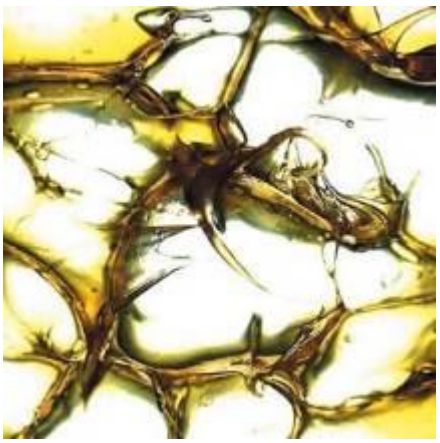
Falex Tribology Case Study 1

Quality
Knowledge
Partner Solutions

Grease Stiction Property

Microtribometer Instrumented Indentation

- Measure cohesiveness and consistency, tackiness and lubricating properties
- Differentiate new grease formulations

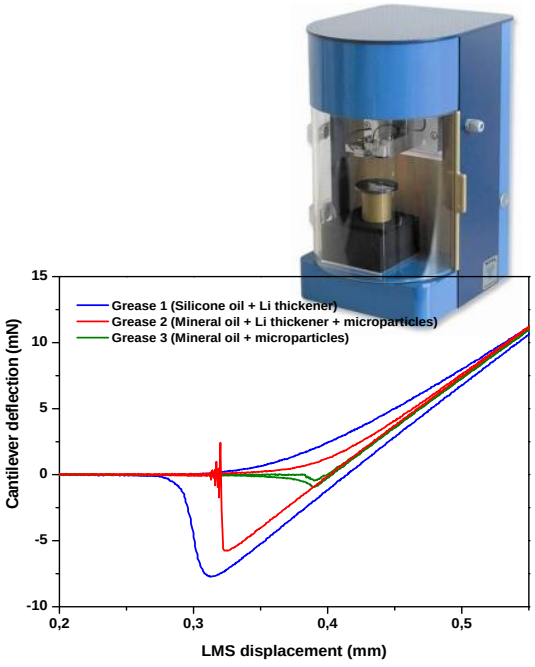


Greases are widely used in machinery and automotive components to protect them from friction and wear losses. As a result, interaction properties like adherence of greases to the substrate, cohesion or consistency and tackiness become crucial factors and often dictate their performance. All these properties are related to microstructural aspects of grease like thickener network, wetting agents and additives. Falex MUST Instrumented Indentation Module can be used to quantify and characterise these interaction properties through approach-retraction test.

Among all grease constituents, thickener has the highest influence on the interaction properties.

Good correlation with conventional cone penetration test data which validates this test method.

Three properties-in-one test unlike conventional tests. Flexibility to use any substrate or counterbody for indentation tests.



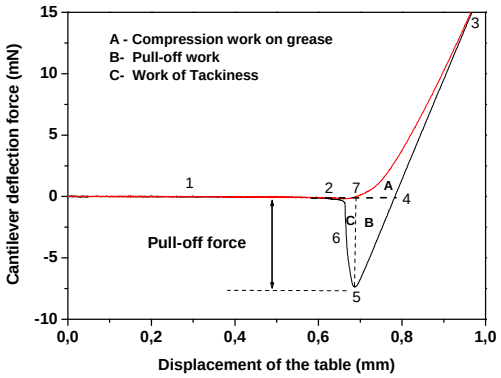
Falex Tribology nv
Wingepark 23b | 3110 Rotselaar – Belgium
T +32 (0)16 40 79 65 | F +32 (0)16 40 51 28 | office@falex.eu | www.falex.eu

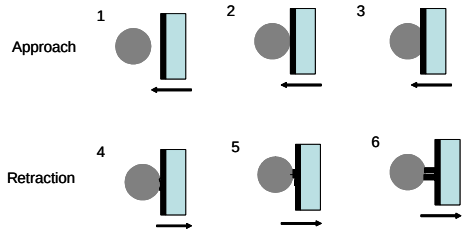
Falex Tribology Case Study 1

Quality
Knowledge
Partner Solutions

The measurement principle is an instrumented indentation .

We approach a grease on a substrate with a sphere attached to an elastic beam. We compress the grease until a given force,then retract until separation between grease and sphere.
The instrument records the displacement force curve , comparable to a nanoindentation experiment.
Separation force and displacement are characteristic values for a grease.





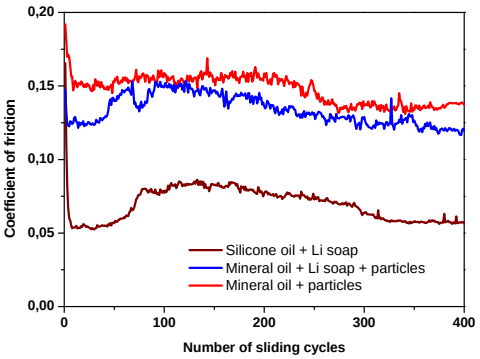
Stored energy or area A can be used as an estimate for the grease cohesion or plastic resistance against indentation.

The area enclosed by section B is a quantification of the adherence of the grease to the sphere after indentation. It can be used to estimate stickiness but also to determine the grease cohesion under tensile stress.

The area enclosed by section C is measure of grease tackiness. When a grease is not tacky at all (i.e. it does not separate by forming threads), the spring would jump back immediately after maximum Pull-off force is reached. Any deviation of an immediate release indicates that grease threads are pulled out of the sample and need to be stretched and broken. This area therefore quantifies tackiness.

With the microtribometer's friction module, we can measure coefficient of friction.

We can measure differences in friction between different grease compositions and also the effect of the substrate material that is being lubricated. Below graph shows the friction coefficient on a Poly oxymethacrylate (POM) substrate.



It shows that a silicone oil-based grease gives the lowest friction.

Grease with a thickener has a higher friction than a paste of oil+particles, because moving the grease+thickener requires more energy than moving a paste. The friction force includes also the viscous drag of the lubricant itself.

Falex Tribology nv
Wingepark 23b | 3110 Rotselaar – Belgium
T +32 (0)16 40 79 65 | F +32 (0)16 40 51 28 | office@falex.eu | www.falex.eu