

DURA-NICKEL HP+[®] & DURA-NICKEL A1[™]



DURA-NICKEL: NEXT-GENERATION NICKEL SYSTEMS ENGINEERED FOR MODERN AMMUNITION APPLICATIONS

Traditional ammunition systems have not changed their principal materials of manufacture since the late 19th century. However, the construction of advanced, next-generation ammunition systems has evolved in recent years utilizing new materials including steel alloys, stainless steel, tungsten and even polymers. This change has expanded the performance envelope, significantly improving both ballistics and terminal performance while reducing cartridge weight.

New materials require component surfaces to be properly engineered, specifically at the areas of engagement. This is especially important when the materials in the design are further apart in the electromotive series, and therefore more likely to react and corrode with one another.

An example of this design consideration is in the use of exposed steel penetrators formed within a copper projectile. Coatings such as zinc have been used to delay corrosion of the steel penetrator. However, these sacrificial coatings have severe limitations that result in premature formation of white corrosion products even in moderate service conditions.

A FAMILY OF
HIGH-PERFORMANCE NICKEL BARRIER COATINGS
ENGINEERED FOR STEEL PENETRATOR PROJECTILES.

The Dura-Nickel family of coatings were engineered to solve the corrosion performance shortfall of a sacrificial zinc coating on a steel penetrator.



THE COATING REQUIREMENTS SPECIFIED A FINISH MUST:

- 1 PROVIDE ASSEMBLED SALT SPRAY PERFORMANCE UP TO 96-HRS WITHOUT DEGRADATION OF EITHER HARD OR SOFT TARGET PERFORMANCE
- 2 MAINTAIN EXTREME CONCENTRIC UNIFORMITY WITH A WEIGHT VARIATION OF LESS THAN +/- 0.25 GRAINS
- 3 ENSURE DURABILITY IN MASS HANDLING, HIGH PRESSURE BULLET ASSEMBLY, RAPID PRODUCTION SCAMP LOADING AND LINKING



**Dura-Nickel HP+[®]
& Dura-Nickel A1[™]**

Both meet all the specified design requirements.



Traditional Coating Systems

Each of these coatings failed one or more of the specified design requirements.

Various zinc systems, conventional barrier systems including heavy build copper or traditional nickel systems.

VS.

A complete summary of test results can be viewed at www.AdvancedPlatingTech.com

SACRIFICIAL VS. BARRIER CORROSION PROTECTION - WHAT IS THE DIFFERENCE?

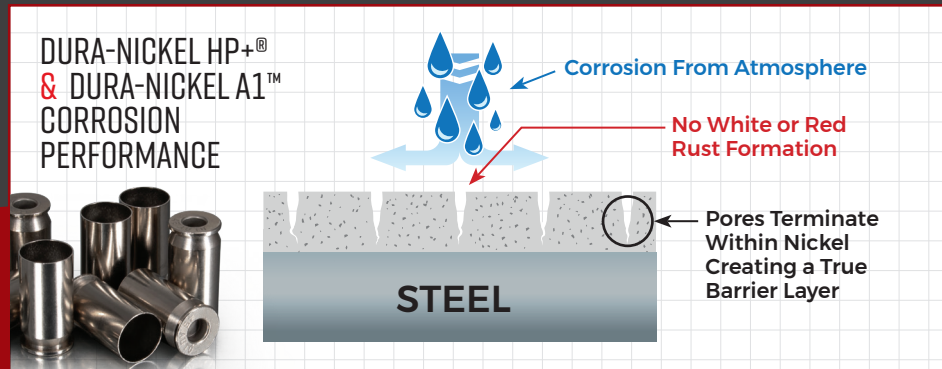
Corrosion resistance coatings fall into two primary categories - sacrificial or barrier coatings. The difference between the two lies in if the coating is more or less likely to corrode than the base material the coating is deposited on. Sacrificial coatings are more reactive than the base material, whereas barrier coatings are less reactive than the substrate. The advantage of sacrificial coatings is that thin coatings can provide

moderate corrosion protection. However, sacrificial coatings will corrode in preference to the base material, producing corrosive products such as white rust as a precursor to base material corrosion. Barrier coatings must be deposited thicker to create a pore-free barrier between the atmosphere and the base material. However, a pore-free barrier coating will not produce sacrificial corrosion products.

