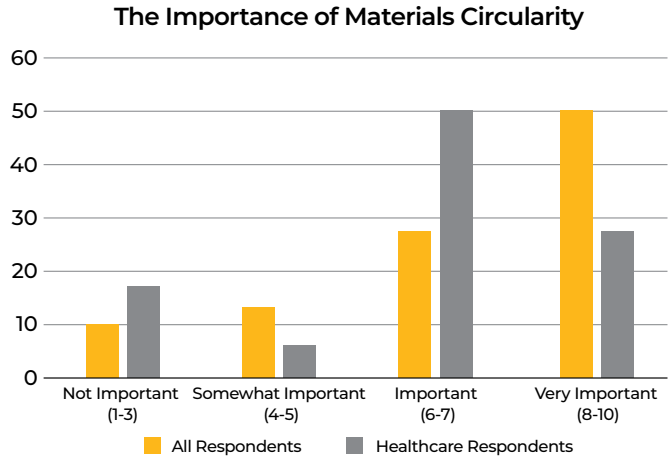


Figure 3. Materials circularity was ranked as important or very important by most respondents.

When asked to rate the importance of sustainability to their organizations on a scale of 1 to 10, with one being the least important, almost two-thirds (64%) of respondents rated sustainability as very important with a score of eight or above.

Follow-up questions revealed that, in their quest for sustainability, companies are prioritizing reduced water usage, carbon capture, emissions reductions, increased energy efficiency, and materials circularity.

Half of the respondents rated materials circularity as very important, and 43% rated water usage as very important. Material use is a factor in medical device manufacturing and pharmaceutical packaging, while water use factors into pharmaceutical formulation.

When survey participants were asked about their companies' other specific priorities, many write-in responses could be directly addressed by an increased use of simulation — including engineering labor efficiency, reduction of paper usage, reduction in testing, and increased time efficiency. Simulation-driven product development can also address many other sustainability concerns stated by respondents, including product durability and longevity improvements, maintenance reduction, minimizing materials usage, and exploring more sustainable materials.

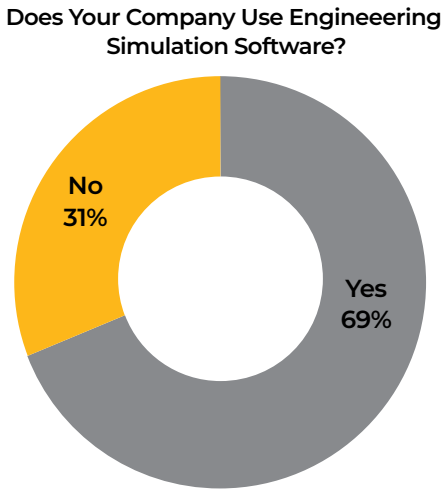
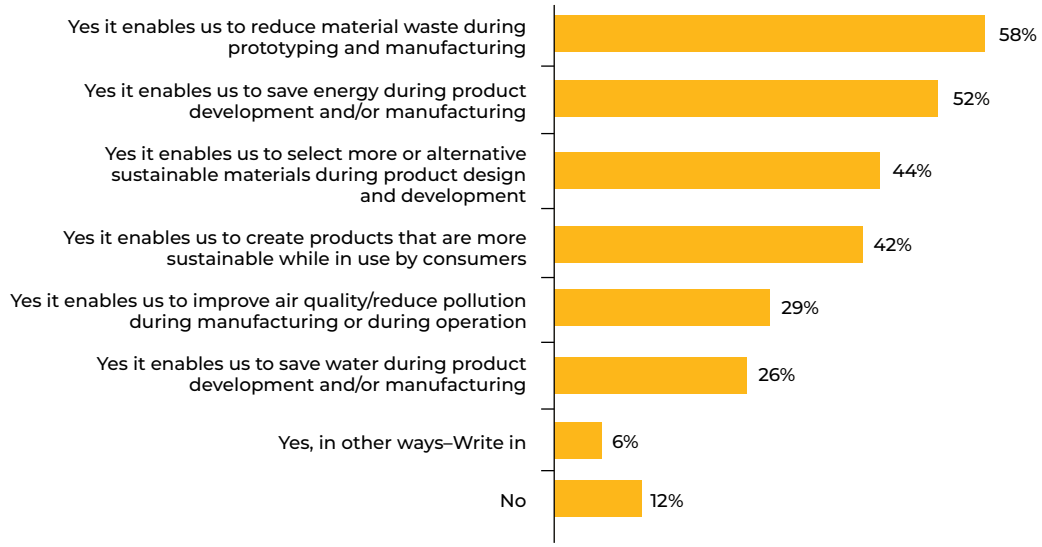


Figure 4. Most companies surveyed are leveraging engineering simulation to support their sustainability goals.

