ADVANCED PLATING TECHNOLOGIES

DUCTA-BRIGHT 7A® NICKEL

DUCTA-BRIGHT 7A® NICKEL: AN ADVANCED NICKEL PLATING ENGINEERED SPECIFICALLY FOR CRITICAL AMMUNITION COMPONENTS

Nickel plating of ammunition components affords many functional advantages that have been utilized by the ammunition industry for years. Specifically, nickel plating of brass casings offers many improvements over unplated brass including:

- Lower coefficient of friction for improved feeding in all actions of firearms
- Enhanced corrosion resistance and reliability during extended storage or field exposure
- Improved visibility for low-light chamber checks
- Improved cosmetics and ease of cleanup during reloading

Very early on in ammunition development, the corrosion resistance of nickel was found beneficial on revolver calibers to avoid verdigris (green tarnish or spots) on brass casings which contacted leather belt pouches and holsters used by law enforcement. For this reason, traditional revolver calibers such as 38-Special and 357-Magnum are commonly nickel plated. More recently, the advantages of nickel have been utilized within the ammunition industry for critical defense, carry, and law enforcement applications as well as for premium safari-grade hunting calibers.

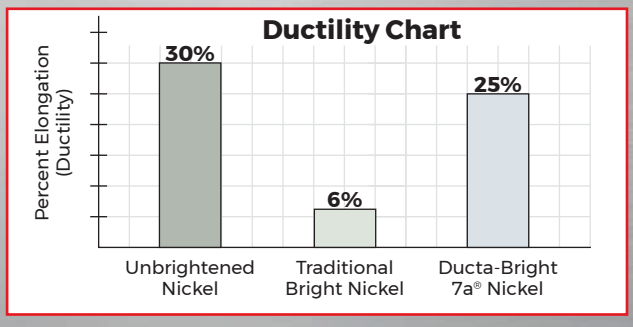
However, complications with nickel plating often cause ammunition engineers to hesitate from specifying nickel for new applications. Historic issues with nickel plated brass included cracking or flaking of the nickel, dimensional control of casings as well as a reduction in the reloading capacity or overall number of reloading cycles that a casing could endure.

DUCTA-BRIGHT 7A® NICKEL: ENGINEERED DUCTILITY, GUARANTEED FUNCTION

The engineering group at Advanced Plating Technologies recognized the limitations of traditional bright nickel and set forth to develop a ductile bright nickel system that eliminated the performance deficiencies of traditional bright nickel plating. A year-long engineering study ensued in which over thirty distinct bath solutions, brightener systems and operational parameters were investigated. The performance of each lot was tested both in controlled lab impact testing as well as live firing and reloading evaluations.

After all testing had concluded, it was found that Lot 7, Group A produced a ductile nickel superior to any other process giving the finish its namesake. The resulting Ducta-bright 7a Nickel® process not only yielded a fully lustrous as-plated deposit but significantly reduced the as-plated stress that limits the performance of traditional bright nickel systems. Ducta-bright 7a Nickel® produces a deposit with nearly five times the ductility of traditional bright nickel systems and nearly 85% the ductility of an unbrightened nickel deposit.

Ducta-bright 7a Nickel® is the only nickel system available today that has been engineered to withstand the bi-directional and dynamic impact stress loadings that ammunition components must endure. Simply put, there is no other bright nickel system today that can provide the durability, reliable function and reloading capacity of Ducta-bright 7a Nickel®. Ducta-bright 7a Nickel® is the benchmark plating process provided by Advanced Plating Technologies and is the foundational process for APT's premium coating offerings including the Black-TPD® process.



