Abrasive wear testing in LTAD

Abrasion is one of the most frequent wear mechanisms and it is responsible for considerable financial losses in the industry. An appropriate selection of abrasion resistant material should take into account design properties, operating conditions, type of abrasive, and material properties. This means that the wear behavior of materials is determined by the tribosystem.

The abrasive wear behaviour of materials can be determined by simulating the action of a hard particle. This is shown in **Fig. 1**. These tests may generate tribological events that may be a few nanometers to hundreds of microns.

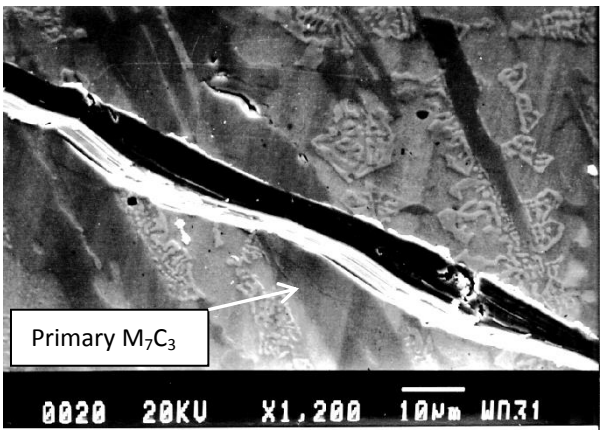

Fig. 1 – Scratching test of white chromium cast iron

To reproduce any field configuration where abrasion mechanism prevails, one can use tests described by different organizations such as ASTM, ISO, DIN, among others. One of the most widespread abrasive tests is the rubber wheel test (ASTM G65). In this case, the material to be tested is pressed against a rotating rubber wheel, and abrasives with a controlled flow are led to the interface between them. Figure 1 illustrates this infrastructure.

This test method covers five recommended procedures which are appropriate for specific degrees of wear resistance or thicknesses of the test material.

The abrasive wear behaviour of materials may be summarized as shown in **Fig. 3**. If the testing material is harder than the abrasive particles, the wear rate remains low. But in cases where the abrasive particles are harder than the testing material, the wear rate increases rapidly, leading to a severe wear regime. This transition from a moderate to a severe wear regime takes place at material hardness similar to that of the abrading hard particles (see **Fig.3**).

Fig. 2– Test apparatus for the rubber wheel abrasion test

In the mining industry, Chromium carbides of the type M_7C_3 in a martensitic matrix are one of the most effective ways in reducing the abrasive wear losses. This is due to the fact that these carbides are harder than most of the mining ore, including sand, combined with relatively good fracture toughness, as shown below.

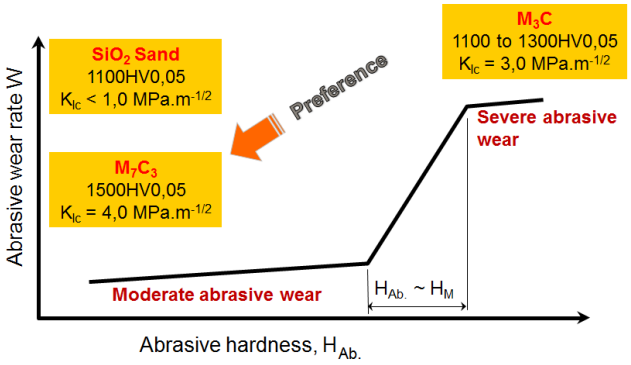

Fig. 3 – Abrasive wear rate as a function of the abrasive particle hardness ($H_{Ab.}$)

In case of hard materials, such as cemented carbides and hardfacings, it is recommended to use the ASTM B611, that uses alumina 30 mesh as abrasive. This abrasive is forced to pass between the testing sample and a rotating steel wheel made of AISI 1020.

To see more abrasive wear testing possibilities in LTAD, go to our internet web site (see address below).

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