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# BIOBASED ADDITIVES FOR CHAIN SAW LUBRICANTS

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Environmental concerns have brought forward vegetable oils as alternative to both mineral oils and to more expensive synthetic lubricant base stocks [1, 2]. Many countries in Europe already require biodegradable lubricants to be used in selected applications [3]. Chain saw oils as total loss lubricants require particular attention. The use of vegetable-based chainsaw oils is controlled by legislation and the use of pure rapeseed oil, a renewable resource, is the industry norm in Austria, Germany and Scandinavia; it is expected that in 2010 use of biodegradable chain saw oil will increase up to 95% of all chain saw oils used in the UK.

Vegetable oils as base fluids of chain saw oils have several advantages (excellent lubricity, very high viscosity index, high flash/fire points) and disadvantages (insufficient oxidative stability [4], high pour point). Chemical modification (e.g., hydrogenation [5], epoxidation [6, 7] and conversion to estolides [8]) of vegetable oils, use of chemical additives (antioxidants, pour point suppressants, tackifiers, viscosity improvers, extreme pressure additives, antiwear agents, anticorrosion additives), winterization, blending with other appropriate fluids can address these problems, but increase the cost. Compounds used as lubricant additives are premium priced and highly application specific. Currently, the majority of these additives are petroleum based, providing an opportunity for environmentally friendly, cost-effective, and often superior quality biobased lubricant additives [9, 10].

Several groups of scientists [11] are intensively working on creation of these new-age additives which can be used with either biobased or conventional lubricants, are fully biodegradable and can be disposed fast, easy and inexpensive. Most often chemical modification of vegetable oils is used for production of biobased additives, e.g., epoxidation [12] of plant oils, their converting into sulfur containing molecules [13], nitrogen containing derivatives [14, 15] and branched chain esters [16, 17].

In order to start the production of environmentally friendly harvester chain saw lubricants from local renewable resources of Latvia it is essential to work out methods for producing of biodegradable additives, as imported commercial additives are expensive.

We used rapeseed oil as base fluid in our investigations. Natural materials, such as rapeseed, hempseed, linseed and sea-buckthorn oils, waste fatty acids

(from biodiesel production), caoutchouc and colophony were used as raw materials for preparation of additives. Epoxidation and ozonation of oils, cleavage of obtained epoxides and ozonides of fatty acids with different reagents, as well as esterification of oils and colophony with primary and branched alcohols were used for preparation of additives.

The obtained additives were exercised to improve the properties of rapeseed oil and to elaborate compositions of chain saw oil which fulfill technical requirements. Testing of the prepared compositions is carried out by Latvian company „Iecavnieks" Ltd., which already produces biodegradable chain saw oils.

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