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Author(s): > Matthew Spencer - Rolls-Royce and University of Birmingham > Timothy Shepherd - Rolls-Royce > Richard Greenwood - University of Birmingham > Mark Simmons - University of Birmingham

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Abstract: In the development of a more accurate laboratory scale method, the ability to replicate the thermal oxidative degradation mechanisms seen in gas turbine lubricants, is an essential requirement. This work describes an investigation into the influence of key reaction parameters and the equipment set up upon extent and mechanism of oil degradation.

The air flow rate through the equipment was found to be critical to both degradation rate and extent of volatilization loss from the system. As these volatile species can participate in further reactions, it is important that the extent to which they are allowed to leave the test system is matched, where possible, to the conditions in the gas turbine. The presence of metal specimens was shown to have a small influence on the rate of degradation of the lubricant. Loss of metal from the copper and silver specimens due to the mild corrosive effect of the lubricant was seen.

The Total Acid Number and viscosity of a series of oil samples from two service gas turbines are discussed. The ratio of these two physical properties was approximately constant between samples, indicating constant evaporation loss. Additionally, Gel Permeation Chromatography was used to compare the molecular weight distribution of a lubricant used in a gas turbine to laboratory samples. The replenishment of oil in service engines was highlighted as key difference between these samples. It is believed that laboratory methods can degrade oil similarly to service engines and therefore can be used to predict oil life and condition in service.

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