Embedded Heaters for Joining or Separating Plastic Parts

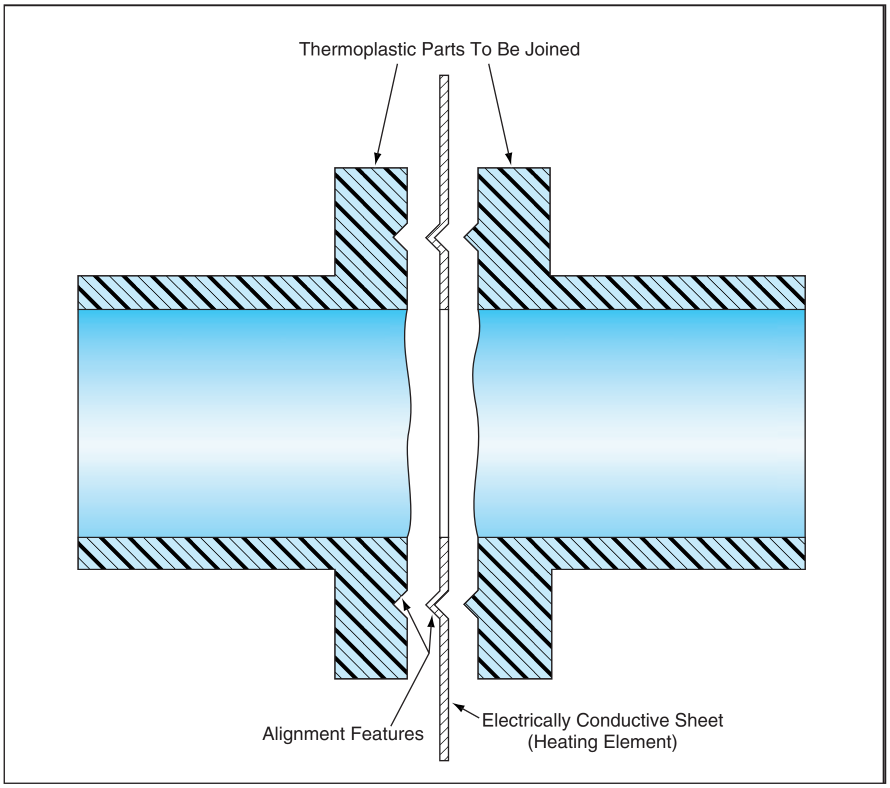
Bonding heat would be generated and applied locally.

Marshall Space Flight Center, Alabama

A proposed thermal-bonding technique would make it possible to join or separate thermoplastic parts quickly and efficiently. The technique would eliminate the need for conventional welding or for such conventional fastening components as bolted flanges or interlocking hooks. The technique could be particularly useful in the sign industry (in which large quantities of thermoplastics are used) or could be used to join plastic pipes.

A thin sheet of a suitable electrically conductive material would be formed to fit between two thermoplastic parts to be joined (see figure). The electrically conductive sheet and the two parts would be put together tightly, then an electrical current would be sent through the conductor to heat the thermoplastic locally. The magnitude of the current and the heating time would be chosen to generate just enough heat to cause the thermoplastic to adhere to both sides of the electrically conductive sheet. Optionally, the electrically conductive sheet could contain many small holes to provide purchase or to increase electrical resistance to facilitate the generation of heat.

After thermal bonding, the electrically conductive sheet remains as an integral part of the structure. If necessary, the electrically conductive sheet can be reheated later to separate the joined thermoplastic parts.



An **Electrically Conductive Sheet** would serve as a heating element to join two thermoplastic parts.

This work was done by Melvin A. Bryant III of **Marshall Space Flight Center.**

This invention has been patented by NASA (U.S. Patent No. 6,394,501). Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to Benita Hayes, MSFC Commercialization Assistance Lead, at benita.c.hayes@nasa.gov. Refer to MFS-31403.

Curing Composite Materials Using Lower-Energy Electron Beams

Less shielding is needed at lower beam energies.

Marshall Space Flight Center, Alabama

In an improved method of fabricating composite-material structures by laying up prepreg tapes (tapes of fiber reinforcement impregnated by uncured matrix materials) and then curing them, one cures the layups by use of beams of electrons having kinetic energies in the range of 200 to 300 keV. In contrast, in a prior method, one used electron beams characterized by kinetic energies up to 20 MeV. The improved method was first suggested by an Italian group in 1993, but had not been demonstrated until recently.

With respect to both the prior method and the present improved method, the impetus for the use of electron-beam curing is a desire to avoid the high costs of autoclaves large enough to effect thermal curing of large composite-material structures. Unfortunately, in the prior method, the advantages of electron-beam curing are offset by the need for special walls and ceilings on curing chambers to shield personnel