

Description

Image

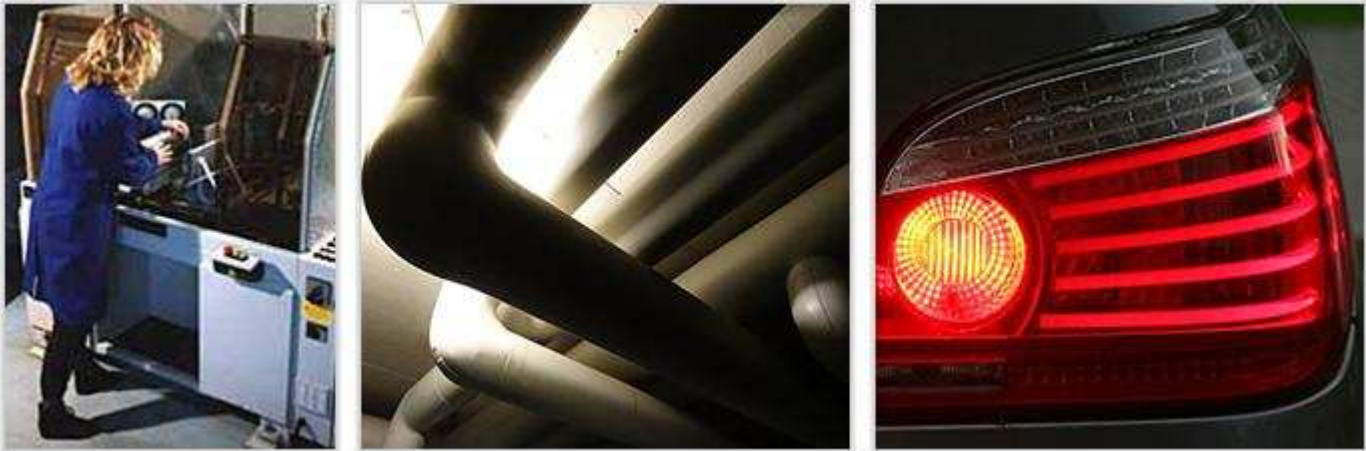


Image caption

(1) An example of a hot plate welding machine © TWI Ltd (2) Water distribution pipes © HebiFot at pixabay [Public domain] (3) A rear light cluster - typical hot plate welding application © Goiwara at Pixabay [Public domain]

The process

HOT PLATE WELDING makes butt joints between bulk thermoplastic components, in a kind of inversion of the way that hot bar welding makes lap joints. The components to be joined are held in fixtures that press them against an electrically heated, PTFE coated, platen, melting the surface and softening the material beneath it. The pressure is lifted, the tool withdrawn and the hot polymer surfaces are pressed together and held there until they have cooled. Hot plate welding can be used to form joints of large area - for example, the joining of large polyethylene gas and water pipes. The process is relatively slow, requiring weld times between 10 seconds for small components and 1 hour for very large.

Process schematic

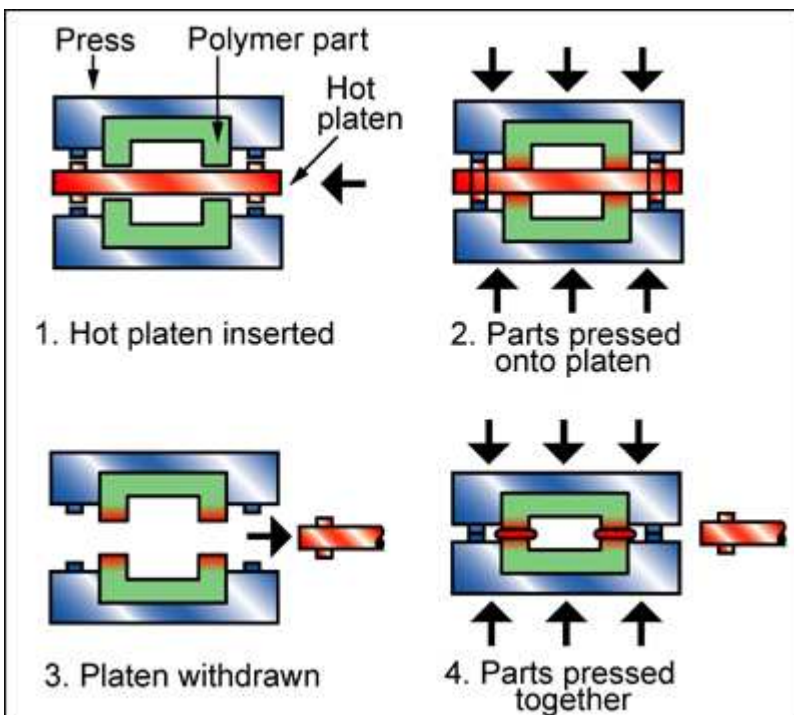


Figure caption

Hot plate welding of thermoplastics

Material compatibility

Polymers - thermoplastics

✓

Function compatibility

Electrically conductive

✗

Thermally conductive

✗

Watertight/airtight

✓

Demountable

✗

Joint geometry compatibility

Lap

✓

Butt

✓

Scarf

✓

Tee

✓

Load compatibility

Tension

✓

Compression

✓

Bending

✓

Peeling

✓

Economic compatibility

Relative tooling cost

low

Relative equipment cost

medium

Labor intensity

medium

Physical and quality attributes

Range of section thickness

2 - 50 mm

Unequal thicknesses

✓

Processing temperature

187 - 287 °C

Process characteristics

Discrete

✓

Supporting information

Design guidelines

Precise temperature control of the hot plate is important for good joints. The plate temperature is generally between 190 - 290°C depending on the polymer that is to be joined. Pressure is applied hydraulically or pneumatically. Most thermoplastic components can be welded by the hot-plate method, but its most effective for joining large components made from polyethylene, polypropylene or highly plasticized PVC. It creates a strong, impermeable (to gas or water) bond.

Typical uses

The process is used to make automotive hydraulic reservoirs and battery cases; to join unplasticized PVC door and window frames; to join thermoplastic pipes for gas and water distribution; and for sewers and outflows up to 150mm in diameter. It is also used for smaller things: tail-light assemblies, water-pumps, refrigerator doors.

The economics

Equipment and tooling are moderately cheap, but the process can be slow.

The environment

The process is clean and involves no unpleasant chemicals, and is generally eco-friendly.

Links

[MaterialUniverse](#)

[Reference](#)
