Chemical Degradation

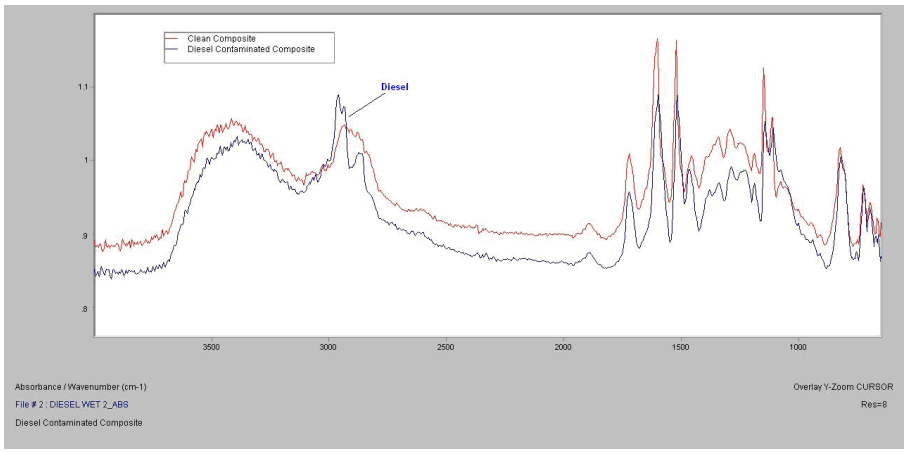

Figure 1 – Infrared spectra clean (red) and fuel contaminated (blue) composites collected with the Exoscan.

Medium modulus composite materials are used in a variety of applications associated with aircraft manufacture. These materials are lighter and stronger than the metals that they replace, however since they typically consist of carbon fiber imbedded in a resin component, i.e., they are organic-based compounds; in-service composites are subject to different stressors than metal when used in aircraft. For example, carbon fiber – resin composites are sensitive to high heat conditions that can degrade the physical strength of the material. Composites are also susceptible to a number of other oxidative/degradative processes such as ultraviolet radiation and affects of exposure to chemicals that are used in routine aircraft maintenance and manufacturing applications.

In the latter case, routine maintenance may include removal of paint via paint strippers in order to repair a damaged area of composite that could come in contact with the composite. Also, during winter operation, composite aircraft will be sprayed with high pressure de-icing chemicals. Furthermore, painting processes used in the manufacture of composite aircraft and re-painting operations in their maintenance may expose the underlying composites to paint thinners as well as other chemicals associated with painting. All of these chemicals could have a deleterious affect of the resin component of the composite.

The Exoscan has been used extensively to measure degradation of composites due to heat and ultraviolet light. Damage due to chemicals can be measured in a similar manner. The Exoscan can be used to detect chemical changes in the resin due to chemical contamination as well as monitor the fiber to resin ratio to indicate if resin has been “dissolved” by chemical exposure. In addition to accessing composites for damage, there is an interest in observing when fuel or other chemicals have been absorbed into the resin-fiber matrix. Figure 1 shows a comparison between clean carbon composite and composite which has residual diesel fuel on the surface. This shows how the Exoscan can be used to monitor contamination of the composites as well as further degradation of the composite, thus providing an important tool to identify potential further damage of the composite.

WWW.A2TECHNOLOGIES.COM
14 COMMERCE DRIVE. - DANBURY, CT 06810
NORTH AMERICA: 203.312.1100 - INTERNATIONAL +44 (0) 7765970210