

Description

Image



Image caption

(1) Hot gas extrusion welding © TWI Ltd at flickr (2) Plastics welding nozzles (left to right) tacking nozzle, round nozzle, high speed nozzle © TWI Ltd

The process

HOT GAS WELDING is a way of joining thermoplastics that is similar, in many ways, to the gas welding of metals. The weld torch is just a souped-up hairdryer that directs a stream of hot gas, at scalp-searing temperatures (200-300 °C) at the joint area and at a rod of the same thermoplastic as the substrate. Polymers are very viscous when heated, so they do not flow in the way that metals do - that is why filler material is needed; the filler is pressed into the softened joint to form the bond. The process is slow and poorly adapted for mass production, but it is easily portable, making it the best way to assemble and repair large polymer components.

Process schematic

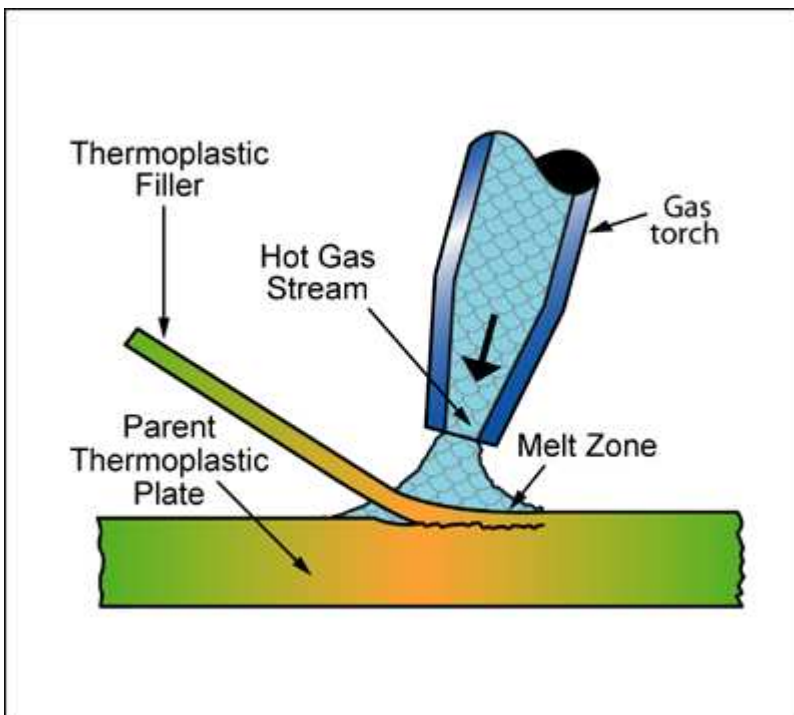


Figure caption

Hot gas welding of thermoplastics

Material compatibility

Polymers - thermoplastics



Function compatibility

Electrically conductive



Thermally conductive



Watertight/airtight



Demountable



Joint geometry compatibility

Lap



Butt



Sleeve



Scarf



Tee



Load compatibility

Tension



Compression



Shear



Bending



Torsion



Peeling



Economic compatibility

Relative tooling cost

low

Relative equipment cost

low

Labor intensity

high

Physical and quality attributes

Range of section thickness

98.4 - 236 mil

Processing temperature

386 - 566 °F

Process characteristics

Discrete



Supporting information

Design guidelines

Hot gas welding is limited to thermoplastics. It is a manual process, best suited to on-site assembly of large structures - pipes, liners and roof membranes for example. It cannot be used with very thin materials - 2.5mm is the minimum.

Technical notes

Hot gas welding is commonly used to join polyethylene, PVC, polypropylene, acrylic, some blends of ABS and other thermoplastics. The welding tool contains an electric heater unit to heat the gas, air, nitrogen or CO₂, and the nozzle to direct it onto the work piece. If air is used, it is provided by a compressor or blower; nitrogen or CO₂ require a more complicated supply of gas.

Typical uses

Installation and repair of thermoplastic pipe and duct work, the manufacture of large chemical-resistant linings, the assembly of storage bins and architecture uses for joining polymer roofing like that of London's Millennium Dome in London.

The economics

The equipment cost and set up time are both low, making this an economic process that can be performed on site; but it is slow, and not suitable for mass production.

The environment

No problems here - just a little hot air.

Links

MaterialUniverse

Reference
