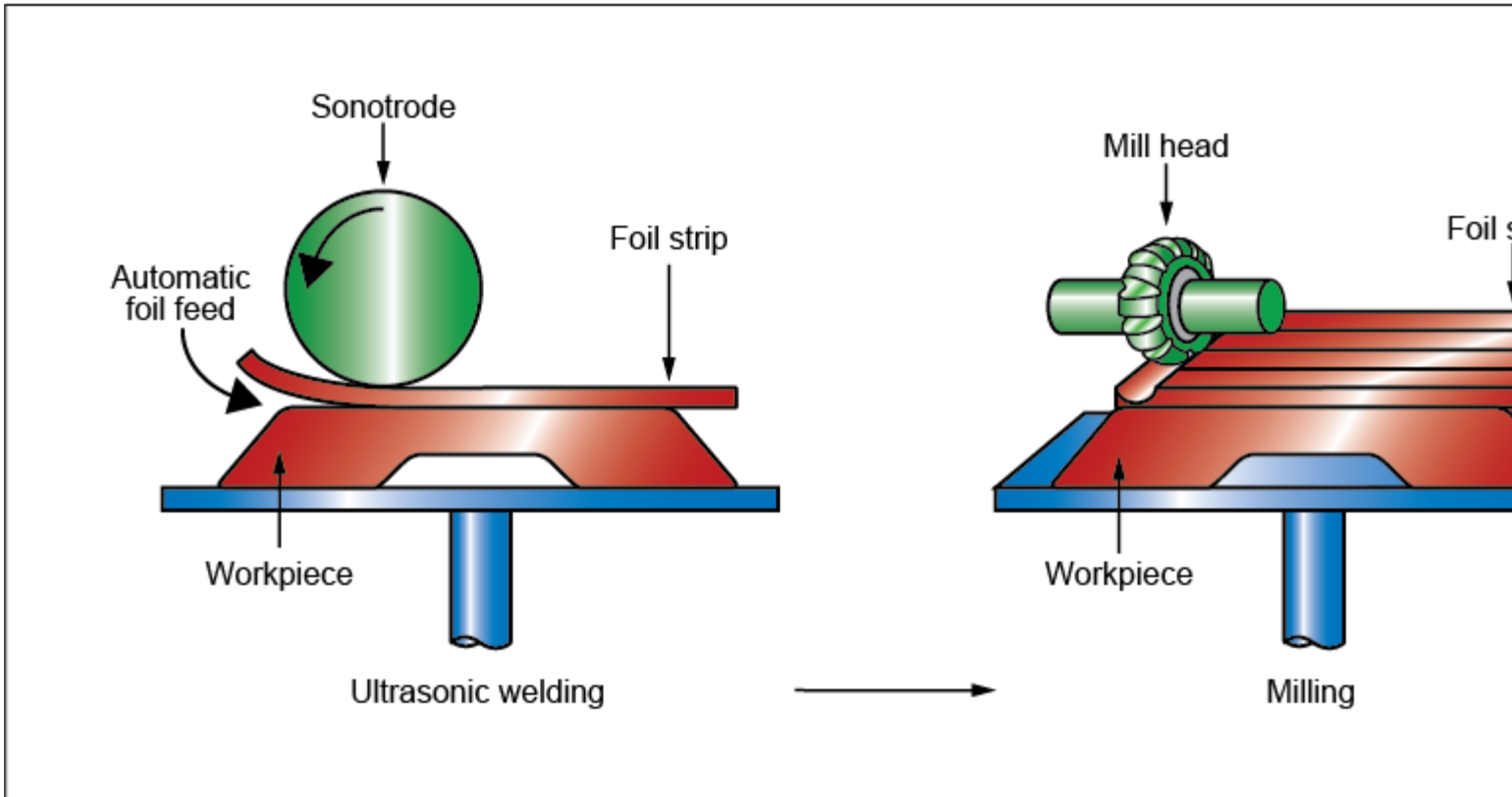


## Description

### Process schematic



### 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. A 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.

### 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

## 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.  
 Must use metal foil strips.

### 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