

Dual frequency microstrip antenna sensor for water content measurements independent of temperature variation

Abstract

Temperature variation causes errors in all indirect moisture measurement methods. To increase the accuracy of moisture content determination and to reduce the influence of temperature, a two-parameter measurement is used. The method uses the magnitude of reflected waves at two microwave frequencies in the X-band region. A dual frequency sensor system is developed to measure moisture content of dielectric-lossy liquids. The experiment is based on measurements of far-field reflection magnitudes at two different frequencies 8.48 GHz and 10.69 GHz using circular microstrip antennas. A calibration equation is sought that instantly gives temperature-independent moisture content of the samples under consideration. The sensor is integrated with a data acquisition card to record the detected reflection signals. The data analysis and error-correction technique are implemented using custom designed software. The system is tested using diluted rubber latex with moisture content ranging from 39.8% to 91.2% wet basis. The moisture content was predicted with a standard error less than 1.3% for the temperature range of 25 °C to 63 °C compared to the standard oven-drying technique

Keyword: microwaves, water content, rubber latex, temperature independent