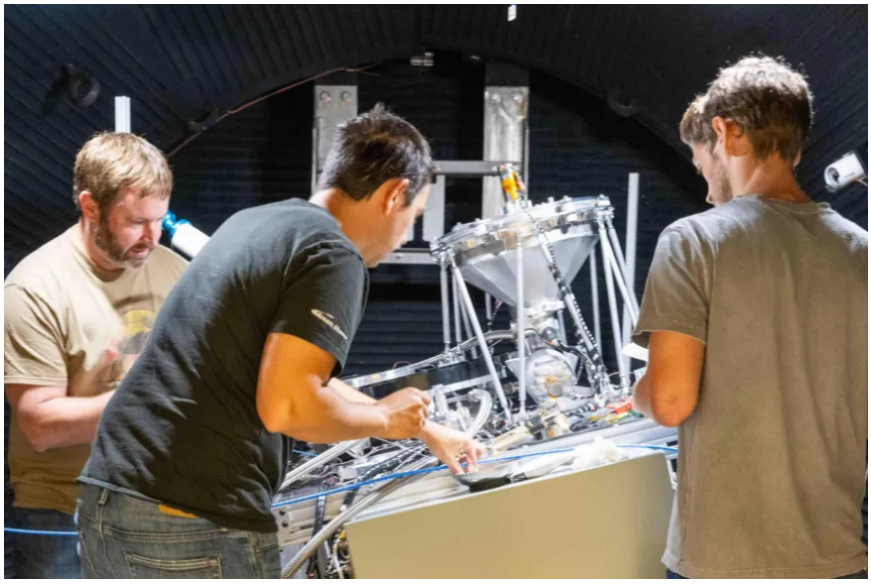
How to make oxygen on the moon



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Once the team vacated the sphere, the experiment began. The box-like machine was now ingesting small quantities of a dusty regolith – a mixture of dust and sharp grit with a chemical composition mimicking real lunar soil.

Soon, that regolith was gloop. A layer of it heated to temperatures above 1,650C. And, with the addition of some reactants, oxygen-containing molecules began to bubble out.

“We’ve tested everything we can on Earth now,” says Brant White, a program manager at Sierra Space, a private company. “The next step is going to the Sierra Space’s experiment unfolded at Nasa’s Johnson Space Center in the summer of 2024. It is far from the only such technology that researchers are working on, as they develop systems that could supply astronauts living on a future lunar base.

Those astronauts will need oxygen to breathe but also to make rocket fuel for spacecraft that might launch from the moon and head to destinations further afield – including Mar

Lunar base inhabitants might also require metal and they could even harvest this from the dusty grey debris that litters the lunar surfac

Much depends on whether we can build reactors able to extract such resources effectively or no

“It could save billions of dollars from mission costs,” says Mr White as he explains that the alternative – bringing lots of oxygen and spare metal to the moon from Earth – would be arduous and expensivet.e.s.Luckily, the lunar regolith is full of metal oxides. But while the science of extracting oxygen from metal oxides, for example, is well understood on Earth, doing this on the moon is much harder. Not least because of the conditions.

The huge spherical chamber that hosted Sierra Space’s tests in July and August this year induced a vacuum and also simulated lunar temperatures and pressures.

The company says it has had to improve how the machine works over time so that it can better cope with the extremely jagged, abrasive texture of the regolith itself. “It gets everywhere, wears out all sorts of mechanisms,” says Mr White.

And the one, crucial, thing that you can’t test on Earth or even in orbit around our planet, is lunar gravity – which is roughly one sixth that of the Earth. It might not be until 2028 or later that Sierra Space can test its system on the moon, using real regolith in low gravity

The moon’s gravity could be a real problem for some oxygen-extracting technologies unless engineers design for it, says Paul Burke at Johns Hopkins University