NEW SCIENCE
3D PRINTING
FEATURE

INNOVATING 3D PRINTING SAFETY SCIENCE

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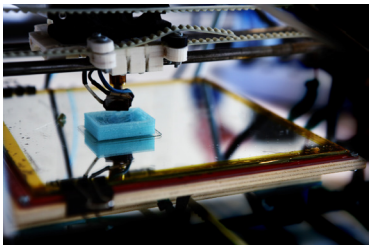
WHY INNOVATING 3D PRINTING SAFETY SCIENCE MATTERS

3D printing, used synonymously with "additive manufacturing," is an already large and fast-growing manufacturing sector whose potential is only beginning to emerge.[1] For almost 30 years, additive manufacturing was employed primarily by engineers and designers to make prototypes quickly and cheaply.[2] Today, product designs and service bureaus (specialist on-demand 3D printing firms) are readily available, and the cost of printers has declined significantly, making 3D printing increasingly accessible for a wide range of commercial and consumer uses.[3] The flip side of the positive momentum additive manufacturing is experiencing is that its flexibility (in terms of materials and designs it can accommodate) and decentralization (in terms of the broad base of current and potential users) are creating new safety risks, making the innovation of safety science essential to providing the needed safeguards.

CONTEXT

The global market for 3D printing—encompassing printers, materials, and associated services—was $4.5 billion in 2013 and is projected to grow 456 percent, reaching $25 billion by 2018.[4] New uses of 3D printing include the direct production of tools, molds, and final products.[5] Together, these uses could facilitate a revolution in mass customization, less-costly supply chains, and even the "democratization" of manufacturing with specialized consumer and entrepreneur printing of products.[6] Longer term, the bioprinting of living organs has the potential to save or extend many lives.[7] All told, 3D printing could generate a total economic impact globally of $230 billion to $550 billion by 2025.[8]



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3D printing provides the freedom to produce more complex product designs, reduce the number of parts a product uses, and rapidly prototype and manufacture molds, tooling, and products—all while potentially making products lighter and stronger.[9] 3D printing can also work with a wide range of materials, including polymers, metals, ceramics, concrete, glass, paper, food, and biologics.[10] At the same time, 3D printing creates complicated safety issues, a sampling of which include:

- How to make certain that safe materials are used or that the materials used are safe for a specific application;
- How to educate people who utilize 3D printing so they understand the limitations and risks;
- How to create safety validation or standards for a quickly expanding array of 3D printable designs, materials, and process specifications;
- How to prevent harmful emissions from the 3D printing process;
- How to certify the safety of components or products that have been printed.[11]

WHAT DID UL DO?

UL pioneered a comprehensive approach to safeguard 3D printing and help protect people, organizations, and facilities. Our unique approach encompasses four broad initiatives: education and training; equipment and materials testing; product validation; and standards, research, and regulatory support.[12]

Education and Training

Our initiative includes three tiers: foundational learning, with four online modules or a one-day in-person training; two- to three-day technical and business applications training programs and topic-specific online courses; and advanced training, comprising one- to two-week hands-on training programs.[13]

Equipment and Materials Testing

For equipment and materials, we provide four essential services: global compliance, based on the principle that product compliance requirements remain the same for 3D printed products relative to the same products produced by traditional processes; safety and performance testing; emissions testing; and a searchable compendium of information on more than 200 3D printing materials via UL's Prospector® database.[14]

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Product Validation

We offer technical support for validation programs that address material qualifications, processes, parts, material reuse, and the 3D printing running environment. We are helping to develop characterizations of additive manufacturing materials to provide common, high-fidelity data that manufacturers need. And we provide online design validation.[15]

Standards, Research, and Regulatory Support

Our staff is very active on relevant standards and technical committees. We develop newsletters and white papers to provide thought leadership and guidance. We also initiate and follow key research projects related to the safety, health, materials, and validation techniques for 3D printing. In addition, we track global regulations as the 3D printing market continues to grow.[16]

IMPACT

UL is continuing its work in developing and deploying a comprehensive program of safeguards for 3D printing. As this market continues to evolve and the related safety risks become more complex, UL is committed to advancing safety science to help protect people, organizations, and facilities.

For more information, please visit ul.com/3Dprinting

SOURCES

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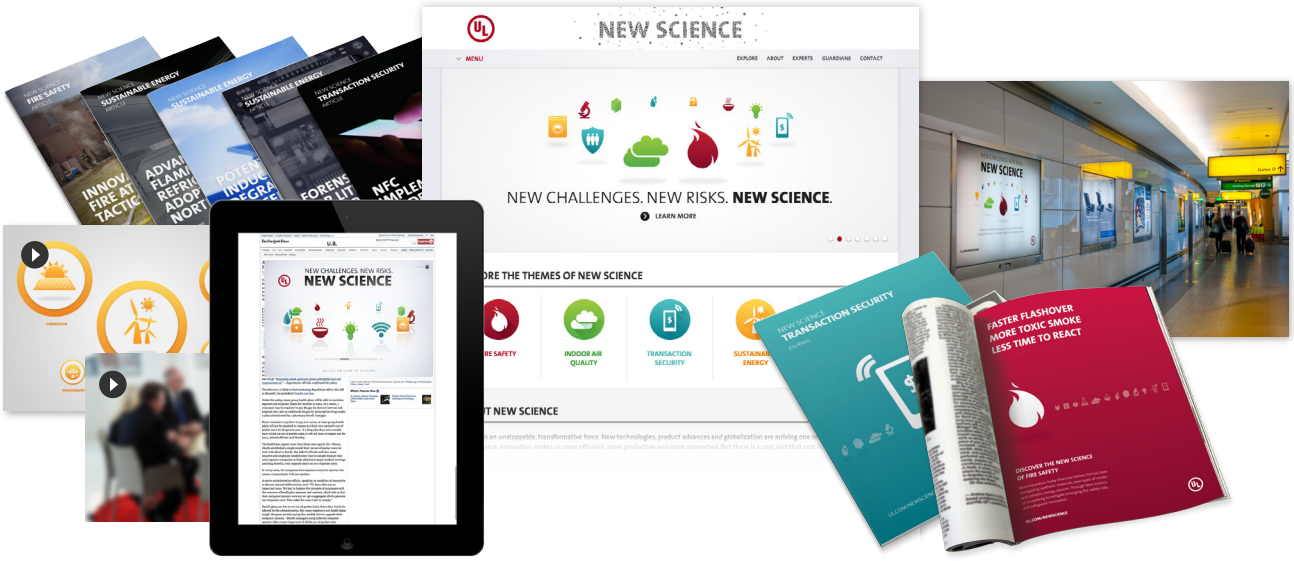
NEW CHALLENGES. NEW RISKS.

NEW SCIENCE



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