

MTM Clutch Screening Method

Introduction

The PCS Instruments Mini Traction Machine (MTM) can be used to accurately screen wet clutch contacts. This allows the in-depth investigation of additives, fully formulated ATFs and ATF - friction material combinations.

To carry out a clutch test at realistic conditions, the MTM should be fitted with a low load beam and placed in the pin-on-disc mode. This requires a low load beam to achieve low pressures accurately, and a locking pin to halt rotation of the ball shaft, producing a pure sliding contact. The corresponding part codes are MTMTHINL and MTMPOD.

Samples

A standard MTM drilled ball is used as the upper specimen, and the new clutch disc is used as the lower specimen. Details about these specimens are given in the table below:

Sample and Parameter	Value
Ball Sample (BALLD)	
• Material	Steel, AISI 52100
• Diameter	19 mm
• RMS Surface Roughness	~ 10 nm
• Elastic Modulus	207 GPa
• Poissons Ratio	0.3
Disc Sample (MTMCMD)	
• Material	Friction Material, BW1777
• Diameter	50 mm
• RMS Surface Roughness	~ 5 μ m
• Young's Modulus	~ 120 MPa
• Poissons Ratio	~ 0.05

Cleaning

The steel ball should be immersed in a degreasing solvent and sonicated in an ultrasonic bath for 20 minutes. It should then be immersed in acetone and sonicated, again for 20 minutes.

Some solvents have been found to adversely alter the BW1777 friction material, therefore care should be exercised when selecting a cleaning solvent for the disk specimen. Hexane is thought to be a suitable solvent. The disk should be sonicated in an ultrasonic bath for 20 minutes, immersed in Hexane.

Testing Profile

An example testing profile has been included in this pack for both the MTM and the MTM2. This profile has been found to give good repeatability. To analyse the results, average the friction coefficient and disk speed at each speed step. Plot a graph of friction coefficient against disk speed (sliding speed) which is given in mm/s.

Example Results

The repeatability of the friction screener was evaluated by carrying out four identical tests, and studying the variation in friction. This evaluation was carried out using the standard testing method at 100°C for a base oil (Figure) and a fully formulated ATF (Figure). The base oil used is a group III base oil, with a kinematic viscosity of 3 mm²/s. The fully formulated ATF has a kinematic viscosity of 5.5 mm²/s and contains a variety of chemical additives.

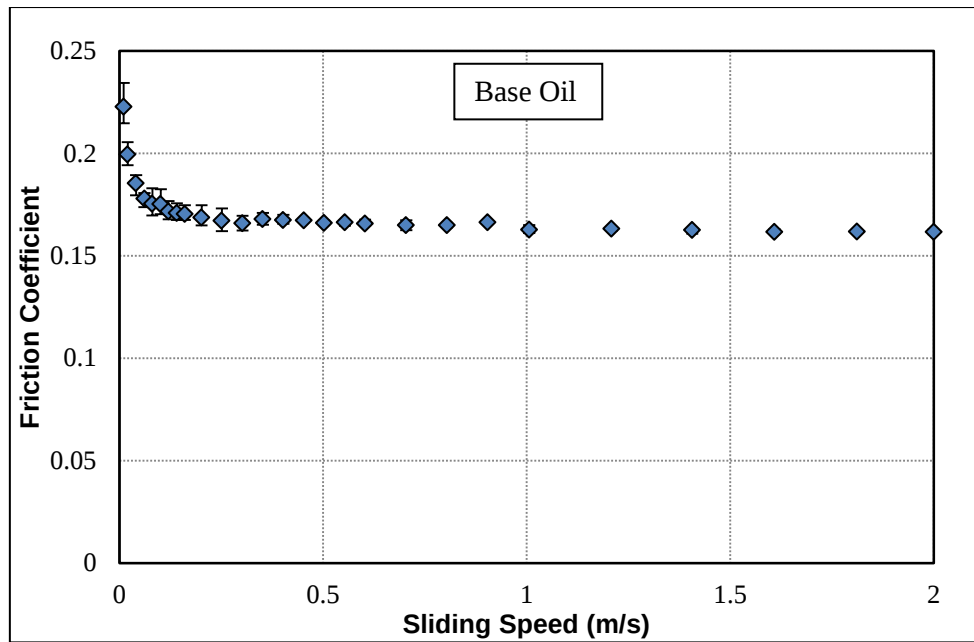


Figure 1: Repeatability evaluation, standard testing procedure with a Nexbase 3030 base oil lubricant. Symbols represent the average of four measurements; the error bars denote the maximum and minimum measured friction over the four tests

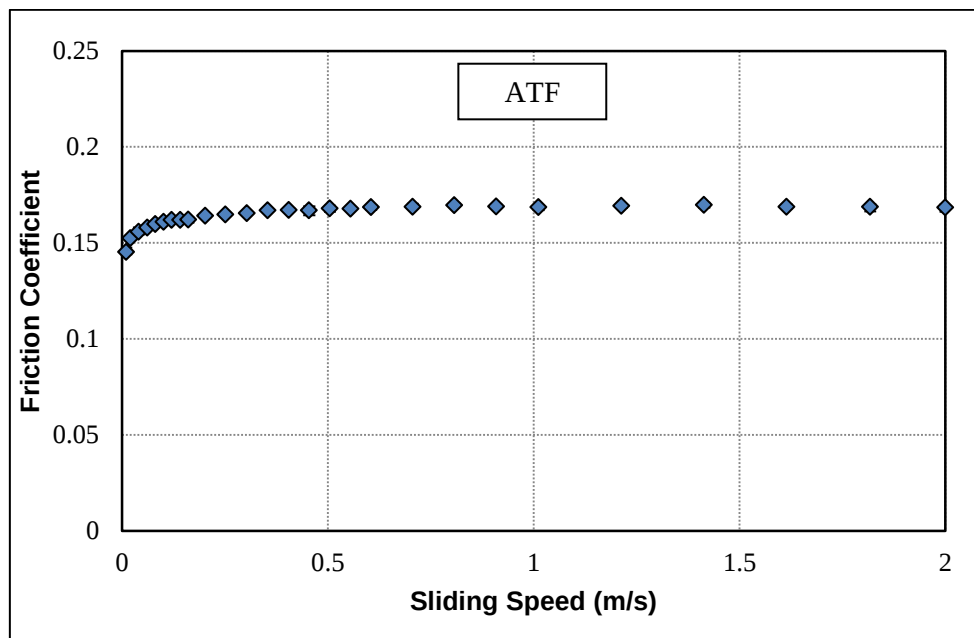


Figure 2: Repeatability evaluation, standard testing procedure with a fully formulated ATF. Symbols represent the average of three measurements; the error bars denote the maximum and minimum measured friction over three tests