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Thermabond® Application Notes -D002

Effect of Pressure on Bond Line Thickness and Bond Strength
Arlon STD Product Numbers 99990A008 and 99990A015

A wide variety of thermal interface adhesives are available for the electronics industry. In the application and cure cycle of these adhesives, pressure plays an important role in determining the final properties of the assembly. Variations in pressure can influence both bond strength and final thickness of the bond. It is logical that increasing pressure will result in a greater bond strength and thinner bond line. However, while a greater bond strength is generally a positive result, variations in the bond line thickness are undesirable as they may negatively impact design criteria. The purpose of this application note is to present the results of a study conducted at Arlon to determine the effect of curing pressure on primerless Thermabond®. In summary, the data suggest that an increase in bonding pressure from 15 to 85 psi results in an average of 0.002" thinner bond line. Bond strength, on the other hand, is unaffected by the pressure increase. This shows that Thermabond gives robust bond strengths in the 15 - 85 psi cure pressure range.

The experiment conducted involved two sets of 30 alumimun-to-aluminum coupons bonded with 0.5 in^2 of Thermabond® NP. 15 samples of one set were cured at ~15 psi and 15 samples of the other set were cured ~85 psi. They were cured in a vacuum bag for 60 minutes at 250°F. The thickness of each aluminum coupon was measured prior to application of the adhesive. In addition, the thickness of each lap shear assembly was measured before and after cure in the center of the bonded area. From these measurements the final bond line thickness could be calculated. The resutls of the experiment are summarized in the Table 1 below. Please note that final thicknesses are average values. The actual data (see Figure 1) fall within a wide range of thicknesses. This variation may depend on the specific topography of the aluminum coupon as well as other factors.

Table 1. Bond Line Thickness

Curing Pressure (psi)	Final Thickness (mil)
15	7.3
85	5.9

Effect of Pressure on Bond Line Thickness and Bond Strength

The study also determined the effect of pressure on bond strength. The maximum shear strength of both sets of assemblies was measured on an Instron with a 1000 lb load cell and a crosshead speed of 0.085 in/min. The resulting shear strengths are presented in Table 2 below. No statistical difference was detected between the two sets. This indicates that pressure in the range of 15 – 85 psi does not affect bond strength.

Table 2. Bond Strength

Bonding Pressure (psi)	Bond Strength (psi)
15	1068
85	1049

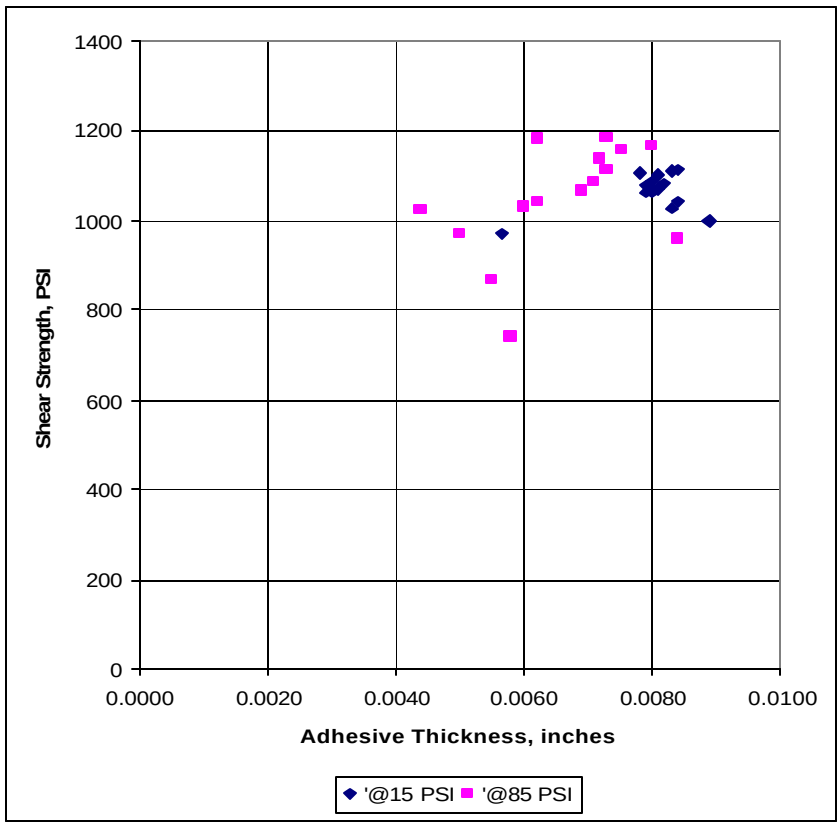

Figure 1. Effect of Bond Line Thickness

In conclusion, cure pressure is a contributing factor in determining final bond line thickness, however, it does not affect the bond strength of the material. In the range of pressures used in most Thermabond® applications, typically 15 – 85 psi, a robust bond strength will be achieved.