

# CHAPTER 1

## INTRODUCTION

### 1.1 New standard for four-stroke motorcycle lubricant

Environmental concerns are great especially for Thailand due to the popular use of small motorcycles. Introduction of new TISI (Thailand Industries Standard Institute) and JASO (Japanese Automobile Standards Organisation) standards subject new lubrication products to meet emission reduction levels from motorcycles. Four-stroke motorcycles have been found to be more environmental friendly as they emit a lower volume of gaseous pollutants compared with the two-stroke models.

Many four-stroke motorcycle lubricants marketed today are re-branded passenger car motor oils, possibly with minor modifications on the clutch friction property. These specifications, however, have been developed only for four-stroke automobile engines. Motorcycle manufacturers use certain grades of oil for use in new engine development. One of the recommended engine oil grades is 10W-30 which is a lower viscosity grade according to the J300 specification (Appendix I)<sup>1</sup>. This situation is becoming less satisfactory as the lubricant requirements for the relatively smaller four-stroke motorcycle engines and the larger four-stroke automobile engines continue to diverge. ILSAC (International Lubricant Standardisation and Approval Committee) had also introduced ILSAC GF series of automobile '*low-friction*' engine oils with low viscosity grades. The use of low viscosity oils results in a reduction in fuel consumption and thus leads to economic and environmental

benefits. However, these 'friction modified' oils are unsuitable for use in four-stroke motorcycle engines<sup>2,3,4</sup>. Low-friction engine oil was found to give clutch problem in four-stroke motorcycle.

Differences in lubricant requirements have led motorcycle OEM (Original Equipment Manufacturer), lubricant manufacturers and industry bodies all around the world to focus on four-stroke motorcycle lubricant specification. A new JASO standard has been released this year and as a result, the four-stroke motorcycle lubricant market is expected to change rapidly. New standardised four-stroke motorcycle engine oils will need to be formulated to have appropriate properties to meet the new requirements.

## **1.2 Viscosity modifier in multigrade oil**

A viscosity modifier (VM), also known as a viscosity index improver (VII), is usually a high molecular weight polymer additive which improves the viscosity characteristics of an oil, i.e. reduces the tendency of an oil viscosity changing with temperature. The viscosity modifier is one essential component of the multigrade oil that has proven to have superior viscosity-temperature behaviour compared to monograde or single viscosity grade oil.

Polymer degradation process can occur on the viscosity modifier in the oil when it is exposed to extremely high shear force areas. This shearing can cause a reduction of lubricant viscosity to such an extent that it is too thin to provide adequate lubrication.

Engine construction for a four-stroke motorcycle is based on an 'all-in-one' crank case design including the engine, clutch and transmission systems. Only one type of oil is used and must satisfy the service of all the engine components which have different shear stress conditions. Shear stability property of the oil is therefore an important property in the selection of viscosity modifier used in four-stroke motorcycle lubricant.

### **1.3 Objective of the research**

The aim of this study is to evaluate experimentally the suitability and performance in term of shear stability for different types of viscosity modifier in formulating four-stroke motorcycle multigrade oils.

### **1.4 Scope of the research**

This study will investigate the effect of type and concentration of different viscosity modifiers including base oil composition on fully formulated multigrade oil according to the new JASO T 903 standard criteria. Commercially available star type hydrogenated isoprene and hydrogenated isoprene-styrene along with an olefin viscosity modifier will be evaluated in term of permanent shear stability.