Sixty-nine percent of respondents are already using engineering simulation software as part of their product development process.

When asked about specific sustainability benefits of engineering simulation, 58% of simulation users reported that it reduces materials waste during prototyping and manufacturing.

Does Engineering Simulation Help Your Company Further its Sustainability Goals?



Top Healthcare Responses

1. Simulation enables us to reduce material waste during prototyping and manufacturing
2. Simulation enables us to save energy during product development and/or manufacturing.
3. Simulation enables us to select more or alternative sustainable materials during product design and development

Figure 5. Of companies using simulation software, the overwhelming majority of respondents (88%, obtained by subtracting the 12% who answered "no" from 100%) said simulation was helping to further their company's sustainability goals.

Just over half (52%) said that simulation saves energy during product development and production. The ability to select alternative sustainable materials was important to 44% of simulation users, while 42% stated that simulation helps them design more sustainable products. Respondents also noted that simulation helps reduce pollution (29%) and water consumption (26%) during product development and manufacturing.

Write-in benefits of simulation included compliance with environmental regulations, reduced labor requirements, less physical testing, improved materials traceability, faster development cycles, increased product reliability, and optimized efficiency.

"We use simulation to reduce project timelines, including prototyping and testing. This reduces environmental impacts throughout the design process and also saves money."

— SURVEY RESPONDENT

Methodology

Ansys commissioned Digital Engineering 24/7 to conduct an e-mail survey of engineering professionals to better understand how they use simulation in conjunction with sustainability efforts. The survey was conducted in July and August 2023. A total of 210 responses were received, with a margin of error at the 90% confidence level (+/- 5.7%).

Ansys Customer Success Stories

Healthcare companies worldwide are focused on developing lifesaving pharmaceuticals and medical devices and providing high-quality care to patients. They don't have time to manually iterate on physical prototypes as they try to meet deadlines while reducing their environmental footprint. Ansys software plays a critical role in modeling and verifying healthcare innovations rapidly, saving time and costs without sacrificing analytic rigor. The following are just a few examples of the ways healthcare companies have decreased their time to market while improving their sustainability efforts with the support of Ansys software.

Airinum Identifies New Textile Materials for Masks

Airinum needed to identify textile materials that were suitable for masks while also minimizing their environmental impact. Masks place a lot of demands on the materials from which they are made because they are worn in such a sensitive area: the face. The material has to look good, be comfortable to wear, have a low resistance to air flow, and be stain resistant. The filter material needs to provide proper filtering efficiency, and Airinum wanted the product development process to be as sustainable as possible.

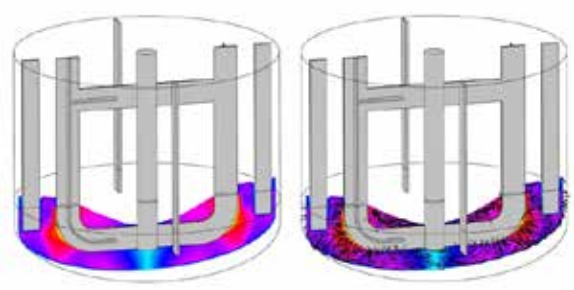
Engineers studied the materials in the Ansys Granta Selector database and looked at "Typical Applications" to see whether the materials of interest were used in similar products. Ansys Granta Selector informed them about the environmental impact of their masks and where they should focus attention in their development. The Eco Audit tool taught Airinum what parts of their products cause the greatest environmental impact and in what life cycle phase that impact occurs. Eco Audit also enabled Airinum to easily change variables, such as the weight of the packaging, to see what kind of impact potential changes would have on the environment in the future.

"Ansys Granta Selector has given us more knowledge about the environmental impact of our products and where we should focus our attention in the development of new ones. Ansys Granta Selector also helped us to verify whether it is sustainable for us to gather used filters from customers to optimize the recycling process."

— **ALEXANDER HJERTSTRÖM** / CEO & Founder / Airinum

Dr. Reddy's Laboratories Simulates the Scaling-Up Process

Dr. Reddy's offers generic medicines, active pharmaceutical ingredients (APIs), custom pharmaceutical services, biosimilars, and differentiated formulations. With so many kinds of drugs available, Dr. Reddy's has become an expert at scaling up the drug manufacturing process from lab to plant level. This process consumes vast amounts of resources, including water and packaging materials. Dr. Reddy's engaged with Ansys to get quicker results and learn faster. The Ansys Customer Excellence (ACE) team helped them develop accurate scale-up conditions by performing steady-state and transient simulations at each scale, and studying parameters like velocity distributions, mixing times, and species concentrations from one scale to another.



