

Research of Natural Antioxidants Influence on Oxidation Stability and Tribological Properties of Rapeseed Oil

R.Kreivaitis, J.Padgurskas

Department of Mechanical Engineering, Aleksandras Stulginskis University, Lithuania

K.Kazancev, M.Gumbytė

Laboratory of chemical and biochemical research for environmental technology, Institute of Environment, Aleksandras Stulginskis University, Lithuania

E.Dambrauskienė

Biochemistry and Technology Laboratory, Institute of Horticulture, Lithuanian Research Centre for Agriculture and Forestry, Lithuania

Abstract: Vegetable oils have good tribological and viscosity properties together with excellent biodegradability and non-toxicity. Unfortunately, their wider use is restricted by poor oxidation stability. Durability of vegetable oil based lubricants depends mainly on oxidation. This problem has been analysed in many research works. Nevertheless, scientists agree that there still remain many unanswered questions in this field. In this study the sage and thyme extracts and attars are suggested for use as antioxidants in rapeseed oil. The influence of natural antioxidants on oxidation stability, kinematic viscosity and tribological properties of rapeseed oil was measured. The sage and thyme extracts studied showed good oxidation stabilisation properties and had no negative influence on tribological properties of rapeseed oil.

Keywords: lubricants, natural antioxidants, rapeseed oil, extracts, attars.

1. INTRODUCTION

The consumption of mineral based fuels and lubricants as well as environmental pollution will increase over time as a result of the annually increasing number of trucks, buses, high power tractors and personal cars. The greatest part of energy consumed in the world is obtained using non-renewable, fossil fuel. The use of such an energy source has a negative impact on the environment. Furthermore, the fossil fuel resources will soon dramatically decrease. Therefore, there is great interest in alternative renewable resources. Environmentally friendly bio-based lubricants are one of the alternative ways to save fossil resources and decrease pollution [1].

According to usage lubricant can be divided into two groups [2]:

- **Long-term** - for enclosed systems (engine oils, transmission lubricants, hydraulic fluids et al.);
- **Total loss** - for open systems (railway applications, chain saw oils, two stroke engines oils et al.).

The long-term lubricants used in the enclosed systems can only escape into the environment during an accident or leakage, whereas total loss lubricants will enter the environment after their first use. A technical solution of this problem is not possible and therefore the usage of environmentally friendly readily biodegradable lubricants is essential for total loss lubricants.

Lubricants must satisfy many requirements. One of the greatest influences on a lubricant's properties are its base oil and durability, which indicates the period the lubricant can be used. Ageing through oxidation is the predominant process that determines durability of lubricants. During the ageing process base oil and completely formulated oils change their physical, chemical and tribological properties [3, 4].