

Green Plastics Go to Space

Here's an interesting application that demonstrates the steps that some are taking to address the environmentally generated noise surrounding plastics.



Green plastic, which is made from sugarcane, is now being used to fabricate parts in space thanks to a partnership between Braskem and Made In Space, a developer of zero gravity 3D printers and an official supplier to NASA. The technology allows astronauts to fabricate tools and spare parts in space using the bio-based resin, which effectively increases the autonomy of space missions.

The first part made from the raw material outside of Earth was a pipe connector for a vegetable irrigation system, which was fabricated by the Additive Manufacturing Facility (AMF), the first commercial 3D printer permanently allocated in space. The equipment, which will fabricate various types of parts using I'm green™ plastic, is located on the International Space Station (ISS) and was developed by Made In Space with the support of the Center for the Advancement of Science in Space (CASIS).

Braskem's Innovation and Technology team worked with Made In Space for more than a year to develop a green plastic solution especially for 3D printing in zero gravity. The partnership will enable astronauts to receive digital designs of parts via email and then print them, which means dramatic time and cost savings. "Through this partnership, we combined one of the greatest innovations in polymers, green plastic, with advanced space technology to print 3D objects in zero gravity. Putting a renewable polymer in space for printing applications represents an important milestone in our



history," said Patrick Teyssonneyre, director of innovation and technology at Braskem.

Polyethylene made from sugarcane was chosen for the project because of its flexibility, chemical resistance and recyclability, and also because it is made from a renewable resource. There are great expectations surrounding the project's benefits, since NASA identified 3D printing in space as one of the advances essential for a future mission to Mars. "The ability to print parts and tools in 3D on demand increases the reliability and safety of space missions. This partnership with Braskem is fundamental for diversifying the raw materials used by the AMF and for making this technology more robust and versatile," said Andrew Rush, CEO of Made In Space.

Braskem's technology is also present in the structure of the printer. The equipment's printing bed is made of Braskem's ultra high molecular weight polyethylene (UHMW-PE), which is marketed under the brand UTEC®. The resin provides increased tack for printing with green polyethylene and offers mechanical properties, such as superior abrasion and impact resistance.



From space to Earth

The project should drive the development of solutions that go beyond manufacturing in space to create opportunities for innovations in polyolefin applications. Braskem's innovation team is ready to create, together with its clients, solutions in green plastic and to make them specific for 3D printing. "The technology has the potential to impact the plastics chain by enabling new applications and mass personalization made with a renewable resource," said Gustavo Sergi, director of renewable chemicals at Braskem.

Reinforcing the relevance of its environmental aspect, a new life cycle assessment of green plastic indicated the removal of 2.78 tons of CO2 for each ton of bio-based resin produced. The study was conducted by the consulting firm ACV Brasil and subjected to a technical review by a panel formed by the Institute for Energy and Environmental Research GmbH (IFEU) and Michigan State University.

Photos courtesy of NASA.