THERMAL ZINC DIFFUSION COATING (TZD)

For corrosion protection, this is a technically superior replacement for zinc plating, hot dip galvanizing, mechanical galvanizing, zinc flake dip-spin and various other competitive processes. In some cases, TZD can even replace stainless steel or chromium plating. TZD delivers exceptional protection against corrosion and also eliminates hydrogen embrittlement, provides superior adhesion and greater uniformity. It wears longer and is competitively priced — plus, it's completely eco-friendly! TZD processes and coatings are totally free of toxics and pollutants, including heavy metals and Cr6+ and Cr3+

The TZD process (Sherardizing) consists in diffusing zinc coating into steel items. The reaction takes place in a rotating electric oven filled with zinc powder at temperatures of 320–430 °C. The process leads to the formation of an outer layer of steel impregnated with zinc on the surface of the protected steel items. This resulting surface layer is characterized by extraordinary anticorrosive protection, without the original dimensions of parts having changed. In addition, the thermal diffusion method is characterized by unbeatable abrasion resistance due to the absence of any applied layer, which will subsequently peel. Due to lower temperatures, the internal steel structure is unaffected by the process and therefore this method is also suitable, for example, for protecting springs and similarly heat-treated elements.

TZD process technology — Phase One:

Starting parts must be free of oil, oxides and other debris and are typically cleaned immediately prior to the coating process using traditional cleaning technologies.

The clean parts are placed in a large metal container along with the proprietary Distek powder containing the key ingredients of zinc (Zn) and other types of various Ballast used only for maintaining a constant temperature in the container during the cyclic process. The container is sealed and commences to rotate while its temperature is ramped through the required temperature profile.

With increased temperature the Zn diffuses into the iron (Fe) surface of the substrate. At the same time, the Distek powder diffuses into the Zn powder. These processes initiate a Zn-Fe diffusion layer and also a Zn powder with a lower melting temperature.

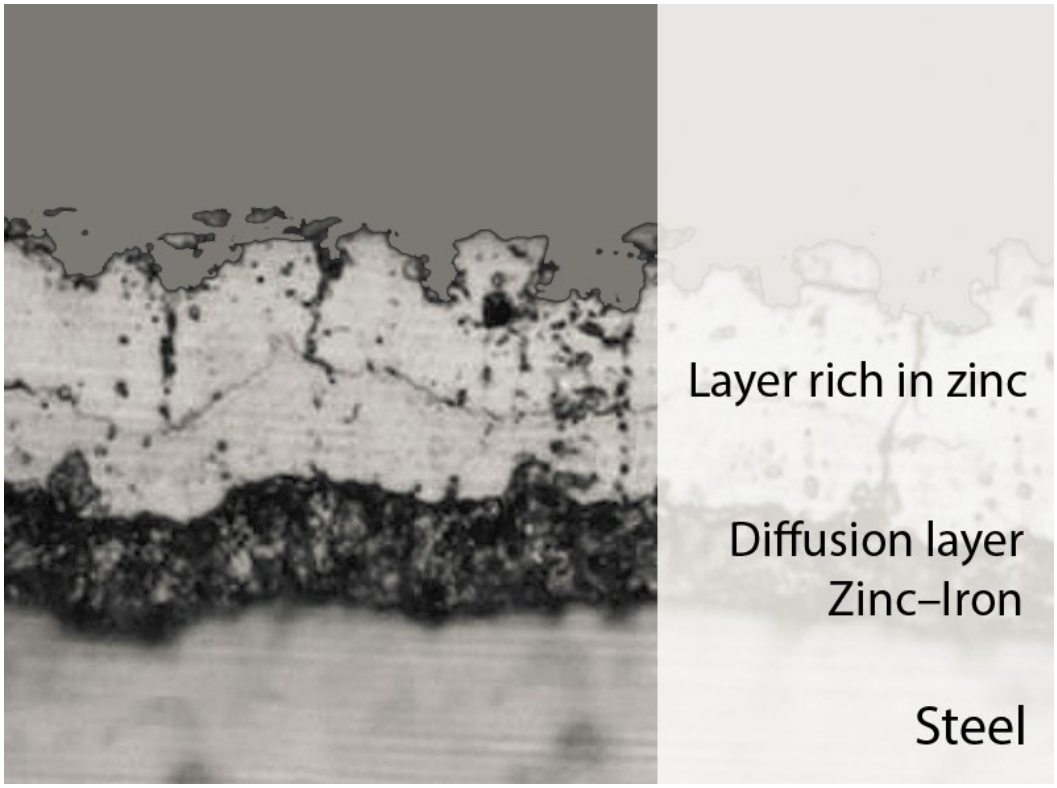
TZD process technology — Phase Two:

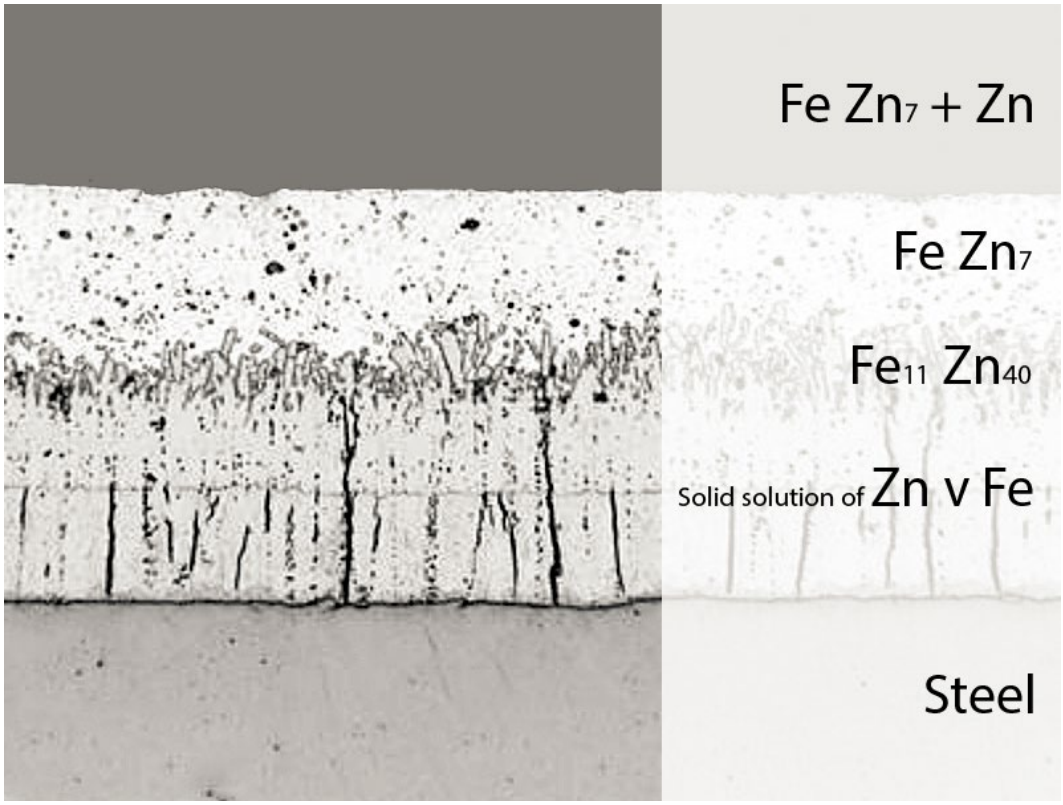
Melted grains of the Zn powder are absorbed onto the Zn-Fe diffusion layer and begin to locally react to create a Zn-Fe intermetallic. The increased Fe content raises the melting temperature and results in a fine dispersion of Zinc rich regions in the TZD structure. The overall thickness of the Zn-Fe diffusion layer continues to thicken until the zinc powder is consumed — completing the process.

TZD process technology — Final Result:

ArmorGalv's thermal diffusion coating process forms a protective layer that is physically diffused into the substrate. Metallurgically bonded, it cannot be easily separated by physical or environmental forces. In addition, the Distek powder inclusions dispersed on the surface serve to heal any micro fissures, cracks, or porosity in the coating, while the zinc provides a sacrificial barrier against corrosion. The result is a highly uniform coating that gives exceptional protection against corrosion as well as enhanced durability and other performance advantages. The natural micro-roughness of the Armorgalv surface gives it superior adhesion qualities for metal topcoats as well as for paints.

The TZD process is carried out in closed chambers, where the zinc diffuses into the steel structure. For this reason, the chamber size limits the maximum dimensions of the parts intended for thermal zinc diffusion.





Coating cross-section, 200x magnification using an optical microscope

Advantages of the technology

- Strong adhesive bonding of layers – without peeling or cracks.
- High corrosion resistance.
- High coverage reliability – about twice as long a period of corrosion resistance compared to hot-dip galvanizing. With thermal zinc diffusion, for example, the standard thickness for a layer of Class 35 intended for a corrosive environment is 30 microns, whereas the equivalent is 70 microns using hot-dip galvanizing.
- High durability of the resulting surface – very high abrasive resistance.
- Uniform thickness of the resulting layer.
- Smooth surface prevents the formation of zinc build-ups and greater roughness.
- Complete coverage – repeatability of processing.
- Provides the perfect surface preparation for painting or rubber coating.
- Possibility to obtain zinc layer in the range from 15 to 120 µm.
- Relatively low process temperature – special parts such as springs can be processed without affecting their mechanical or strength characteristics.
- Environment-friendly process. No use of chromium plating.

Quality standards

- ISO 17668:2016 - Zinc diffusion coatings on ferrous products - Sherardizing
- American Standard Testing: ASTM B633, ASTM B695
- Russian Federation Standard: GOST R 51163-98

Coating Classes

In accordance with ISO 17668:2016, thermal diffusion coating thickness is determined according to the following classes:

Class	Minimum coating thickness (µm)	Application
Class 15	15	Ordinary indoor and outdoor conditions
Class 30	30	Indoor and outdoor conditions in more aggressive environments or if requirements for coating lifetime are greater
Class 45	45	Strong corrosive environment, industrial and sea atmosphere