

## MOLD COPPER COATINGS

### Protect Coppers, Improve Strand Quality

For nearly 50 years, SMS Technical Services has been coating molds and innovating new coating technologies and processes to improve coating performance and improve continuous caster mold service lives.

Today our in-house coating department provides a wide range of coatings for mold copper plates to increase caster efficiency.

#### Why coat mold coppers?

Simply put, coatings protect mold coppers from wear and help molds retain their cavity dimensions.

Beyond protecting the copper, coatings also protect the exiting strand from picking up copper that can cause defects such as “star” cracks and blisters as well as longitudinal face and corner cracks. Because coatings also help control hot-face temperatures and mitigate mold cooling differences, they can im-



▲ After being in service for more than 500,000 tons, this broad-face copper coated with our UniGuard® Coating was returned to service

prove product quality.

Because our broad range of coatings provide a wide spectrum of wear resistance and mold copper protection, we can develop custom coating configurations optimized for your caster.

#### Copper plating

This process extends mold copper life by applying thick, machinable layers of copper primarily to narrow-face edges to repair wear and damage. Copper plating has a hardness of up to 150 HB; low porosity; high thermal and electrical conductivity; and good strength at casting temperatures.

Copper plating is typically used to fully utilize the hot-face life of

narrow-face coppers. Narrow-face copper edges are routinely plated to restore width dimensions and return coppers to designed heat-removal specifications.

#### Nickel and nickel-cobalt alloy coatings

These coatings provide machinable protection for mold coppers that can extend their lives two to three times longer than an uncoated copper mold. Nickel coatings have a hardness of 175 to 250 HV.

Because nickel-cobalt alloys can be manipulated to produce coatings with a hardness from 200 to 400 HV, they provide 30-40% more wear resistance than pure nickel.

Nickel and nickel-cobalt alloys have a similar thermal conductivity and, compared to copper, have a heat-transfer ratio of 5.5 to 1.

**Nickel and nickel-cobalt alloy coating configurations**

Nickel and nickel-cobalt coatings can be applied to just the lower portion of the mold copper in a parallel or tapered-step configuration. These cost-effective configurations allow the copper hot-face to be machined and reused without replating but do not provide heat-removal insulation in the meniscus.

Nickel and nickel-cobalt alloy coatings applied across the full-face of the mold copper, in either a parallel or tapered configuration, are recommended for most casters. Full-face coatings not only resist wear and prevent star blisters but also provide the added benefit of slower heat removal in the upper half of the copper. Because full-face coating configurations promote uniform hot-face temperatures, heat removal is equalized, resulting in fewer longitudinal face cracks.

**NanoGuard® Mold Coating**

Our NanoGuard® Mold Coating has a hardness from 200 to 700 HV and is a proprietary coating process developed by SMS Technical Services that provides superior wear resistance.

A hardened nickel-based super alloy, it can be applied as a step or full-face coating and retains its physical properties very well at casting temperatures. Our NanoGuard® Mold



▲ A wide variety of in-house plating operations facilitate copper refurbishment with options ranging from copper to our premium nickel-alloy NanoGuard® Coating

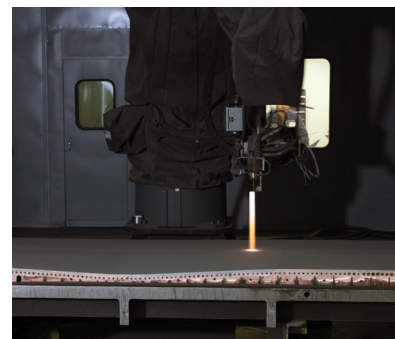
Coating’s wear resistance exceeds nickel and nickel-cobalt alloy coatings and is only surpassed by our UniGuard® Mold Coating.

**A breakthrough in mold coating technology**

The revolutionary UniGuard® Mold Coating is a mold coating breakthrough because it combines a hardness of more than 1000 HV that rivals hard chrome with the ability to withstand the meniscus temperatures of most continuous casting molds.

UniGuard® Mold Coatings can be applied to all copper alloys and nickel and nickel-based alloys and can increase mold campaign length two to six times longer than nickel and nickel-cobalt coatings. In fact, some casters have set mold-life records using molds coated with our UniGuard® Coating.

Because the UniGuard® Mold Coating’s wear-resistant composition is unaffected by heat, it can be used



▲ We have nearly 20 years’ experience applying thermal spray coatings

in the meniscus and provides superior protection from molten zinc and cadmium. And because the coating is not prone to fatigue and thermal cracking in the meniscus and is highly wear resistant, less copper is removed during refurbishment.

**Coatings that increase caster efficiency**

To learn more about how SMS Technical Services’s mold copper coatings can increase mold campaign lengths and improve product quality, please call +1-724-553-3420.

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