

Analysis of the Operating Regimes of a Medium / Low Voltage Transformer Supplying a Distribution Network for Urban Transports

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Abstract- A medium/low voltage transformer from a distribution substation for urban transports operating in a highly distorting regime is analyzed. Regimes of idle running, running with non-linear load, respectively fault (short-circuit) are presented from the theoretical point of view. The results yielded by their operation simulation using MATLAB / SIMULINK are discussed. Aspects related to the measurement and harmonic analysis of voltages and currents are analyzed, along with experimental results related to the highly distorted regime influence over the primary and secondary windings. Losses in distribution transformers due to non-linear loads resulting into (no-) load losses due to increased skin effect, eddy current, stray and losses through hysteresis with negative effects over the lifespan of the transformers and total costs are discussed too. As the analysis revealed that the harmonic content and reactive power must be diminished, some solutions are suggested. A relative cheap solution (not necessarily the best) is passive filtering. A more efficient solution for the compensation of the distorting regime is the active filtering, this being efficiently adaptable to the analyzed system's operating regimes, resulting into power savings and transformer's operation at the rated parameters. Another good solution is the substitution of old transformers (particularly sensitive to non-linear loads) by more efficient transformers.