Description

Image

Image caption

(1) Nicopress Toggle Action Swaging Tool © Superior55 at Wikimedia Commons (CC BY 3.0) (2) Swaged Stop Sleeve © Superior55 at Wikimedia Commons (CC BY 3.0)

The process

In ROTARY SWAGING (or RADIAL FORGING) a rod, wire or tube is reduced in diameter by the reciprocating radial movement of one or two pairs of opposed dies. The dies are shaped to give the required external shape. A mandrel may be used with thin-walled tubes and to give internal shape. Normally the dies are rotated around the workpiece as they reciprocate radially. The 'stationary die swaging' process is a variant in which bot spindle and dies do not rotate, allowing non-round external cross-sections to be formed. Good mechanical properties, surface finish and tolerances are achieved. Typical final diameters range from 0.5 mm to 150 mm, but swages capable of handling up to 350 mm diameter tubing have been produced.

Process schematic

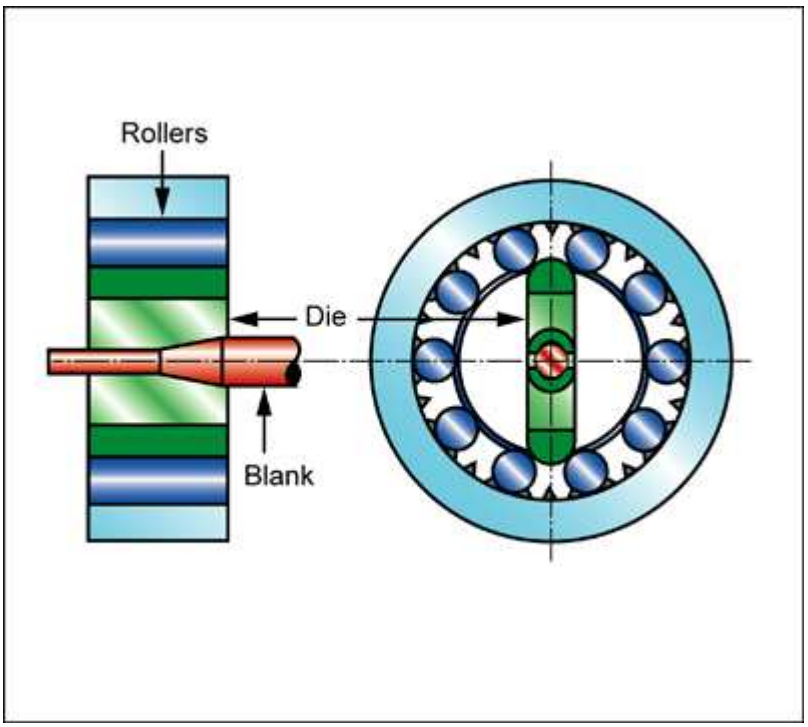


Figure caption

A rotary swage.

Tradenames

Radial

Material compatibility

Metals - ferrous	✓
Metals - non-ferrous	✓

Shape

Circular prismatic	✓

Economic compatibility

Relative tooling cost	medium			
Relative equipment cost	medium			
Labor intensity	medium			
Economic batch size (units)	500	-	5e4	

Physical and quality attributes

Mass range	0.02	-	200	kg
Range of section thickness	0.5	-	150	mm
Tolerance	0.13	-	0.5	mm
Roughness	0.6	-	3.2	µm
Surface roughness (A=v. smooth)	B			

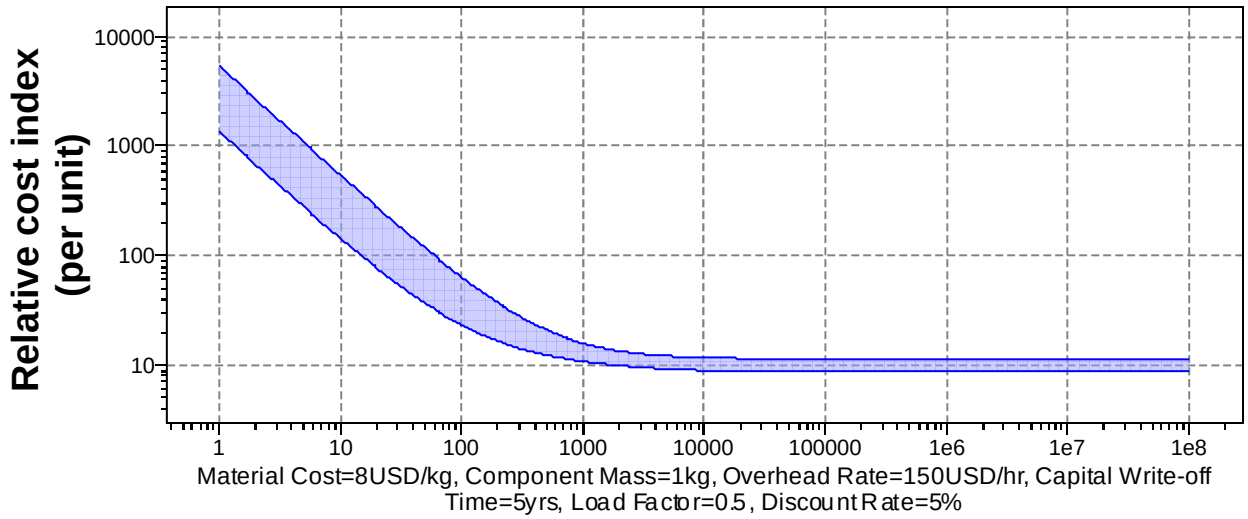
Process characteristics

Primary shaping processes	✓
Discrete	✓

Cost model and defaults

Relative cost index (per unit)	10.9	-	15.9	

Parameters: Material Cost = 8USD/kg, Component Mass = 1kg, Batch Size = 1e3, Overhead Rate = 150USD/hr, Discount Rate = 5%, Capital Write-off Time = 5yrs, Load Factor = 0.5



Capital cost	5.37e4	-	1.34e5	USD
Material utilization fraction	0.98	-	1	
Production rate (units)	50	-	400	/hr
Tooling cost	1.34e3	-	5.37e3	USD
Tool life (units)	1e4	-	5e4	

Supporting information

Design guidelines

Swaging is usually limited to simple cylindrical parts except for use of stationary die swaging which allows production of non-round prismatic cross-sections. Internally shaped tubes are possible using shaped mandrels.

Technical notes

Swaging is generally used with low-carbon steels and ductile nonferrous metals. For ferrous metals, swageability decreases as the carbon content or the percentage of alloying metals increases. It is the standard way of consolidating and reducing sintered tungsten billets to prepare them for wire-drawing for lamp filaments.

Typical uses

Furniture legs, golf clubs, fishing rods, pins, needles, punches, bicycle spokes, screwdriver blades, rifle barrels, automotive torque tubes, steering posts, exhaust pipes, tungsten for lamp filaments.

The environment

The process is very

Links

MaterialUniverse