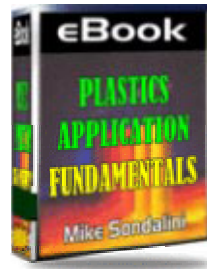


# Process, Plant and Equipment UP-TIME

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## Plastics Application Fundamentals

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1	8	3	Polyethylene - its properties and uses.
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# HEAT WELDING OF PLASTICS

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## **ABSTRACT**

Heat welding of plastics. Welding can join thermoplastic parts together. It can be by melting the surfaces and pressing them together or by extrusion welding with a filler rod. Several methods of welding are available. Proper manual techniques are critical to success as is the pressure testing of pressure parts. Keywords: electro-fusion, butt welding, electro-socket welding, hot air gun, melt temperature.

## **WHY USE PLASTICS**

Plastics have some wonderful engineering properties that can be used to great benefit.

- they handle a vast range of chemicals;
- they don't rust;
- some of them are very slippery and little sticks to them;
- they are extremely cheap compared to the exotic alloys required to match some of the properties;
- they don't transmit electricity or heat easily
- some are tough and will deform instead of breaking under impact
- they are so easy to fabricate that people can be trained in a week to join plastics well.

Their major drawbacks when compared to metals are:

- most soften at comparatively low temperatures;
- they cannot take high tension continuously;
- some can expand greatly when heated;
- they breakdown in sunlight unless protected.

## **THE TWO FAMILIES OF PLASTIC**

Plastics are broadly grouped into two distinct families – thermoset and thermoplastic. Thermosets can only be molded once. After their first melt they set permanently. A thermoplastic can be melted a number of times and the shape changed. Welded plastics are thermoplastics.

The difference between the two families of plastic results from how the macromolecules (See article 183 on Polyethylene) bond together at the atomic level. Thermoset molecules are triggered by heat to chemically react and join. Thermoplastic molecules are attracted to each other but do not chemically bond. Figure 1 shows the difference in the type and numbers of bonds between thermoset and thermoplastic materials.

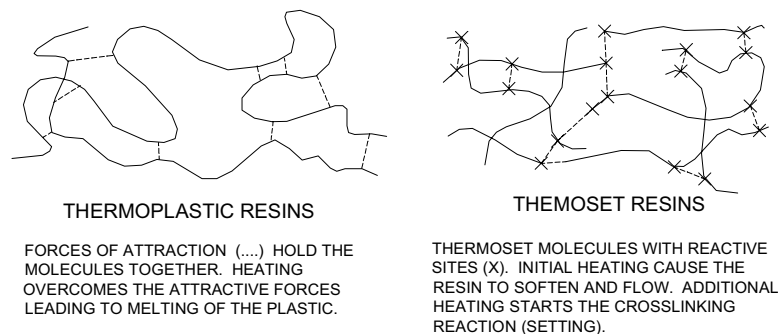


FIGURE 1 Bonding in plastics

## **HEAT JOINED PLASTICS**

The common plastics, which are joined together using heat, are PE (polyethylene), PP (polypropylene) and PVC (Polyvinylchloride). At the exotic end PVDF (polyvinylidene fluoride) and PTFE (polytetrafluoroethylene) can also be welded.

## **JOINING PLASTIC TOGETHER**

Heating the contact surfaces above their melting point and then pushing them together firmly till they set joins thermoplastics. When the molten faces come together the macromolecules intertwine and bond together on cooling.

The three critical factors for a good join are - achieving the right melt temperature; sufficient pressure when pushing the faces together; the length of time the join is allowed to cool before releasing the pressure.

## **METHODS TO JOIN PLASTICS USING HEAT**

Several methods are available to heat join plastics.