

Making a material difference

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Making a vessel by building it up from a base material is at least as old as the art of pottery. To create a vase, a potter starts by mixing clay with sand, other minerals – perhaps mica for a glittery shine – and water. Then the clay is kneaded to the desired consistency and coiled into thick ropes of moist clay that lie on top of each other to form the desired shape.

That ancient process has a lot in common with high-tech additive manufacturing, or 3D printing. It is a good way to take the guesswork out of precisely fabricating a hollow metal object, while tweaking and fine-tuning the properties of the material composing it.

Additive manufacturing starts with a design file from a computer. That file controls an electron beam or laser that fuses successive layers of metal alloy or other material to build an object. The laser traces the shape of the part by melting the raw material with a bright flash, and then the machine's platform shifts down almost imperceptibly and a wiper spreads another layer of powder. This process might repeat thousands of times over several hours or days.

Additive manufacturing is a potential way to solve the performance challenges a component faces with hard use in harsh environments where failure isn't an option, such as aerospace or drilling. Researchers at Los Alamos National Laboratory's Sigma Complex apply fundamental science and research to take this advanced manufacturing to an even higher level.

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