

Metal forming

Extrusion

Extrusion

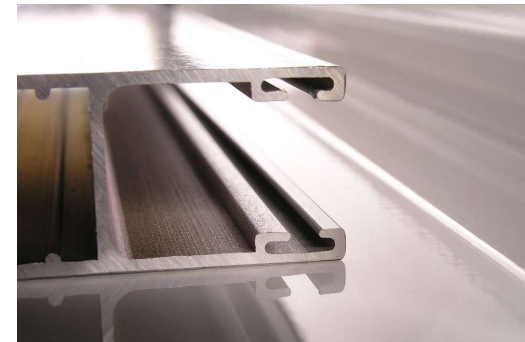
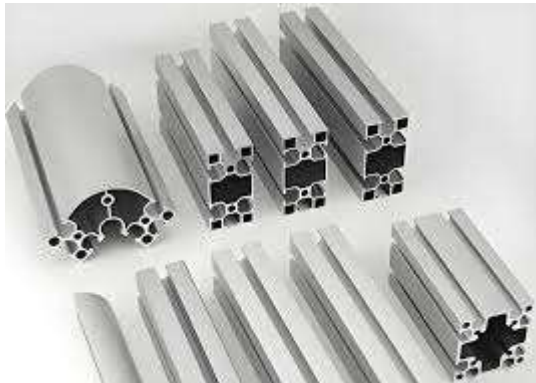
Extrusion is a process in which a billet is forced to flow through a die opening to produce a product with a constant cross-section. By applying compressive forces, usually with a hydraulic or mechanical press, the material is plastically deformed and takes the shape of the die.

Extrusion

- The advantages of extrusion include the ability to produce complex and precise profiles, good material utilization, and a smooth surface finish.

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Common applications include manufacturing pipes, rods, tubes, window frames, automotive components, and various structural profiles



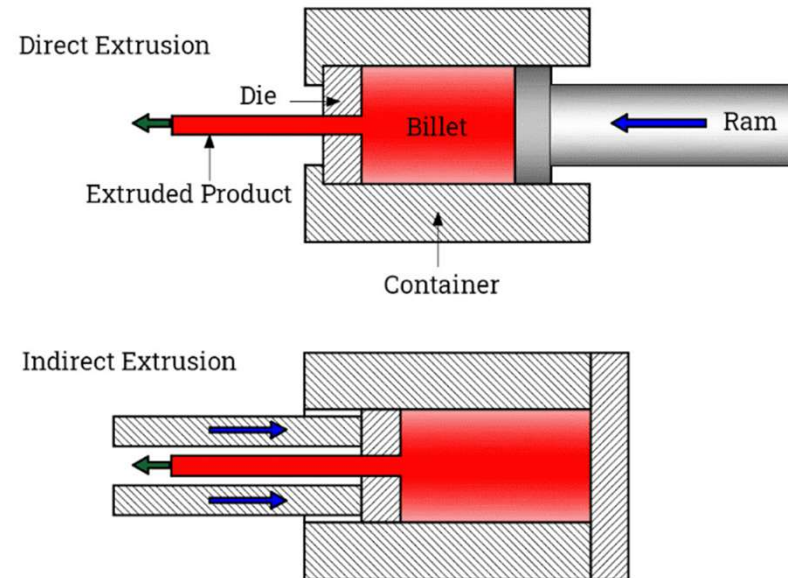
Extrusion

There are two main types of extrusion:
direct and indirect extrusion.

In direct extrusion, the billet moves toward a stationary die, while in indirect extrusion the die moves toward the billet.

Indirect extrusion requires lower forces because there is less friction between the billet and the container.

Direct and Indirect Extrusion



Extrusion

Direct extrusion

- **The profile is complex** and requires strong control of material flow.
- **The billet is relatively short**, so friction on the container walls is not a major issue.
- You need **a simple, cost-effective, high-productivity process** — the equipment is mechanically simpler.
- **The material is easy to deform**, such as aluminum alloys.
- **Lubrication can be applied** to reduce friction and heat

Indirect extrusion

- **Reducing extrusion force is important** — absence of billet–container friction can lower forces by 25–30%.
- You work with **materials that are difficult to deform**, such as steels, titanium alloys, or magnesium alloys.
- **Tool life must be extended** thanks to reduced friction and wear.
- **High surface quality** is required, especially for thin-walled products.
- You need **longer extrudates**, such as tubes or slender profiles, since the force stays lower throughout the stroke

Extrusion

Practical advantages

Direct extrusion

- Simpler tooling and press design.
- Can produce a wide variety of shapes.
- Greater operational flexibility

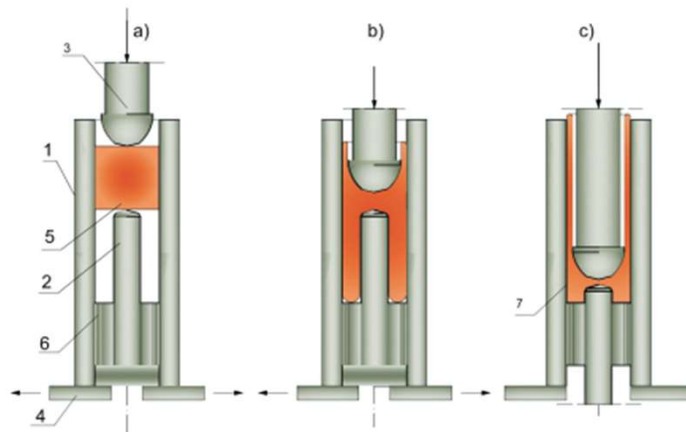
Indirect extrusion

- Better surface finish.
- Lower energy consumption.
- Reduced risk of material cracking.

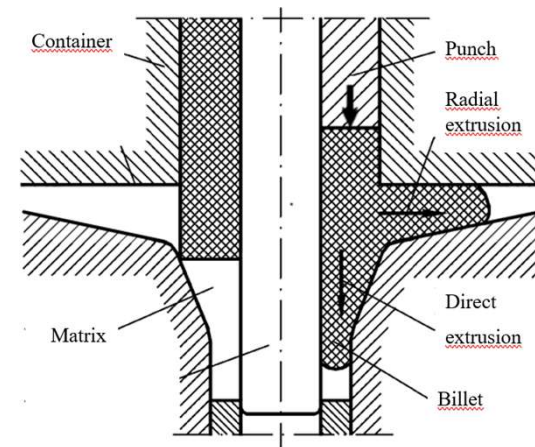
Extrusion

Combined

- Direct and indirect extrusion



Radial extrusion



Extrusion

Extrusion can be carried out either hot or cold.

Hot extrusion allows for forming materials with high resistance to deformation, such as steel or titanium alloys, while cold extrusion offers better surface finish and dimensional accuracy, typically used for aluminum, copper, and low-carbon steels.