

ABSTRACT

This thesis is framed within the doctoral program by agreement between the Faculty of Engineering of the Universidad Metropolitana (Caracas, Venezuela) and the Department of Engineering Projects at the Universitat Politècnica de València, Spain.

This research presents the development of a predictive methodology for the fulfilment of the functional requirements of the oils used in aviation, aiming to replace the current physicochemical analysis of the oils in service (that determine their degradation or oxidation) by means of statistical models developed using the information obtained by infrared spectroscopy (FTIR).

Four types of oils were analyzed by FTIR (used mineral oils, laboratory aged mineral oils, used synthetic oils and laboratory aged synthetic oils) and later, multivariate regression models were applied in order to predict acidity (one of the main wear indicators) of the oils. This makes it possible to perform all tests in a faster and more price-efficient way (without reagent consumption) required for private aircrafts in Venezuela to maintain their airworthiness certificate and meet the corresponding regulations in other countries.

The analysis of oils aged under controlled laboratory conditions aims to know how time and temperature affect each type of oil so the FTIR profile of the oils used in real conditions can be ensured.

In the models developed to improve the ability to predict the acidity of oils, the main focus has been the location of the ranges of the spectrum where the main degradation compounds appear.