The technique of holiday and unacceptable thinning detection in dielectric coatings by high voltage testing

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The problem of assessing the technical condition and extending the service life of dielec-tric anti-corrosion and waterproofing coatings has great practical importance, which is con-firmed by the experience of operating various types of industrial metal products, including at pipeline transport infrastructure facilities. One of the main requirements for such coatings is to ensure 100% coatings continuity. However, if the technology of applying coatings and the rules for operating products are vio-lated, defects may occur in the coatings that violate their continuity: non-painting, through and non-through pores, cracks, tears, punctures, etc. In turn, in most cases, layer-by-layer deposition of dielectric coatings is assumed. But in case of violation of the application technology, the number of coating layers may not corre-spond to the declared one. Thus, there is an urgent problem of testing the number of layers in a finite system. The majority of modern testing technologies involve measuring the final thickness of the coating with devices that make discrete measurements at various points in the structure, for example, electromagnetic thickness gauges. Therefore, the implementation of continuous testing of the coating thickness is a non-trivial technical problem. One of the most common methods of non-destructive testing (NDT) of the continuity of dielectric coatings is high voltage testing method, in which an electric field of high intensity is formed between the surface of the coating and the electrically conductive base to detect defects. At an appropriate electric field strength, a spark discharge is formed in them. Modern methods for choosing the testing voltage applied using an electrode to the coat-ing surface, reflected in standard methodic, make it possible to detect only through-hole defects in coatings. At the same time, the methods do not pay due attention to the relation between the thickness of controlled coatings and their breakdown voltage for the task of detecting unaccept-ably small thickness and blind defects in coatings. So, the development of a unified technique for detecting not only through-hole defects in coatings, but also unacceptable thinning, is relevant. The paper presents a theoretical and experimental analysis of the spark forming processes occur when through and non-through defects are detected in dielectric coatings on conductive sub-strates. The minimum testing voltages for the investigated dielectric coatings are measured and calculated, taking into account the detection of both through and non-through defects. The ap-plication of a probabilistic approach to the detection of the above defects is proposed. It is shown that with a known value of the electrical strength of the coating, it is possible with a calculated probability to detect both through and non-through defects in coatings at a given test voltage.