

Description

Image

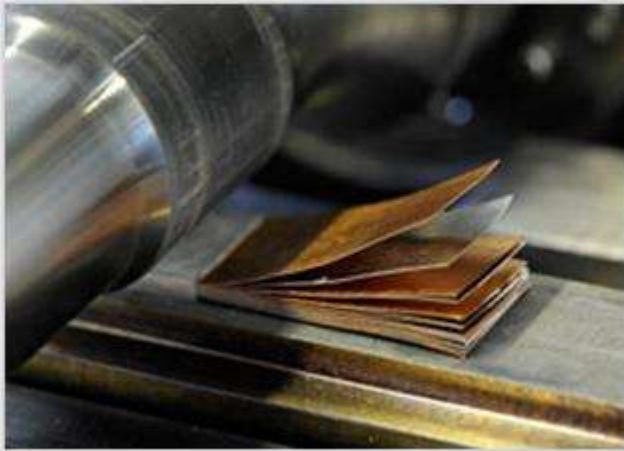


Image caption

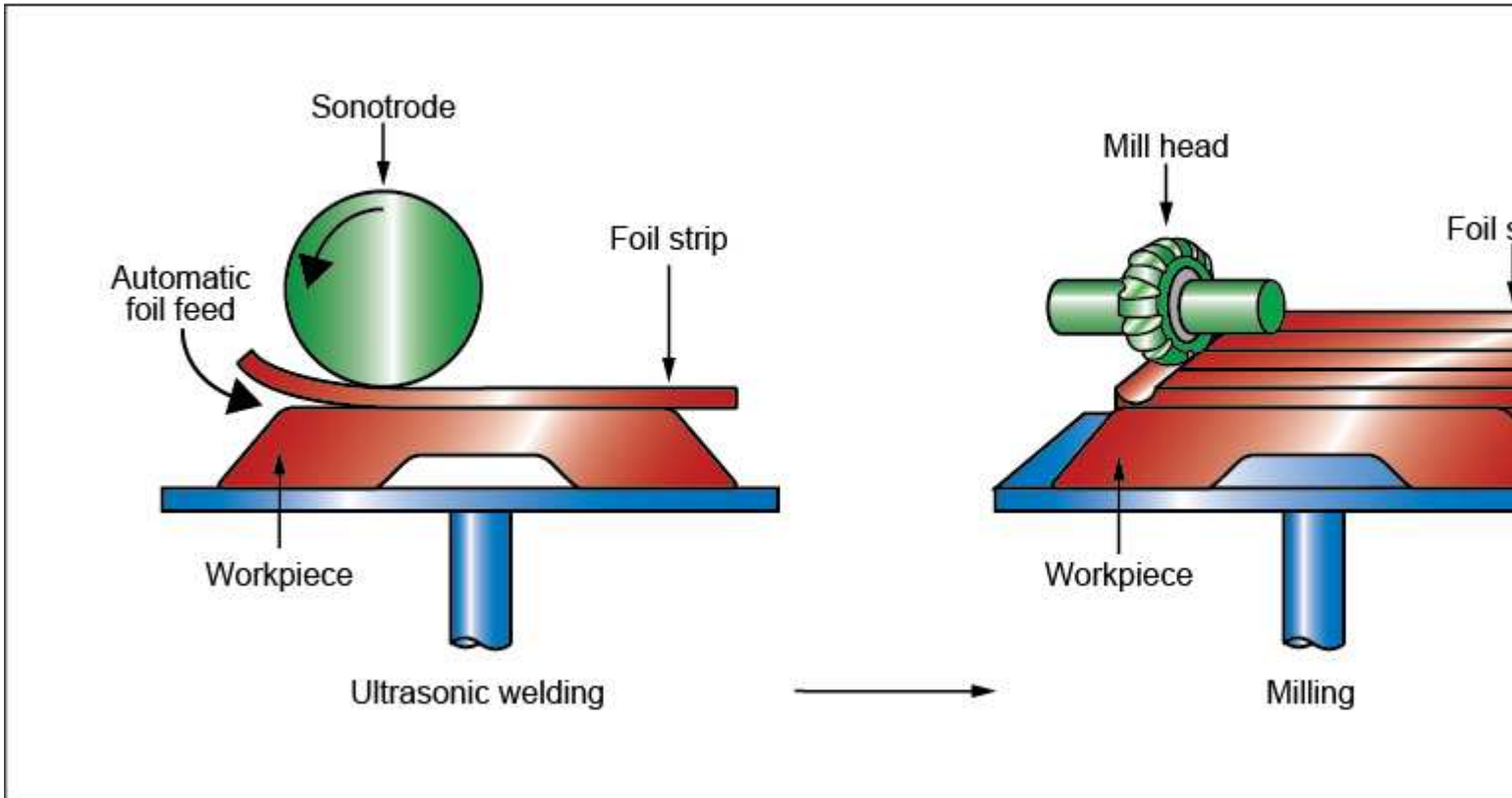
(1) Smart Material Structures by Ultrasonic Consolidation © Dr. Russell Harris at Loughborough University (2) Milling a soft composite F-14 Tomcat © U.S. Navy at Wikimedia Commons [Public domain]

The process

ULTRASONIC CONSOLIDATION (UC) is a hybrid additive-subtractive process in which an object is built up from layers of metal foil. many foils side-by side which is bonded using ultrasonic metal seam welding, then after around 40 layers, trimmed using CNC milling. rotating sonotrode travels along the length of each foil strip as it is laid down. This device oscillates at 20kHz transversely to the direction of travel, causing metallic bonds to form between sheets. As with other additive manufacturing processes, a CAD solid model of the part is required.

The process is also known as ultrasonic additive manufacturing.

Process schematic



Material compatibility

Metals - ferrous	✓
Metals - non-ferrous	✓

Shape

Circular prismatic	✓
Non-circular prismatic	✓
Flat sheet	✓
Dished sheet	✓
Solid 3-D	✓
Hollow 3-D	✓

Economic compatibility

Economic batch size (units)	1	-	100
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Physical and quality attributes

Mass range	0.03	-	50	kg
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Process characteristics

Primary shaping processes	✓
Discrete	✓
Prototyping	✓

Cost model and defaults

Capital cost	6e5	-	1.3e6	USD
Material utilization fraction	0.7	-	0.8	
Production rate (units)	0.04	-	40	/hr

Supporting information

Design guidelines

The process cannot be used to produce objects with overhangs, but complex internal structures integrated with electronics are

Technical notes

The build envelope (L x W x H) ranges from 508 x 305 x 152 mm to 1830 x 1830 x 915 mm.
Typical layer thickness is 200 µm.

Typical uses

Objects made from multiple materials, with complex internal structures, integrated with wiring, fiber optics, sensors and instruments structures, metal matrix composites.

The environment

No particular environmental hazards. Wastage is higher than some other additive manufacturing processes due to

Links

MaterialUniverse

Reference