

Plastic piping system fabrications by David A. Chasis

Thermoplastic piping products of chlorinated polyvinyl chloride (CPVC), polyethylene (PE), polypropylene (PP), polyvinyl chloride (PVC), polyvinylidene fluoride (PVDF) and other thermoplastics are mostly manufactured from extrusion and injection molding processes. The physical properties of thermoplastics allow these manufacturing processes to produce cost-effective large quantities of product having exceptional quality. For piping products of small volume and/or unique design requirements, injection molding or extrusion is usually impossible to cost justify. However, plastic fabrication is an excellent method to produce these special items. There are several proven methods of fabricating plastic fluid handling products: hot air/gas welding, bending/belling, solvent cementing, heat fusion, machining and fiberglass reinforcing. The selection of the proper fabrication technique(s) is based on the piping material, design configuration and the application's conditions of service.

Hot air/gas welding

Thermoplastics can be hand welded using a heat source (welding/extrusion gun), welding rod and compressed air or nitrogen. Plastic welding, unlike metal welding, produces a material surface bond which normally limits the finished product to 10-psi or less working pressure. Commonly fabricated welded products are: tanks, tank liners, fittings, pipe manifolds, laboratory work stations, fans, blowers, and double contained piping.



Large diameter PVC tee with 90-degree elbow.

Bending/belling

By definition, thermoplastics are materials that can be heated, reformed and cooled with no change in mechanical properties. This feature lends itself to fabricate products that are produced by correctly heating pipe and sheets (usually 4' X 8') so they become flexible enough to form and maintain a desired shape. Fabricated products using this technique are: duct, hoods, scrubbers, belled or "swedged" pipe ends, pipe bends, tanks and tank liners.

Solvent cementing

Solvent cementing of PVC and CPVC is a very common method of making joints (other piping products such as ABS and styrene are also cementable). This technique provides the benefits of excellent joint integrity, is safe and easy to use and, in most cases, the joint is stronger than either of the joining products. Fabricated products using solvent cementing are: pipe fittings, pipe manifolds, fans, blowers, flanged products and many other vinyl fluid-handling products.

Heat fusion

Almost all thermoplastics, when heated to a particular temperature, can be fusion joined. Using butt or socket fusion techniques (not used for vinyl materials), a permanent plastic joint can be made. PVC and CPVC butt fused joints are not pressure rated and are only used for drainage applications. PE, PP and PVDF butt and socket fusions produce a joint that is equivalent or greater than the working pressure of the products being joined. The benefits of using this method of fabrication and the products fabricated from this technique are quite similar to solvent cemented products. However, unlike solvent cementing, all thermoplastic materials can be heat fused.

Machining

Using specially designed machining equipment for plastics, piping products can be produced using similar metal fabrication techniques. Machined piping products can be fabricated from the alteration of existing products, sheet and solid-profiles. Commonly fabricated products using this technique are: nuts and bolts, product prototypes, valves and other flow control products, perforated pipe/sheet, gauge guards, sight glasses, threaded connections, metal-to-plastic adapters and flange plates.

Fiberglass reinforcing (FR)

Some of the techniques used in the fabrication process of producing piping products do not allow for the finished product to withstand high working pressures. To increase the working pressure of plastic fabrications, FR wrapping is applied to the outer surface of the product. The thickness of the wrap and type of resin used depends on the thermoplastic materials, system working pressure and chemical make-up of the fluids to be handled. Fiberglass reinforcing is commonly used to increase the pressure ratings for fabricated fittings, manifolds and tanks.



Fiberglass reinforced PVC flanged spool piece.

In many cases, using one or more of the mentioned fabrication methods to produce a product is common. For example, to produce a large fabricated fitting for a pressure application with an instrumentation tap could incorporate all of the listed fabrication techniques.

There is an adage in the industry that says, "If you can draw it, a professional plastics fabricator can make it." There are several experienced plastic fluid handling fabricators in North America. To find a component fabricator in your area, contact a local knowledgeable distributor or a piping product manufacturer. ■

David A. Chasis is president of Chasis Consulting, Inc., author of the book "Plastic Piping Systems," and a member of and consultant to the Plastic Pipe and Fittings Association. He can be reached at Chasis Consulting, Inc., 329 The Hills Drive, Austin, TX 78738 USA; (512) 261-9115, fax (512) 261-3518, e-mail: dchasis@austin.rr.com, www.davidchasis.com.