

NON-DESTRUCTIVE TESTING THE INTEGRITY OF HELICOPTER BLADES UTILIZING A UNIQUE CORONA BEAM TECHNOLOGY

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The technology entitled "Electron Resonance Analysis Technology" (ERAT), that we have named "Corona Beam Technology" or "C-Beam Technology", has the capability to test the integrity and characterize many types of non-conductive materials and items. The integrity and character of a non-conductive and relatively non-conductive material is determined utilizing a novel electron beam technology and electronic instrumentation in an open atmosphere. ERAT produces a stable electric corona discharge. The corona discharge is maintained at a high positive voltage utilizing a focusing resistor with the beam having a prescribed frequency and stabilized by an inert cover gas. The corona beam resonates through the material to characterize the structure and identify anomalies. The signal is then analyzed through the use of formatted FFT sound analysis in order to determine the presence of micron and nanometer sized anomalies, i.e.; holes, molecular structure, coating voids, as well as many other types of non-acceptable differences. This process can be performed by the material manufacturer or field test operations to provide certified quality levels. The process can validate 100% of the material in real-time, on-line and non-destructively with a predetermined range of acceptability. The technology is base on utility patents and proprietary technology that is extremely broad in application.

The technology can determine the thickness of materials, stress fractures, fissures, porosity size, and permeability. We can also characterize anomalies, as well as perform other types of measurements to identify various traits required for validation. The corona beam is drawn and not projected. The truly unique aspect is that the beam will follow a tortuous path through the material and can curve to follow its potential in an open atmosphere. The corona beam has a set frequency that travels with the beam. The electronic instrumentation measures the variation of the destructive harmonics of the frequency that are caused by irregularities in the composition to determine the location and type of anomaly. All of the different types of anomalies and measurements can be set to a very exact range or window of acceptability.

In measuring, we can provide a series of discrete measurements across the width of the item rather than a gray or average measurement. The accuracy of measuring thickness is greater than 0.1%. Anomalies and their location, such as thickness, cracks, stress fractures, pinholes, un-catalyzed resin, molecular structure, contamination, tortuous path holes, fissures and others can be detected, identified and positioned.

The concept for the equipment is to have a gantry carrying a series of corona beam guns traveling the length of the blade. The blade would be cradled by a bladder containing a conductive gel that would conform to the shape of the bottom half of the blade. One side of the blade would be tested, and then the blade would be rolled over or positioned in any alternative fashion to accommodate testing. The conductive cradle is required to provide a conductive conformal base and a reservoir source to draw electrons. The bladder would be fluid enough to accommodate different blade positions and various sized blades. The thickest areas of the blade may take in excess of a million volts to propagate the required penetration for analysis. The corona beam read head guns would traverse the length of the blade and the voltage would be cycled for the various thicknesses of the blade.

Note: FFT stands for "Fast Fourier Transform", a mathematical algorithm used in signal processing to three dimensionally display changes in a driven frequency signal.