"Ansys helped us through multiple strategic consulting projects in generating necessary process understanding and accurate scale-up conditions for our mixing tanks to go from lab scale to plant scale. We received valuable insights into the physics of scale-up and the risks involved. These simulations helped us in decision-making on equipment sizing and cutting down on expensive raw material usage for the testing process."

— **RAVICHANDRA PALAPARTHI** / Head, Modeling and Simulation / Dr. Reddy's Laboratories / Hyderabad, India

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Regeneron Develops New Pharmaceuticals and Medical Devices with the Help of Simulation

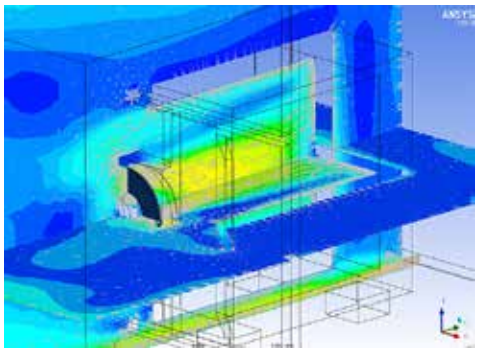
Regeneron is a leading biotechnology company that invents, develops, and commercializes life-transforming medicines for people with serious diseases. Using simulation upfront to develop new devices, rather than just to verify a physical prototype, has enabled Regeneron to drastically reduce the time and expense involved in product development. Rather than using more valuable resources to design prototypes that end up not being used, simulation cuts down on the amount of materials and energy used by decreasing the overall number of prototypes.

"Because we have simulation, we can get into things that we fundamentally couldn't do before, so we've reduced the number of iterations, but we've also developed products that have more capabilities."

— **ROSS KENYON** / Associate Director and Leader of the Modeling, Simulation, and Analysis team / Regeneron Pharmaceuticals

Skycell Simulates Smart Containers to Reduce Vaccine Shipment Losses

SkyCell designs, creates, and manages smart, durable air freight containers for transporting vaccines across the globe. The containers are constructed with a bespoke material, require no direct human management, control their own temperature, and report their location in real time. SkyCell uses Ansys HFSS, Ansys CFD software, and Ansys Mechanical to simulate a holistic view of Industrial Internet of Things (IIoT) components, air and energy flows, and the structural integrity of the container. Without simulation, it would be impossible for the team to aim for perfection in an industry that needs it, especially when lives are at risk.



"Using Ansys software helps us to reduce the vaccine loss rate during shipping to just 0.1%. When the industry average for air freight containers is between 1% and 10% — and lives are very literally on the line — reducing this by a factor of a hundred has an incredible impact on human lives. Ansys' software allows us to view the world in a more holistic way, designing a product that is far closer to perfection than other platforms can allow."

— **NICO ROS** / CTO / SkyCell

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[1] "Health Care's Climate Footprint." Health Care Without Harm, ARUP, September 2019, www.arup.com/perspectives/publications/research/section/healthcares-climate-footprint

[2] Choi-schagrin, Winston. "How Hospitals Fuel Climate Change." The New York Times, 5 Nov. 2021, www.nytimes.com/interactive/2021/11/05/climate/climate-change-health.html.

Learn More About Sustainability and Simulation

When used as part of the design and development phase, simulation can help Ansys customers build effective and efficient products that are integral to meeting the environmental sustainability needs of the future.

Ansys customers from virtually every industry are using simulation to meet their sustainability goals. Companies in the energy sector are reducing greenhouse gas emissions, improving low-carbon energy alternatives, and optimizing operations with digital twins that are enabled by simulation and artificial intelligence. Automakers are transforming into electric mobility companies, while also continuing to work on improving aerodynamics and reducing vehicle weight. The aerospace industry is exploring new propulsion and fuel storage solutions while implementing advanced manufacturing and model-based systems engineering (MBSE). The high-tech sector is using simulation to design more energy-efficient electronics that are designed with material intelligence to improve e-waste recovery. And heavy industry is transitioning to digital workflows that rely on the Industrial Internet of Things (IIoT) to optimize operations, save energy, and control pollution.

Please see additional information on Ansys' exciting technological innovations and corporate responsibility initiatives below.

Additional Resources:

- **Sustainability at Ansys**
  Our simulation software empowers designers and engineers to assess and scale their sustainable innovations faster, reduce their environmental impact, and foster a better future.

- **Discover the Ansys Earth Rescue Online Video Series**
  Earth Rescue reveals what visionary companies are doing today to engineer radical new ideas in the fight against climate change.

- **Read our Corporate Responsibility Report**
  Highlighting our progress across our environmental, social, and governance (ESG) initiatives, the Ansys corporate responsibility report sets out our commitment to delivering positive change and long-term value for our stakeholders – our investors, customers, employees, and partners.

Questions?

Please contact our corporate responsibility coordinator at: corporateresponsibility@ansys.com.

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