THE USE OF DEFECT TYPE RECOGNITION METHODS BASED ON DGA RESULTS FOR THE RECOGNITION OF COMBINED TYPE DEFECTS

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For non-destructive diagnostics of the state of high-voltage power transformers, the analysis of dissolved gases in oil (DGA) is the most common and used. This method, using various diagnostic criteria allows to recognize most of the defects (both electrical and thermal type) occurring in the transformer. However, during operation, the so-called combined defects may occur. In addition, two or more defects of different types may occur in the same transformer. The values of the criteria used to recognize combined defects differ significantly from the values of the criteria characteristic of thermal or electrical defects, which significantly complicates the recognition process.

As of today, more than 20 different methods of recognizing the type of defect based on the DGA results are known. The analysis of these methods showed that they all differ in the type of implementation (graphical or analytical), the diagnostic criteria used and the number of defects recognized. At the same time, among the analysed methods, only 1/3 allows to recognize combined defects [1]. Thus, given that these methods use different diagnostic criteria for recognizing defects of combined type, and allow recognizing a different number of types of defects, the issue of a comprehensive analysis of the recognition of combined defects by different methods is relevant and has practical value.

In [1], the recognition of overheating in different temperature ranges, which is accompanied by discharges of different intensity, using these methods is given. Among the 6 methods that allow to recognize defects of combined type, the highest reliability of recognition is provided by graphical methods – ETRA square, Duval Triangle 1 and nomogram method. However, the 3 ratio technique is the only one of the recognition methods that could not make any correct diagnosis. Moreover, grading the defects by the temperature of overheating, the nomogram method proved to be the best in the recognition of low-temperature combined defects, the Duval Triangle 1 in the recognition of medium-temperature combined defects, and the ETRA square in the recognition of high-temperature combined defects. It is possible to increase the reliability of recognition using the values of gas ratios for the recognition of combined defects, which were regulated by the Soviet standard RD 34.46.302-89 if used together with the values of gas ratios regulated by IEC 60599.

References:

1. Кулик, О. С. «Розпізнавання перегрівів у різних діапазонах температур, що супроводжуються розрядами з різним ступенем інтенсивності, за результатами аналізу розчинених у маслі газів». Вісник Національного технічного університету «ХПІ». Серія: Енергетика: надійність та енергоефективність, вип. 1 (4), Липень 2022, с. 44-55, doi:10.20998/2224-0349.2022.01.07.