

Heat Bonder

A heat bonder is a portable device that automatically controls heating based on temperature feedback from the repair area. Heat bonders also have a vacuum pump that supplies and monitors the vacuum in the vacuum bag. The heat bonder controls the cure cycle with thermocouples that are placed near the repair. Some repairs require up to 10 thermocouples. Modern heat bonders can run many different types of cure programs and cure cycle data can be printed out or uploaded to a computer. [Figure 7-40]

Heat Blanket

A heat blanket is a flexible heater. It is made of two layers of silicon rubber with a metal resistance heater between the two layers of silicon. Heat blankets are a common method of applying heat for repairs on the aircraft. Heat blankets may be controlled manually; however, they are usually used in conjunction with a heat bonder. Heat is transferred from the blanket via conduction. Consequently, the heat blanket must conform to and be in 100 percent contact with the part, which is usually accomplished using vacuum bag pressure. [Figure 7-41]

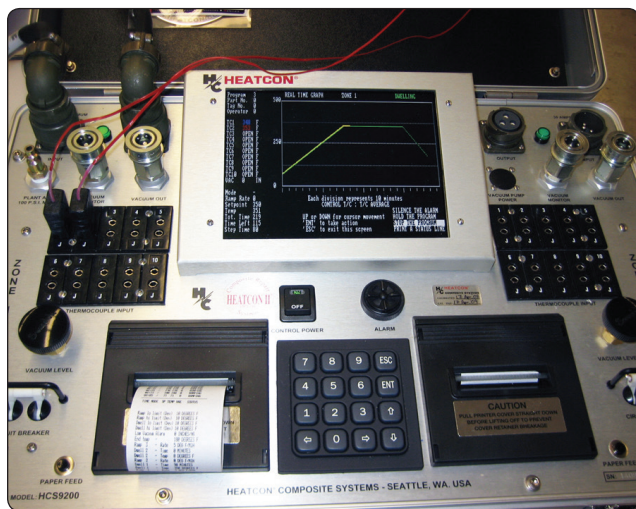


Figure 7-40. Heat bonder equipment.

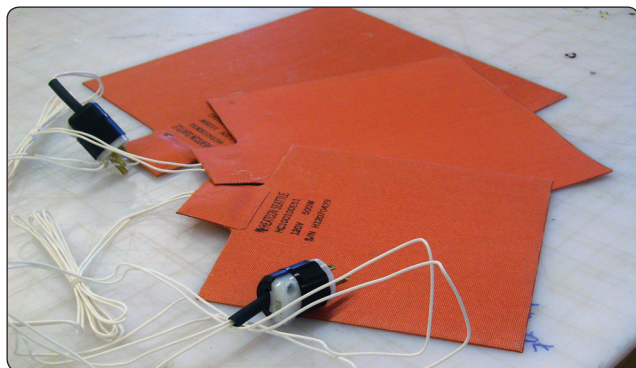


Figure 7-41. Heat blankets.

Heat Lamp

Infrared heat lamps can also be used for elevated temperature curing of composites if a vacuum bag is not utilized. However, they are generally not effective for producing curing temperatures above 150 °F, or for areas larger than two square feet. It is also difficult to control the heat applied with a lamp, and lamps tend to generate high-surface temperatures quickly. If controlled by thermostats, heat lamps can be useful in applying curing heat to large or irregular surfaces. Heat bonders can be used to control heat lamps.

Hot Air System

Hot air systems can be used to cure composite repairs, and are mainly restricted to small repairs and for drying the repair area. A heat generator supplies hot air that is directed into an insulated enclosure set up around the repair area after vacuum bagging has been deployed. The hot air surrounds the repair for even temperature rise.

Heat Press Forming

During the press forming process, flat stacked thermoplastic prepreg is heated to above melt temperature (340–430 °C, or 645–805 °F) in an oven, rapidly (1–10 seconds) shuttled to a forming die, pressed to shape, and consolidated and cooled under pressure (700–7,000 kPa, or 100–1,000 psi). [Figure 7-42] In production, press forming dies usually are matched male-female sets constructed of steel or aluminum. However, rubber, wood, phenolics, and so on can be used during prototyping. The die set can be maintained at room temperature throughout the forming-consolidation cycle. But, the use of a hot die (120–200 °C, or 250–390 °F) allows control of the cooling-down rate (avoiding part warpage and controlling morphology in semicrystalline thermoplastic prepreg, such as PEEK and polyphenylene sulfide) and extends the forming window promoting better ply slip.



Figure 7-42. Heat press.