

Chapter 6

APPLICATION OF PETROLEUM-BASED OIL IN POWER TRANSFORMER

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ABSTRACT

Petroleum based oils; the so-called mineral oils are used for impregnating solid insulations or filling products of very large number of electric materials: transformers (power, distribution, traction, furnace, measurement...), reactance, capacitors, cables, bushings, circuit breakers, tap changers, etc. In this contribution emphasis is laid on their applications in power transformers, which represent the single largest capital item in substations, comprising almost 60% of the total investment.

Since power transformers are critical to the reliable operation of every power grid, ways to prevent incipient electrical failures extend their life expectancy and improve preventive maintenance procedures have become increasingly important. The physicochemical degradations and up to date standardized assessment techniques of mineral oils are presented. Problems with current laboratory analysis and new ways to enhance the service reliability are discussed in this chapter. The intention is to propose more accurate ASTM test methods, capable of monitoring the decay process of mineral insulating oils step by step. Hence, the impact of oil's real purity on the gassing of liquid insulation can be quantitatively determined. Thus, the maintenance of oil in pristine conditions for the lifetime of transformers becomes cost effective.

INTRODUCTION

The early transformers, produced in 1884, were of dry type ones [1]. Petroleum oil was used on an experimental basis in the insulation of three-phase transformers early in 1891. However, at the end of the XIX^e century, transformers were still isolated/ventilated with air. Due to the increasing demand of electric energy and the growing power transmission