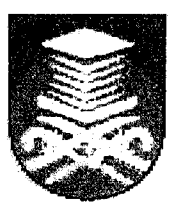
DETECTION OF CORROSION UNDER A THIN LAYER OF PAINT USING MICROWAVE NON-DESTRUCTIVE (MNDT) TESTING AT FREQUENCY 17.5 GHz TO 28GHz (K-BAND)

This thesis is presented in partial fulfillment for the award of the Bachelor of Electrical Engineering (Honors) (Communication)



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ABSTRACT

The Vector Network Analyzer is used to measure the complex reflection coefficient (real and imaginary). By using free-space method, the dielectric properties for the samples of Aluminium Alloy were measured. The complex reflection coefficient (S_{11}) for the 10 samples of corrosion and non-corrosion Aluminum Alloy were measured. The dielectric constants and loss fact were measured for the non-corrosion and the corrosion metals in the frequency range of 17.5 to 28 GHz (K-Band). From the measurements results, the dielectric properties for corrosion metals are higher than the non-corrosion metals. The ranges of dielectric constant for corrosion metals are from 2.7750 to 2.9461while the value of dielectric constant for non-corrosion metals are 2.4021 to 2.4901.Therefore, we can distinguish whether the metal is corroded or not. The thru, reflect and line (TRL) calibration technique were used to eliminate the effect of undesirable multiple reflection. For thin samples, the sample had to be sandwiched between two half-wavelength Teflon™ planes, to eliminate the effect of sagging. The measurement system consists of Vector Network Analyzer (VNA), a pair of spot focusing horn lens antenna, mode transitions, coaxial cable and computer. A computer program, FORTRAN was used for calculation of dielectric constant. Data from VNA measurement is the input to this program.

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