STUDY ON THE EFFECT OF HYDROGENATED LUBRICANT BASE OIL COMPOSITION TO ITS OXIDATION STABILITY

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ABSTRACT

In this paper, we studied the high temperature oxidation stability of hydrogenated lubricant base oils used in automobile engine oil formations. Different oil from Daqing, Lanzhou and Kelamayi were investigated, and a hydro-isomerised poly alpha olefin oil PAO-6 produced by Mobile company was used as model oil.

The influence of aromatic hydrocarbon, sulfur and nitrogen content of the base oils to their oxidation stability was investigated. The result indicated that, the high temperature oxidation stability of all these base oil was not good, but their thermo-stability was very good.

KEYWORDS: hydrogenated lubricant base oil, composition, oxidation stability

INTRODUCTION

Compared with traditional solvent refined base oil, hydrogenated lubricant base oil has good performance properties in the formation of top grade engine lubricant oil and high quality industry oil. And the foundation of lubricant hydrogenation equipment in CNPC, the hydrogenated base oil will be main material in the formulation of top grade lubricant oil. There is great difference in composition and self anti oxidation stability between the hydrogenated base oil and solvent refined base oil, the aim of this study was to improve the understanding of high temperature oxidation of these hydrogenated base oil, apply the basic data and theory for the research of top grade lubricant oil.

EXPERIMENTAL METHODS

In Rotating Bomb Oxidation Test (RBOT), the oil is heated in a vessel in presence of water and copper catalyst, and the vessel is filled with oxygen to a pressure of 620 kPa, and the time it takes to reach a specific pressure loss is measured.

Pressure Differential Scanning Calorimetry (PDSC) is a common tool for the determination of oil oxidation. There are two ways to detect the oxidation process. One way is procedurally increasing temperature method. Oxidation onset temperature was used as index of sample oxidation stability. Other way is constant temperature test method. The oxidation induce time was used as index of sample oxidation stability.

Oven oxidation test method is a nonstandard oxidation test method, and the experiment temperature was controlled at 170°C. After 96 hours oxidation, the viscosity, acid number, composition and infrared spectroscopy of the samples were tested. The thermo oxidation stability of base oil was detected through this test.

RESULT AND CONCLUSIONS

The oxidation stabilities of Lanzhou 125N, 500N and Daqing 5cst, 10cst were not good and they can be oxidized very easily. KN4006, KN4010 and PAO-6 had better oxidation stability. Lanzhou 500N, KN4006 and KN4010 had higher content of aromatic hydrocarbon which was sensitive in thermo oxidation, they became dark after a period of oxidation. After 96h of thermo oxidation in oven, the base oils were still transparent, no sediment formed, and this indicated that hydrogenated base oils had good thermo oxidation stabilities.

Base oils with aromatic content below 1%, the aromatic content was not decisive factor that affected base oils oxidation stability; when aromatic content was above 1%, the oxidation stability increased with growth of aromatic content.

The result showed that base oil which had good oxidation stability can retard the increase of acid number during oxidation.

Nitrogen, sulfur content dropped dramatically to a very low level after hydrogenation, and the nitrogen and sulfur content had no apparent effect on oxidation stability of the base oils.

Base oils with high viscosity index can retard the increase of kinetic viscosity during oxidation, and can prolong the working time of lubricant oil formulated from it

REFERENCE