

ASK DR. GALV

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I have had the occasional request that an item's galvanized coating be made dull and not shiny so it will blend into surroundings and not stand out. What are the best methods of performing dulling processes?

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Dulling requests are infrequent and—usually—ridiculous; but there are some instances when it is necessary to appease the customer's request.

As the reflective nature of galvanized steel has been blamed for car accidents, poor visibility, and disrupting the quiet and peaceful surroundings of nature by disturbing the wildlife, there are several ways of achieving less-reflective, dull or matte finish on newly-galvanized material.

Natural Weathering

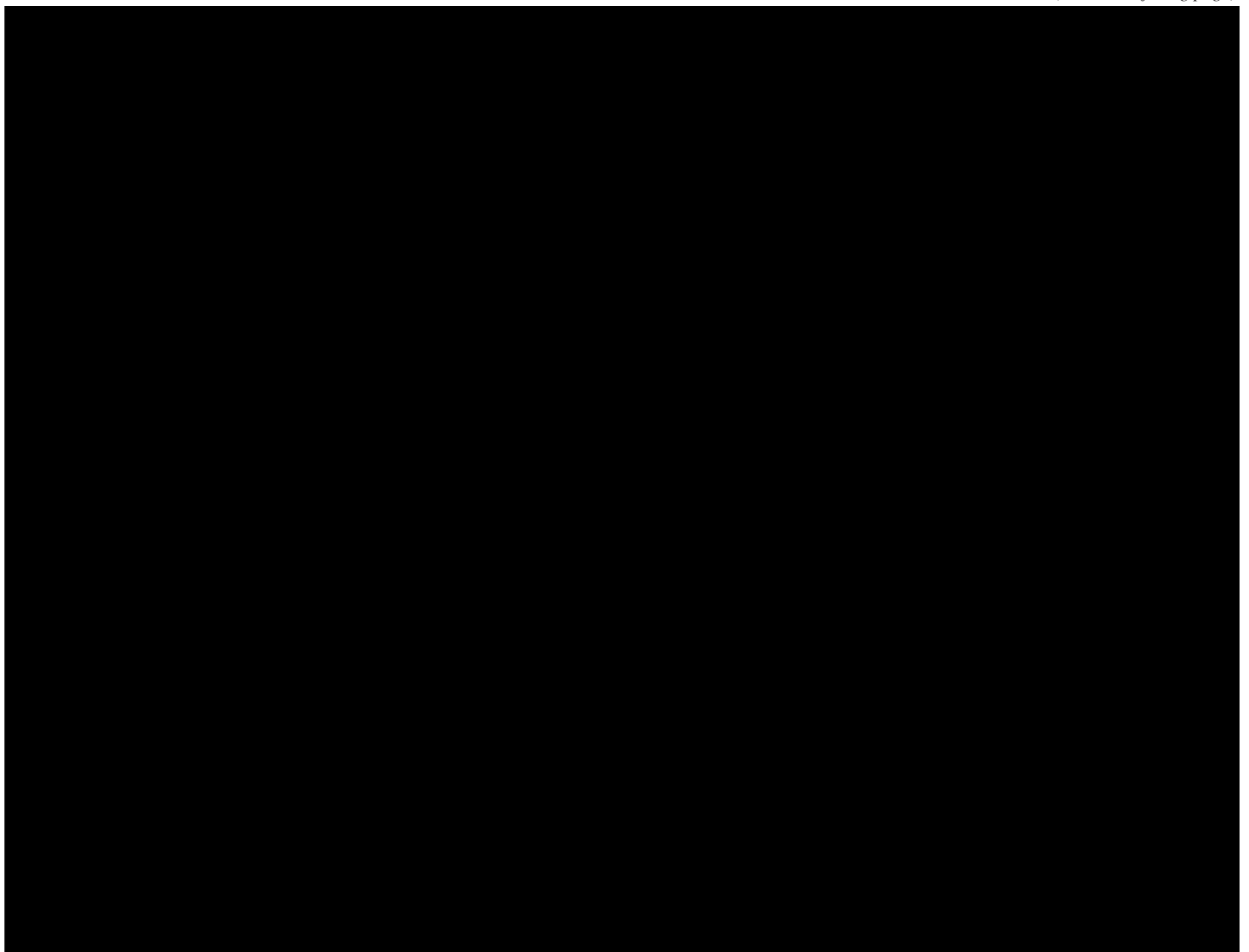
The primary method of achieving a dull galvanized finish is to allow the material to age for more than six months. Additionally, it is recommended that you omit any quenching

