Spray forming
Forming process for special alloys

The spray forming process is suitable for the production of special alloys in the form of semifinished products from materials which cannot be cast or can be cast only with difficulty strongly segregating materials.

Due to rapid cooling and solidification of the droplets a fine-grained microstructure with little segregation and metastable condition can be achieved.

Pre-material immediately after the end of the process

Application examples

Low-temperature superconductors
Pre-material for forming tools with high hardness and uniform hardness distribution
Pre-material for Bourdon tubes
Bearing bushes, slippers

Spray-formed billet immediately after the end of the process

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Spray forming

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Spray forming is suitable for the production of special alloys in the form of semifinished products from

- materials which cannot be cast or can be cast only with difficulty
- strongly segregating materials

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Bearing bushes, slippers
Application examples

Spray forming

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Application examples

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WIELAND COPPER ALLOYS

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Principle of the process
Unlike conventional casting processes, in spray forming a metal melt is atomized into fine droplets with an inert gas. Prior to complete solidification, the droplets impinge on a rotating substrate to form a billet. As the cooling rate in the atomized jet is very high, there are almost no segregation processes. The structure is fine grained and has good working properties.

The sprayforming process consists of three steps:
1. Atomization of the metal melt into small droplets (Ø 60 µm) with an inert gas
2. Rapid solidification of the droplets
3. Compaction into a semi-finished product

Billets with the following dimensions can be produced:
- Length: maximum 2000 mm
- Diameter: 160 mm to 500 mm
- Weight: 600 kg up to 2500 kg

Properties of spray-formed copper alloys
Spray-formed copper alloys have the following characteristics:
- Limited segregation
- Homogeneous microstructure
- Fine grains

Due to the homogeneously distributed alloying elements and the fine grain, isotropic properties can be achieved in the spray-formed condition. This allows cold and hot working, for example, of tin bronzes with a tin content of up to 16%. The designer can choose from a range of new materials with a much wider property profile.

Properties of CuSn alloys
- Naturally hard materials with high hardness, strength and corrosion resistance
- Good hot and cold working properties
- Nonmagnetic

Applications
- Superconductors
- Connectors
- Spring elements
- Bearing bushes and slippers

CuMnNi
- Age-hardenable spring material with very high hardness, strength and corrosion resistance
- Good resistance to stress relaxation
- Nonmagnetic

Applications
- On- / Off-shore connectors
- Bourdon tubes

Aluminium
- High pressure resistance
- Low galling tendency in contact with stainless steel

Applications
- Deep-drawing tools
- Working tools
- Profiling tools
- Moulds

Properties of spray-formed materials
- Professional spray-formed materials
- Innovative materials
- TIN BRONZES
- Standard composition
- CuSn 13.5
- CuSn 13.5 Pb
- CuSn 15.5 Ti 0.25
- Properties
- Naturally hard materials with high hardness, strength and corrosion resistance
- Good hot and cold working properties
- Nonmagnetic
- Applications
- Superconductors
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- Bearing bushes and slipper

CuMnNi
- Standard composition
- CuMn20Ni20
- Properties
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**Properties of CuSn alloys**

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<tbody>
<tr>
<td>CuSn 13.5</td>
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**Properties of CuMnNi alloys**

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<tr>
<td>CuMn20Ni20</td>
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**Properties of CuAlFe alloys**

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<tbody>
<tr>
<td>CuAl13Fe4.5CoMn</td>
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<td>Deep-drawing tools, Working tools, Profiling tools, Moulds</td>
</tr>
<tr>
<td>CuAl15Fe4.5CoMn</td>
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**Principle of the process**

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**Properties of CuSn alloys**

- Naturally hard materials with high hardness, strength and corrosion resistance
- Good hot and cold working properties
- Nonmagnetic

**Applications**

- Superconductors
- Connectors
- Spring elements
- Bearing bushes and slippers

**CuMnNi**

- Age-hardenable spring material with very high hardness, strength and corrosion resistance
- Good resistance to stress relaxation
- Nonmagnetic

**Applications**

- On-/Off-shore connectors
- Bourdon tubes

**AluminiumBronzes**

- High pressure resistance
- Low galling tendency in contact with stainless steel

**Applications**

- Deep-drawing tools
- Working tools
- Profiling tools
- Moulds

**Nitrogen steels**

- Professional spray-formed – innovative

**References**

- TIN BRONZES
- Standard composition: CuSn13.5
- CuSn13.5 Pb
- CuSn15.5 Ti 0.25
- Properties: Naturally hard, high hardness, strength, corrosion resistance, nonmagnetic
- Applications: Connectors, spring elements, bearing bushes and slippers

- CuMn20Ni20
- Properties: Age-hardenable, spring material with very high hardness, strength and corrosion resistance
- Applications: Bourdon tubes

- CuAl13Fe4.5CoMn
- CuAl15Fe4.5CoMn
- Properties: High pressure resistance, low galling tendency, suitable for contact with stainless steel
- Applications: Deep-drawing tools, working tools, profiling tools, moulds
**Principle of the process**

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**Aluminium bronze**

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