SYNTHESIS OF TEST ACTIONS FOR CAPACITIVE MOISTURE METER THAT IS INVARIANT TO SUBSTANCE TYPE CHANGE

Kateryna Golub[1,2], Oleksandr Zabolotnyi[1]

[1]Department of aviation devices and measurements, National Aerospace University "KhAI", Chkalova Str., 17, Kharkiv, 61070, UKRAINE

[2]PRE HARTRON-ARKOS LTD, Acad. Proskury Str., 1, p/b 9971, Kharkiv, 61070, UKRAINE, E-mail: golub-ekaterina@bk.ru

The main objective of the article is ensuring the invariance of capacitive moisture meters to change of a substance type. Determination of moisture using capacitive moisture meters is based on measuring the capacity of primary converter filled with the studied substance, thus capacity depends on substance dielectric permeability (i.e. its type). So, there is a problem of substance type uncertainty for capacitive moisture meters.

In the article the analysis of existing methods for substance type uncertainty compensation within a capacitive method is carried out. As a result of the analysis it is revealed that the most widespread method to solve the problem today is determination of moisture using calibration schedules (or tables). However, this method is not without disadvantages, as assumes not disposal of type dependence for capacitive moisture meters, and only its some account. The authors identified, perhaps, the most perspective direction for further researches – test methods. Are chosen and applied the block diagram of measuring system for realization of test approach including additive and multiplicative tests units, and test algorithm for carrying out of measurements. According to the chosen algorithm some capacity measurements of primary converter are carried out: with the studied test of substance, with addition of a known amount of water and by change of capacity of initial substance in k-times. The expressions for determining the substance moisture at various water additions and multiplicative test coefficients are carried out. As a result of synthesis of these expressions it is obtained the expression which allows to compensate a substance type uncertainty having a dielectric constant in the range from 2 to 3,5 (for example, oil and oil products) with moisture content from 0 % to 30 %. Pearson's criterion is applied to determine quantitative estimates of divergence magnitude of the obtained moisture results from the true values. On the basis of Pearson's criterion calculations results the conclusion is drawn on good convergence of moisture measurement results, i.e. this expression allows to define substance moisture with the minimum value of type uncertainty. Also it is carried out the comparative assessment of test expression for moisture determination with the expressions received in early works on this research direction. By the results of this assessment it is determined that the received expression has the best convergence indicators of results.

Key words: capacitive moisture meter, uncertainty of substance type, test method, additive test, multiplicative test.