

Joining Techniques for PP Pipes & Fittings

Among the techniques used for welding of polypropylene – butt welding, socket welding and extrusion welding are more commercially popular due to the easy portability of the welding machinery.

Butt Welding

This technique is used for welding pipes made from PE, PP, PVDF etc. The pipes are mounted in the clamps of the butt fusion equipment and checked for initial alignment. The pipe ends are then planed to ensure that they are flat & square. The welding sequence begins when a flat heated plate is positioned between the two pipe ends. The pipes are pushed towards each other until they come into contact with the hot plate and the pressure is increased to give good thermal contact. The pipe ends melt and the interface pressure forces the molten material outwards to form 'weld beads' at the outside and inside pipe surfaces; hence the term 'bead-up' stage. Then the pressure is reduced to a value sufficient only to maintain the pipe in contact with the hot plate. This allows the melt depth to increase without increasing the size of the weld beads. At the end of this 'heat soak' stage, the pipe ends are pulled away from the hot plate. The hot plate is removed, and the two molten pipe ends are pushed together at the same pressure as used during the initial bead-up stage. This causes further growth of the weld bead and is called the 'bead roll over' stage. The pressure is maintained until the weld is fully cooled and joint is ready.

Socket Welding

The socket fusion technique is also used mainly for PP and PVDF for fabricating process and piping systems. The method involves the use of a socket type fitting and the operation process is generally manual for small sizes. The welding cycle consists of a heating phase and a cooling phase. In socket fusion welding, a socket mounted on a hot plate is used to heat the outside surface of the pipe being welded. On the opposite side of the hot plate, a spigot is used to heat the inside surface of the injection moulded fitting. Both the fitting and pipe are heated for a set 'heating time'. When the heating time is complete, the heated pipe and fitting are removed from the socket and spigot, and the pipe is pushed inside the fitting, producing the weld. Depending on the pipe size, this process is carried out by hand (for sizes up to 50mm OD) or on a mechanical/hydraulic machine, similar to a butt fusion welding machine, (for sizes typically between 63mm and 160mm OD).

Extrusion Welding

The process involves continuously extruding molten thermoplastic material into a weld preparation on the plastic component or structure which is being joined. The extrusion barrel on the extrusion gun is heated along its length, either by cartridge heaters or hot air. A thermoplastic rod or granule feedstock is fed into the rear of the extrusion barrel and the material is heated as it is drawn through the barrel by the rotating extruder screw. The ejected material is shaped to match the profile being welded, and defines the shape and size of the final weld. At the leading edge, hot air is used to ensure there is sufficient heat in the substrate material to form the weld. Typical welding speeds are 0.5-1.0m/min. Extrusion welding is generally used to weld custom fabrications with sheet, nozzles etc.

Other methods of welding include infrared, bead and crevice free, friction welding depending on the requirements of the application and ultimate use of the manufactured products.

