

# Key terms: 3D printing technologies in the food system for food production and packaging

Results available: No results available

Area of research interest: [Emerging challenges and opportunities](#)

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**3D printing:** 3D printing or additive manufacturing is the construction of a three-dimensional object from a CAD or digital 3D model file. It can be done with a variety of materials and printing processes in which material is deposited, joined or solidified under computer control, with material being fused together, typically layer by layer.

**Additive manufacturing/ Additive layer manufacturing:** Additive manufacturing (AM) or additive layer manufacturing (ALM) is the industrial production name for 3D printing, a computer controlled process that creates three dimensional objects by depositing materials, usually in layers.

**Binder jetting:** A binder liquid is dispensed via the printer nozzle in the x- and y-axes onto a food powder bed. After each layer is solidified, usually by applying heat to speed up drying, a new layer of powder is applied to the powder bed via a re-coater and the process is repeated after lowering the powder bed table in the z- direction.

**Directed energy deposition:** Directed Energy Deposition (DED) allows for the creation of objects by melting the material (most frequently used for metals such as titanium, aluminium, stainless steel or copper) in powder form, or as a wire/filament with a focused energy source that melts the metal as it is deposited by a nozzle on a surface.

**Extrusion based printing:** Extrusion of viscous and semi-viscous materials including food ingredients, often called food inks, through a nozzle via a pump mechanism. A number of extrusion mechanisms exist but the most common are, syringe-based, air pressure based, or screw-based.

**Food ink:** Viscous or semi-viscous paste of food ingredients used for 3D printing of food.

**Fused deposition modelling:** Fused deposition modelling (FDM), also called fused filament fabrication (FFF) is a 3D printing method, which uses a continuous filament that is extruded through a heated printer head/nozzle.

**Fused filament fabrication:** Builds a 3D object by heating up a material filament before extrusion that solidifies while binding onto the previous layer.

**Hot air sintering:** Hot air sintering, similar to SLS but sintering facilitated by a beam of hot air rather than a laser.

**Hot melt extrusion:** Nozzle of extrusion-based printer is heated to facilitate extrusion.

**Ink jet printing:** Is not strictly a 3D method for creating layered structures but rather for dispensing mostly low viscosity/liquid food ink droplets onto the surface of food items in a patterned fashion mainly for decorative purposes or surface filling. The nozzle of inkjet printers does not touch the food onto which is printed.

**Material extrusion:** Material, liquid or paste, extruded through a nozzle.

**Material jetting:** Material jetting creates objects in a similar method to a two-dimensional ink jet printer. Material is jetted onto the build surface or platform, where it solidifies in order to build up an object layer by layer.

**Powder bed fusion:** Powder bed fusion (PBF) methods use either a laser or electron beam to melt and fuse material powder together in order to create 3 dimensional objects. This includes the methods of selective laser sintering (SLS) and multi-jet fusion (MJF) technologies.

**Selective laser sintering:** Selective laser sintering (SLS) is an additive manufacturing (AM) technique that uses a laser as the power and heat source to sinter powdered material (most commonly polymers), aiming at points in space defined by a 3D digital model to create the object.

**Sheet lamination:** Sheet lamination is an additive manufacturing (AM) methodology where thin sheets of material (usually supplied via a system of feed rollers) are bonded together layer-by-layer to form a single piece that is cut into a 3D object.

**Surimi:** Surimi is a paste made from fish or other meat, often from waste streams. The term can also refer to a number of East Asian foods that use that paste as their primary ingredient.

**Vat photopolymerisation:** Vat polymerisation uses a vat of liquid photopolymer resin, out of which the model is constructed layer by layer using a focused ultraviolet (UV) light beam that cures or hardens the resin where required.