steps from the process, including chromating. Recent observations reveal that, while newly-galvanized steel—with a bright, shiny coating—has a reflectivity of over 70%, the zinc patina will decrease reflectivity as the HDG coating weathers. For example, after 72 hours of outdoor exposure, the reflectivity on one pole dropped to 55%. After two years of outdoor exposure, another pole's reflectivity dropped to 28%. A third pole, exposed for four years, dropped to 23% reflectivity. The formation of the zinc patina and the probable accumulation of dust and dirt will significantly reduce the reflectivity on these poles over a relatively short time period.

Chemical Post-Treatments

The second most-common method of dulling newly-galvanized material is through the use of chemical post-treatments. There are several different name-brand products currently available on the market; the majority are largely comprised of acidic zinc phosphate. When applied to the surface of newly-galvanized steel, they deposit fine-grain zinc phosphate crystals (that can be a recommended surface preparation for painting). The solutions are applied by either spraying on the surface or immersion in tanks. The process is essentially a cleaning, phosphating, and acid rinse sealing, with rinsing between each of the steps. Zinc phosphating is

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employed when the job size is quite large. Colorado's Public Service Company used a spray-applied solution to dull galvanized steel. The solution consists of three pounds of copper sulfate crystals per gallon of water (if the crystals dissolve poorly, they may be crushed prior to addition or hot water used). Let the water cool and add one half pint of concentrated-grade hydrochloric acid, stirring well. The acidified copper sulfate solution should be applied with the use of low-pressure spray equipment. A dull coating will form on the zinc immediately upon spraying; the steel should then be rinsed with water to stop the acid action.

Galvanizers can do something very similar with their acid or flux tanks—however, care must be taken and immersion times monitored as not to impair the service life of the coating. Results from this immersion step are varied and can leave the material very blotchy with dull and not-so-dull areas all over the part. This is only appropriate for very small jobs.

Process Variables

There are certain steps a galvanizer can take to try to intentionally form more intermetallics in the coating and thus create a darker or less-shiny surface. If the steel part is thick, i.e. greater than 0.5", not quenching the material and allowing it to cool down slowly will promote the work to form more intermetallics as the part stays at or near reaction temperature, even when withdrawn from the kettle. Allowing the bath concentration of aluminum to drop below 0.005% can likewise give a duller surface.

Mg Experiment

In 1973, the American Smelting and Refining Company studied the feasibility of magnesium addition to the galvanizing bath in order to produce a duller coating in the finished product. Steel panels were galvanized under standard conditions using a spelter of up to 1.0% Mg. A dulling effect was noticed in all samples galvanized in spelter concentrations greater than 0.4% Mg; however, concentrations greater than 0.2% began to produce deleterious effects in the coating adherence and excessively-thick coatings were also observed. The major drawbacks discovered by the study were the preferential oxidation of the magnesium from the bath (which might rule out its use as a dulling agent for long-term production runs) and the cost of Mg (which may outweigh post-treatment methods).

Conclusion

You can achieve a less-shiny galvanized finish via the following methods:

- For most products, do nothing and the coating will be dull in just six months.
- For small jobs, the flux or acid tank may be used.
- For larger jobs, investment in a post-treatment tank for one of the proprietary systems using zinc phosphate.

Remember the customer is always right . . . unless you can convince him/here there is a better way!