

Incremental deformation by rotation process for forming of sheet

Processes of incremental rotation forming are based on the accumulation of small deformations applied to the material in every turn it gives, while it is fixed in the axis of rotation of the machine.

The most representative processes are:

- Metal Spinning
- Shear Spinning
- Flow Forming
- Rotary Forging

Notable features of these processes:

GEOMETRIC

- You can get parts virtually with final dimensions.
- The pieces obtained mostly have rotational symmetry, unless certain developments of machinery and specific tools are used.
- The starting material may be a flat sheet, a tube in cold or hot rolled finish, a pre-form machined or forged, and the result is normally a piece with a significant change in shape or dimensions from the starting one (see examples in the table).

PROPERTIES OF THE MATERIAL PROCESSED

- There is a change in the mechanical properties of the material by cold work hardening. The degree of increase depends on the material and the level of applied deformation.
- The metallographic structure also changes, organizing the crystals according to the applied strain.

EXPLOITATION

- These are flexible processes when compared to other deformation processes. In general, the tools are simple and the process is easy to tune up.
- The incremental process, in some cases, may be slower than a press stroke, but its flexibility makes it more interesting for shorter and medium series.
- The combination of variety of starting materials, obtained geometric forms, change in mechanical properties and flexibility of the processes themselves, make them very interesting for high value-added parts of the transportation, aerospace and defense sectors.

SOURCE :
ACERINOX EUROPA
I+D+I T + 34 956 629 541
www.acerinox.com
DENN (Industrias Puigjaner)
www.denn.es

EXAMPLES OF PRACTICAL APPLICATIONS:

Parts	Material	Preform Process	Initial Dimensions (mm)			Final Dimensions (mm)		
			D	t	L	D	t	L
Retention valve body	304L	Metal spinning Disk	443	6.35	-	215.9	3.40	316.6
Glass blender 25 l	304L	Disk Shear spinning	382	2.0	-	382.0 D _{base} 130	0.42	562.0
Motor rotor liner Electric	304L 316	Preform Stamped Flow forming	38.48	1.0	40.0	38.48	0.16	270.0
Ducting of desalination plants	316	Tube Flow forming	624.00	22.00	4000	624.00	11.00	8000
Hydraulic cylinder of loading ramp	15-5-PH	Mechanized Preform Flow forming	81.92	8.68	1210	81.92	4.34	2000

Stainless Steels

Stainless steels are widely used in spin-forming processes, and not surprisingly, the process parameters must be adapted to each family.

The incremental deformation process is initiated by applying low rotational deformation forces that are increasing as the material is hardened by cold deformation. If the deformation is very high, it is appropriate a heat treatment to recover properties that allow further deforming.

The mechanical properties desired for the finished component, also should be

considered when designing a comprehensive manner the forming process. Although in most cases, the properties obtained are suitable for the intended component function, sometimes necessary properties can only be achieved by an appropriate combination of the starting characteristics, the degree of shaping applied, and even heat treatment during process or at the end thereof.

European project RFCS STT

DENN takes 130 years dedicated to the design and construction of machinery for sheet metal and tube forming by incremental deformation processes. Currently they are involved in the European project "Tailored Steel Tubes" with Acerinox Europa and other partners (<http://sttproject.eu/>).

In this project they are developing new ways of processing tubular components in the automotive industry, to achieve weight reductions while the mechanical properties of the current components are improved. The processes provided by DENN help to reduce manufacturing costs of certain components of steel, and to reduce or eliminate operations such as welding or machining.

Incremental deformation processes allow a more efficient use of stainless steel, with less waste.