

## Guidance - Generating and Measuring Wear

A single measurement, at the end of the test, tells nothing about the wear rate or wear transitions. We therefore need to supplement post-test wear measurements, with in situ measurements, using the post-test measurement to back-calibrate any on-line measurements.

### How much wear do we need to produce?

#### Example 1: Ring and Liner

Fired engine tests typically produce no more than 10 microns of cylinder wear.

The deepest honing marks are typically about 10 microns deep and are frequently not fully removed, thus the contact is still running on the original surface and is still influenced by the remains of the original surface topography.

Even scuffing failure is preceded by mild wear.

Wear occurs on both surfaces.

Hence, to model this, we need to be able to generate and then measure a maximum of approximately 10 microns of wear.

For on-line measurements, a combination of displacement measurement and in situ profilometry may be required.

#### Example 2: Thin Hard Coatings

Thin hard coatings are typically 2 to 4 microns thick and do not really wear, but fail through fatigue, therefore we do not need in situ wear measurement, only a mechanism for detecting the failure.

The failure is confined to coating and there is no point running on, once coating has failed. No one is interested in the friction or wear of the substrate. It is important to ensure test run on coating, not substrate.

Displacement measurement and in situ profilometry are probably not needed.

#### Example 3: Thick Coatings

Thick coatings are typically 20 to 50 microns thick and do wear.

To model this, we need to be able to generate and then measure a maximum of approximately 50 microns of wear which is usually confined to coating. Displacement measurement needed.

#### Example 4: Polymers against Metals

It is possible to generate significant amounts of wear and we potentially need to be able to measure up to 50 microns of wear. Displacement measurement probably needed.

#### Summary

For contacts dependent on surface topography, in situ profilometry is useful, especially when used in conjunction with displacement measurement.

For tests dependent on bulk material properties and that generate large wear scars, confined to the softer material, displacement measurement is sufficient.

For tests that generate fatigue failures, not mild wear, wear measurement is not relevant.