DURA-NICKEL HP+® & DURA-NICKEL A1™

ENGINEERED TO SOLVE THE CORROSION AND BALLISTIC DESIGN REQUIREMENTS OF STEEL PENETRATORS.

The performance advantages of Dura-Nickel can be leveraged within a range of ammunition applications including hybrid or steel case designs and improved corrosion resistance over traditional nickels on standard brass or gilding metal.



Dura-Nickel HP+®

is a more cost-effective coating that can be used in most applications where radii of the components can be maintained at 0.020" or greater.

Dura-Nickel A1™

is a next-generation coating within the Dura-Nickel family that provides improved corrosion resistance, especially in applications where sharp tips and radii of components are less than 0.020".

PERFORMANCE ADVANTAGES OF DURA-NICKEL:



OUTSTANDING CORROSION PROTECTION

- Barrier Coating Eliminates Potential for White Rust
- Reduced Galvanic Corrosion Potential on Steel Substrates Over Zinc or Copper Coatings
- Salt Spray Performance Exceeding 48-hrs (Dura-Nickel HP+®) and 96-Hrs (Dura-Nickel A1™)



UNMATCHED DURABILITY AND TOUGHNESS

- Low Stress Nickel with Outstanding Toughness and up to 30% Elongation
- No Use of Chromates or Other Thin Films that Can be Damaged in Rough Handling
- As Plated Hardness Between 40-55 Rc Resists Rough Handling & Impact Damage



TERMINAL PERFORMANCE ON ANY TARGET

- Melting Temperature of Over 2650°F will Not Fuse on Impact with Armor Plate
- Deposited at Below 200F - Will Not Decrease or Temper Base Material Hardness
- Soft Target Performance Unaffected by Barriers



ENGINEERED TO YOUR DESIGN REQUIREMENTS

- Exact Dura-Nickel System Matched to Application (HP+ vs A1)
- Plate on Any Substrate Including Brass, Alloy Steel, Stainless Steel and Copper
- Black Color Options Available for Tactical or Unique ID Requirements

Properties of Dura-Nickel HP+® & Dura-Nickel A1™

Property	Dura-Nickel HP+®	Dura-Nickel A1™
Hardness	Rc 40-45	Rc 50-55
Deposit Thickness Options	0.0001" per Side to 0.0015" per Side	0.0001" per Side to 0.0015" per Side
Thickness Tolerance (Per Side)	+/- 0.0001-0.0002" per Side	+/- 0.00005-0.0001" per Side
Salt Spray per ASTM B117*	Up to 48-Hrs	Up to 96-Hrs
Percent Elongation	Up to 30%	Up to 20%
Galvanic Couple to Steel	0.29 V	0.29 V
Coefficient of Friction	0.25-0.35	0.20-0.30
Color Options**	Satin Silver or Satin Black	Semi-Bright Silver or Semi-Bright Black

* Salt spray performance is a function of thickness and base material/condition. The highest corrosion resistance will require 0.001" or more coating.

** Black Color Options Available in Either Finish and Are Referred to as Dura-Black HP+ or Dura-Black A1 Respectively.

ENGINEERED SOLUTIONS IN SURFACE FINISHING

ESTABLISHED 1948

VISIT WWW.ADVANCEDPLATINGTECH.COM TO LEARN MORE ABOUT DURA-NICKEL HP+® & DURA-NICKEL A1™. CONTACT A MEMBER OF OUR TECHNICAL SALES TEAM AT: SALES@ADVANCEDPLATINGTECH.COM



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CERTIFICATIONS



ISO 9001

QUALITY MANAGEMENT



ISO 13485

MEDICAL DEVICES

