

APPLICATION NOTE

Wear resistance of dies for production of coins

For thousands of years, coins have been made for use as payment in trade and commerce. They are manufactured from a variety of materials that are often quite valuable. But the quality of a coin stems from the quality of the impressions stamped onto its faces. The dies used for this purpose must continue to raise the details that attest to coin quality, and consistently over the course of a long service life. Thus, they are provided with a wear-resistant coating that has a well-defined surface hardness.

In South Africa, coin production enjoys a long tradition: the first automated production facility was built at the end of the 18th century. The country is also one of the most resource-rich on the globe and was therefore practically predestined for this industry. The South African Mint has been operated as a public company in Pretoria since 1941 and produces regular issue coins for circulation, including the very famous and highly collectible Krugerrand. The South African Mint Company (Ltd.) has been a wholly-owned subsidiary of the South African Reserve Bank since 1988.



Fig. 1: Beautiful, valuable and beloved by numismatists: Krugerrand coins

In numismatic circles, South African coins are particularly popular because of their very high production quality, which is evident in the extremely smooth coin surfaces. To achieve such a high standard, the dies – essentially stamps engraved with the inverse images of the finished coin – are prepared in a complex process to guarantee long and reliable service life.

One of the final steps in manufacturing is to coat the die surface with a specially developed wear-resistant layer about 2-3 microns thick, which gives it a very high surface hardness.

To ensure consistency and accuracy over the entire service life of these tools, before use the SA Mint checks the actual surface hardness of new dies using a FISCHERSCOPE® HM2000. The measurement system employs the instrumented indentation test and, besides measuring a material's hardness, can also determine other mechanical properties such as elastic and plastic deformation or creep behavior.



Fig. 2: Dies for South African coins (Image: South African Mint Company (Ltd.))

The internal testing instructions at the SA Mint specify a test load of 50mN. The results obtained in the examination ensure that only optimally coated dies are taken for the demanding and high-pressure work on the coining press. Since implementing instrumented indentation testing, the SA Mint has been able to lengthen the cycle periods between changeovers, substantially reducing downtime on the coining presses.

Coin dies must provide consistently high-quality stamping results over long periods of time. In order to control the anti-wear coating on the embossing faces, the surface is checked for the required hardness using the FISCHERSCOPE® HM2000. For more information, please contact your local FISCHER sales representative .