

Features and benefits of ArmorGalv® thermal zinc diffusion

By Michael J. Pasko, applications engineer, SPIROL International Corporation

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Thermal diffused zinc, a finishing process historically known as sherardising, has been used for corrosion protection of metal parts for over a century, and over the years improvements have been made. The modern, greatly improved process, known as ArmorGalv® is now being introduced to the fastener industry by SPIROL.

ArmorGalv is anodic to steel and as such, provides long-term sacrificial galvanic protection. Unlike traditional electroplating there is no risk of hydrogen embrittlement, adhesion is superior, coating thickness uniform, and all surfaces are covered. There are no insignificant surfaces. The affordability, durability, and low environmental impact of ArmorGalv makes it ideal for today's market.

ArmorGalv is a zinc alloy thermal diffusion coating, and is covered by ASTM A1059M-08(2013). This process requires a closed container, heated to a minimum 343°C (650°F), with a powdered zinc mixture. At this temperature sublimation of the zinc mixture occurs and it is dispersed into the container as a vapour. Being soluble in iron, the zinc vapour subsequently diffuses into the surface of ferrous parts. Volume of the zinc mixture is calculated based upon total surface area of the parts resulting in excellent control of resultant thickness with near total consumption of the zinc powder.

After the diffusion, specially designed topcoats and sealers are applied to complete the finish. The United States Environmental Protection Agency has stated this finish approaches zero emissions and it has received recognition and awards for its contribution to pollution prevention. There is no hazardous chemistry and water consumption is extremely low. In addition to these benefits, ArmorGalv exceeds the performance benchmarks of many competing solutions.

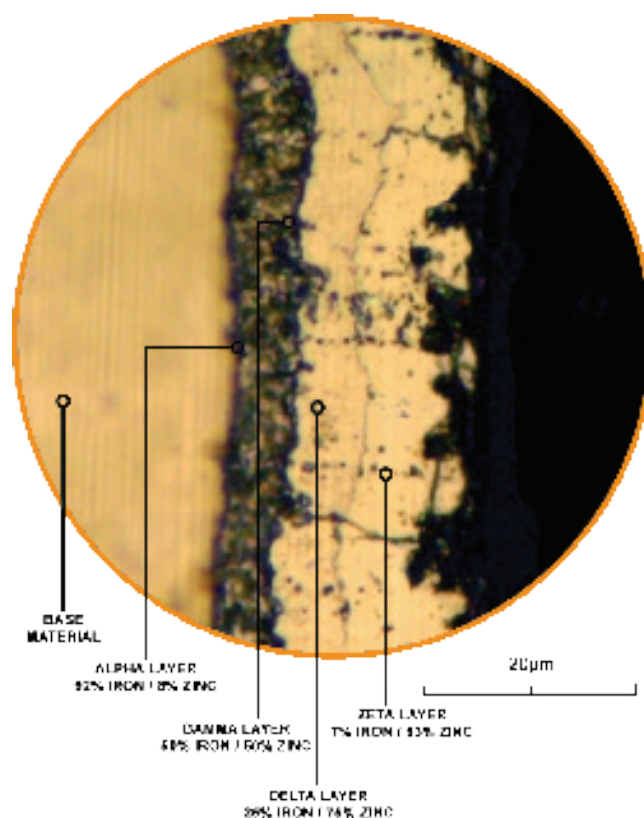
SPIROL recommends ArmorGalv coating as an alternative to traditional platings and coatings for many reasons including product quality, maximum corrosion protection/performance, cost-effectiveness, and environmental stewardship.

The primary benefits of ArmorGalv include 1,000+ hours of corrosion resistance; zero risk of hydrogen embrittlement; will not reduce fatigue strength of material – applicable to all alloys including stainless; uniform deposition of coating on all surfaces; and features anti-galling characteristics similar to cadmium.

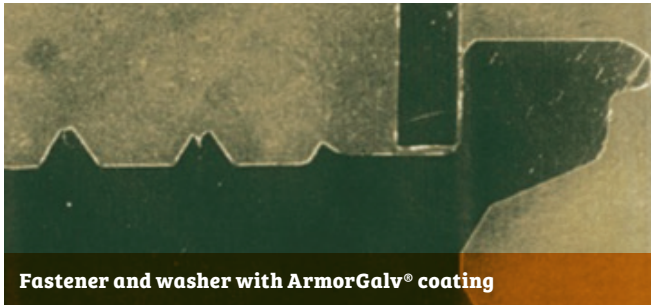
Approximately ⅓ of finish thickness is diffused into the coated surface effectively becoming part of the component, which means no flaking, peeling or blistering and the coating is also hard and highly abrasion resistant at 37-42 HRC.

ArmorGalv offers a low risk, cost-effective, high performance alternative to many of today's plating and coatings. With ever increasing performance and life cycle requirements, this coating is an ideal solution for fasteners used in some of the most aggressive environments such as marine, automotive, mining, and industrial manufacturing.

The image below demonstrates the layered structure of ArmorGalv. Maximum percentages of zinc occur at the surface with the percentage of iron increasing with depth – 20 microns average coating thickness is applied to SPIROL fasteners.



Uniformity of deposition is visible in the following photographs. Note coverage of all surfaces including peaks, valleys, corners, and gaps:



A closer cross-section with thicker deposition for clarity in the two images below and to the right:



SPIROL leads the innovation of new technologies in the fastener industry in order to meet the ever changing requirements of a dynamic market. Until now, thermal diffused zinc had not been a commercially viable option for small components. By leveraging its 68+ years of engineering ingenuity, developing the associated process, and investing in the necessary equipment, SPIROL is able to bring this coating to the fastener market at a cost-effective price.

“ArmorGalv is a game changer in the fastener industry, and SPIROL is proud to be at the forefront of bringing this technology to the market,” comments Christie Jones, marketing manager at SPIROL.

Currently ArmorGalv is only available for SPIROL’s tubular product lines. However, it is looking forward to rolling out ArmorGalv for other product lines in the future.

info@spirol.com