Thermoplastic Polyester-Polyurethane Elastomer

Radio Frequency Sealing

TPAU (chemical type: aromatic polyurethane)

In this RF welding study, polyurethane bonded well to itself and all flexible and rigid PVCs. An interesting result was obtained when the method of bond rupture was considered. When polyurethane was welded to itself or rigid PVC, samples which were purposely cut through during welding produced better results. However, in polyurethane/ flexible PVC combinations, samples welded without cutting through gave superior results.

Heat aging tended to decrease weld strength of polyurethane/ polyurethane and polyurethane/ flexible PVC combinations, whereas weld strength increased in the polyurethane/ rigid PVC combination. It is felt that plasticizer migration from the flexible materials to the weld site may be compromising peel strength in the polyurethane/ flexible PVC combination. This phenomenon is accelerated by elevated temperature aging. Rigid PVC, however, lacks plasticizer and elevated temperature aging may increase the chance of chain entanglement after welding.

Table 87.1: Radio frequency weld strengths of aromatic polyester polyurethane between itself and other materials. (The breaking strength per unit cross sectional area of each weld was calculated, then divided by the tensile strength of the weaker material. This number (multiplied by 100) gave the weld strength expressed as a percentage of the highest possible value or "potential.")

Material	Joining Material	RF welded without cutting through samples	Samples purposely cut through during RF welding	
			no aging	aged 48 hours at 60°C
aromatic polyester polyurethane	TPE alloy	no bond	no bond	
aromatic polyester polyurethane	styrenic TPE	no bond	no bond	
aromatic polyester polyurethane	aromatic polyester polyurethane	fair (6-15% potential)	excellent (31-50% potential)	fair (6-15% potential)
aromatic polyester polyurethane	filled radiopaque PVC 75A	excellent (31-50% potential)	good (16-30% potential)	fair (6-15% potential)
aromatic polyester polyurethane	clear rigid PVC 80D	fair (6-15% potential)	excellent (31-50% potential)	superior (>50% potential)
aromatic polyester polyurethane	clear flexible PVC 80A	superior (>50% potential)	good (16-30% potential)	fair (6-15% potential)
aromatic polyester polyurethane	clear flexible PVC 65A	excellent (31-50% potential)	good (16-30% potential)	fair (6-15% potential)

Reference: Leighton, J., Brantley, T., Szabo, E., *RF Welding of PVC and Other Thermoplastic Compounds,* ANTEC 1992, conference proceedings - Society of Plastics Engineers, 1992.