DUCTA-BRIGHT 7A® NICKEL

TRADITIONAL BRIGHT NICKEL: A PERFORMANCE GAP FOR AMMUNITION APPLICATIONS

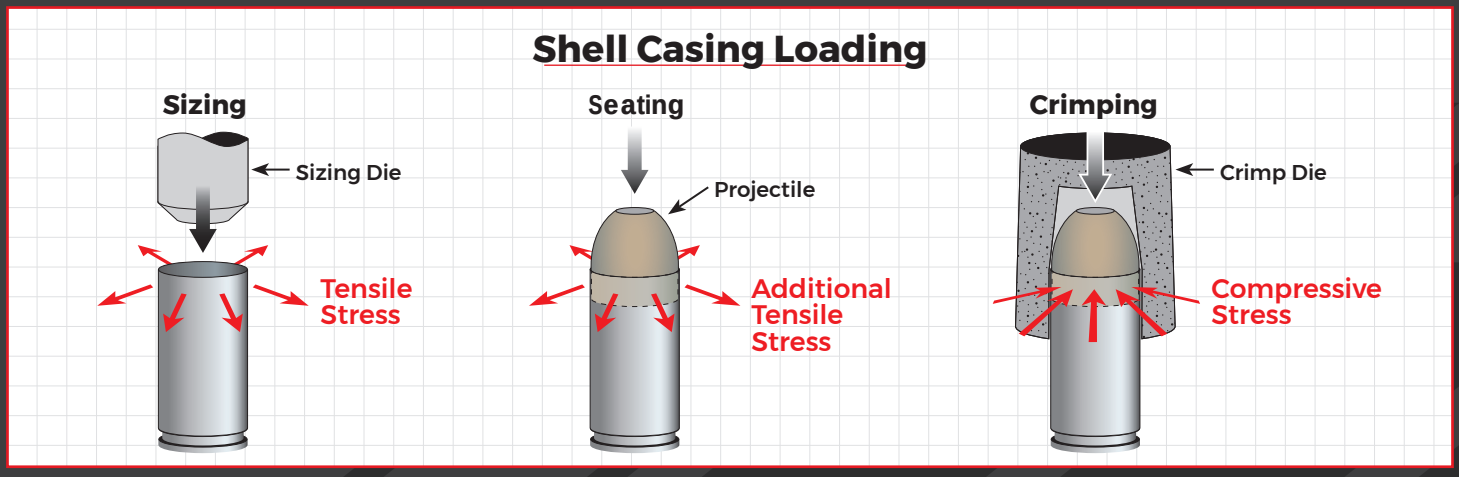
Nickel electrodeposits can be plated in both the brightened and unbrightened (matte) condition. Bright nickel plating has been the historic nickel deposit of choice within the ammunition industry due to the improved luster and marketing appeal that a bright deposit imparts. However, many of the functional issues with traditional bright nickel plating – such as cracking and flaking of the deposit – are inherent mechanical properties of a traditional bright nickel deposit.

In order to electroplate nickel with a bright appearance, organic brighteners must be added to the nickel plating chemistry. Organic brighteners refine the grain structure of the nickel deposit to produce a lustrous finish. However, the brighteners also have the undesired effect of co-depositing within the nickel deposit. These co-deposited organics increase the as-deposited stress of the nickel and reduce the percent elongation (ductility) of brightened nickel deposits to less than one-fifth of an unbrightened nickel deposit.

The reduction in ductility of traditional bright nickel deposits can produce a performance-gap with the design requirements of modern ammunition. Components such as shell casings must endure repeated cycles of compressive and tensile stress during the manufacture and reloading of ammunition. During loading, casings are sized or flared, which imparts tensile stress in the deposit. Seating of a projectile imparts further tensile stress as the casing expands to the outside diameter of the projectile. The casing is then taper or roll crimped which reverses the stress in the compressive direction. The nickel coating must withstand this bi-directional loading stress followed by the violent dynamic impact stresses that occur during firing. This stress cycle is then repeated numerous times if a casing is reloaded.

WHAT ARE ORGANIC NICKEL BRIGHTENERS?

The process of electroplating of nickel was originally developed by Oliver Patterson Watts in 1915. Originally, nickel was only plated from an unbrightened condition and had to be mechanically buffed or burnished to achieve a lustrous finish. Due to the costs associated with post-plate polishing, considerable research and development was performed on methods to plate nickel in the as-bright condition. It was found that brightness can be induced in a nickel finish with organic aliphatic and aromatic compounds that decompose at the surface of the deposit to refine the grain size. However, these compounds also co-deposit sulfur and carbon in the nickel, increasing the as-plated stress of the deposit. The increased as-plated stress reduces the plating's ductility and corrosion resistance, limiting the deposit's capacity to flex.



VISIT **WWW.ADVANCEDPLATINGTECH.COM** TO LEARN MORE ABOUT DUCTA-BRIGHT 7A NICKEL®.
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