



Low Damage Cutting of Aluminum/Carbon Composite using a Diamond Wire Saw



Cutting and
Sectioning

1.0: Purpose

This report will evaluate the effectiveness of cutting an aluminum / carbon honeycomb composite antennae using a Model 850 Wire Saw. Several cuts will be made on the sample to test the effectiveness of cutting using a diamond wire. Cutting should keep the original microstructure of the specimen intact, prevent delamination of the layers, reduce contamination from wet cutting methods, and provide expeditious cutting times. Qualitative investigation of the as cut surface and cutting times will be done to determine the effectiveness of these methods.

2.0: Experiments and Procedures

For this experiment a 4" x 4" x 0.5" (100 mm x 100 mm x 14 mm) square sample of an aluminum honeycomb, carbon composite antennae was obtained for cutting experiments. The sample was mounted onto a graphite mounting plate affixed to an aluminum mounting block using a low melting point wax (MWH 135). The entire assembly was then placed into the Model 85015 Work Table and setup for cutting. Cutting was done using a 0.010" diamond impregnated stainless steel wire blade and was cut dry at a speed of 200 rpm (3 dial setting). Below is an image showing the mounted sample as attached to the Model 850.



Figure 1: Image showing the composite sample as mounted onto the Model 850 Wire Saw. The sample is placed between the two larger pulleys and the sample is aligned to the wire blade. Sections are cut consecutively and the sample is advanced using the micrometer controlled stage.

3.0: Results

After the instrument had been setup, cutting was done using the 3 dial setting on the saw. Each cut took approximately ten minutes and three consecutive cuts were made. The sample exhibited a good cut edge and showed no damage to the fragile aluminum honeycomb matrix. Below is an image showing the as cut sample.



Figure 2: Illustration of the as-cut specimen after sectioning using the Model 850. The cut edges are very clean and exhibit no damage to the microstructure contained in the composite material. Cutting times were on the order of 10-15 minutes.

4.0: Conclusions

Based on these preliminary cutting experiments it has been shown that successful sectioning of an aluminum / carbon composite material can easily be sectioned using diamond wire techniques. Low damage, relatively fast cutting times, and ease of use make cutting these structures with a Model 850 Wire Saw an attractive technique.

