

TECH Notes

Testing of Hardmetals on the UMT

Friction and Anti-Galling Evaluation in Severe Sliding Ring-on-Disk Test

● TN1005 Rev. A0

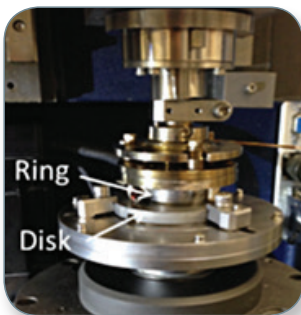
Why Severe Sliding Testing

In sliding contact applications where lubrication is not possible or can provide only limited resistance to galling (severe adhesive wear combined with material transfer), material solutions include both hardfacings and hardmetals.

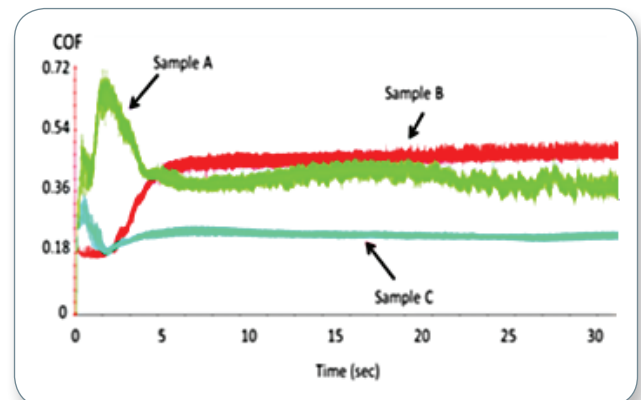
Applications requiring sliding contact of high strength materials under unlubricated conditions include:

- Gate valves in high pressure systems
- Drilling bits, cutting-tool bits or inserts
- Mining and road construction
- Plain bearings for stationary power generation

Hardfacings are often weld-deposited overlays and include hardenable (Martensitic or work-hardening) steels and metal carbides, and are usually applied for increased wear resistance. Hardmetals, on the other hand, can be of even higher strength than many hardfacings, and include cemented carbides, nitrides, carbonitrides, and tungsten-based alloys. Hardmetals are often used for cutting tools, in high temperature applications,



Ring-on-Disk setup on a UMT.



Ring-on-Disk data showing behavior on startup of different hardmetal couples. Tests conducted at 0.5 MPa contact stress and 4.2 m/s sliding speed.

or where severe metal-on-metal sliding contact occurs under conditions of limited or no lubrication.

Testing of hardmetals or hardfacings requires similarly severe conditions as those of the in-service application. One example is high-speed sliding under conformal contact conditions, such as those of an unlubricated plain bearing. Testing on the UMT is accomplished using a ring-on-disk geometry, as shown at left. Since the samples are always in intimate contact, significant thermal input results from the sliding friction in this test, and therefore self-welding propensity also can be assessed.

Use of Various Tests for Hardmetal Testing

Each unique application may have a key parameter which needs to be tested, such as the coefficient of friction during startup, galling resistance under low speed high stress sliding, or resistance to high temperatures generated by high sliding speeds. As such, testing of material changes for improved performance under the right conditions is important.

The UMT can apply high contact stresses and high sliding speeds under unidirectional or reciprocating motions, while monitoring temperature, friction, and wear, and can be set to automatically terminate the test when pre-defined conditions are met. Such versatility allows for testing of virtually any kind of hardmetal or hardfacing under application-specific conditions to help with research and development studies.

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