

BIOBASED LUBRICANTS: A VIABILITY STUDY

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ABSTRACT

Biobased lubricants are an attractive alternative to conventional petrobased lubricants due to a number of their physical properties including: renewability, biodegradability, high lubricity and high flash points. Biobased lubricants have not replaced petrobased lubricants due to their higher cost, oxidative and thermal instability and limited temperature applications.

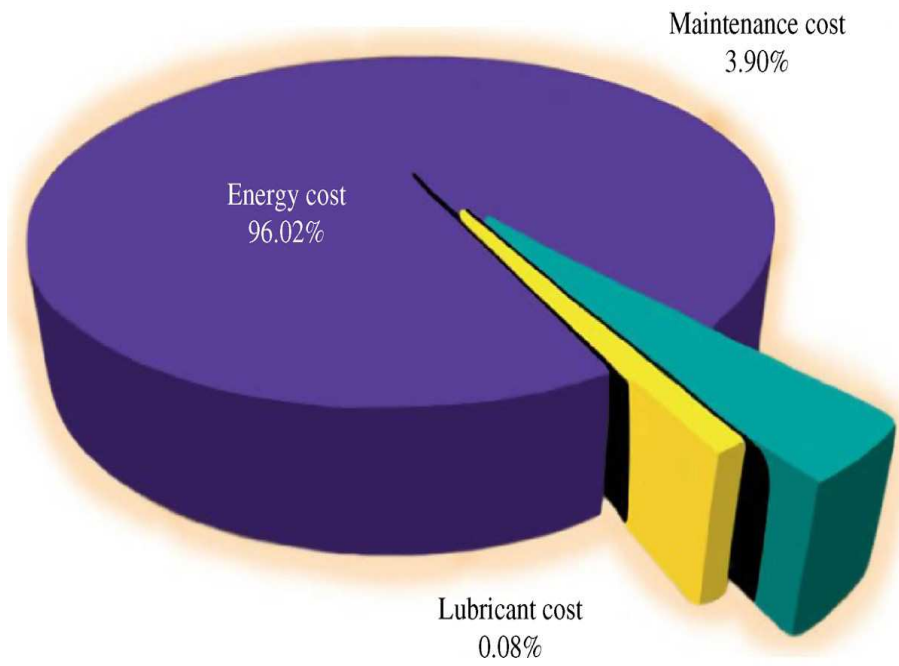
Research has been done to improve the physical properties of biobased lubricants. Dupont has bioengineered soybean seeds to yield soybean oil that is more oxidatively stable. The Prileshajev Epoxidation Process was developed to increase the oxidative stability of soybean oil. The Amberlyst 15 Catalyst was used to Reduce Pour Point of Vegetable Oil.

Biobased lubricants are generally more expensive than petrobased lubricants, but their increased lubricity allows for monetary savings through a decreased energy input requirement. As biobased lubricants are derived from vegetable oil, careful work must be done to balance the allocation of crop used to make lubricant. Currently there is not enough arable land to support the widespread use of biobased lubricants, so a collaboration of industry and government policy must be used to promote the use of biobased lubricants.

The high lubricity of biobased lubricants result in mechanisms with lowered energy input needs, varying depending on the application. Indicative energy savings include (Cliff, 2007):

- Hydraulics – 1-3% energy savings
- Plastics Injection Moulding equipment – 2-3% energy savings
- Compressors – 2-7% energy savings
- Worm Gears – 15-30% energy savings
- Spur Gears – 1-5% energy savings

As seen in illustration 3, the cost of operating a machine is 96.02% from the operating energy requirement. Increasing the effectiveness of the lubricant can result in large savings in energy and maintenance costs. As an example, a 100HP compressor using a biobased lubricant instead of a petrobased lubricant, operating on a full load over three shifts would save approximately \$750(CAD) annually. Biobased lubricants reduce maintenance costs of the machine as the decreased coefficient of friction will minimize the gradual degradation that a machine is exposed to during operation. The increased cost of the lubricant is negligible when compared to the savings in energy in maintenance costs (Cliff, 2007).



Source: Cuthbertson (2001)