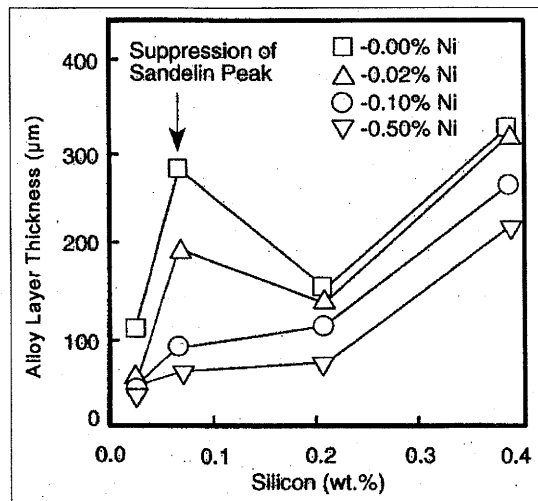


DR. GASK GALV

Q *What are the benefits to using nickel in galvanizing kettles and what does it do for the finished coating? Also, I have noticed an increase in dross formation since we started using nickel in our kettle. What's going on?*

A Nickel additions to galvanizing kettles are primarily made to suppress the reactivity of silicon- or phosphorus-bearing steels. It is used secondarily to improve the coating appearance by making it more bright and shiny. If the amount of silicon or the silicon equivalent [SE = (%Si) + 2.5(%P)] is between 0.04% and 0.15% or above 0.25%, the coatings produced in a galvanizing kettle will be excessively thick. These thicker coatings are less adherent and more susceptible to damage during handling. The silicon or phosphorus in the steel will accelerate the intermetallic crystal growth of the galvanized coating. Often these thick coatings are matte gray in

appearance, which is objectionable to some customers. The presence of nickel in the kettle will reduce coating weights on some reactive steels to an acceptable level that produces an aesthetically pleasing appearance, as well as a tightly adherent coating.



ASK DR. GALV

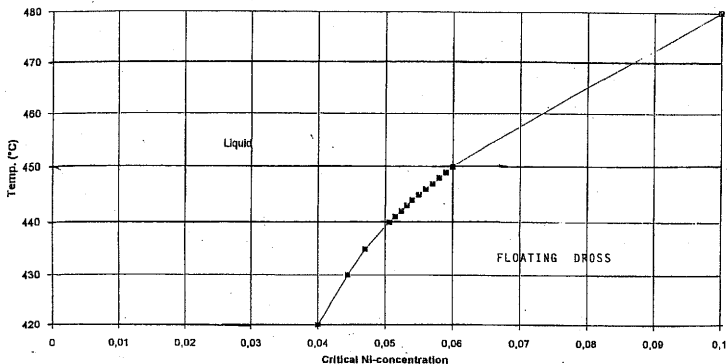
The amount of nickel in the galvanizing kettle must be controlled very accurately. The level of nickel should be below 0.1% and, commonly is maintained between 0.04% and 0.09%. The level of nickel in the kettle can be maintained in two different ways. The first is to make master alloy additions of between 1% and 2% nickel when zinc is added to the kettle. The second way, developed by TeckCominco, is to use a "direct alloying process" by adding nickel in the form of a powder. The monitoring and replenishment of nickel to the kettle must be done often because it is rapidly depleted from the bath and unmaintained levels may be ineffective and sometimes costly.

One other appealing characteristic of nickel additions to the galvanizing kettle is the final appearance of the coating. Parts that are galvanized in a kettle that contains nickel often have a shinier appearance. This appearance is sometimes preferred by architects or engineers for aesthetic reasons.

Nickel additions not only affect the growth of the intermetallic crystals, but they also affect the solubility of iron in the molten zinc. Large, excess amounts of nickel will lower the solubility of iron, especially at lower galvanizing temperatures. When the solubility of iron is decreased in the galvanizing kettle, an increase in dross formation is inevitable. The chart on page 19 shows the maximum levels of nickel that will not form an excess of dross for a range of common galvanizing temperatures. If your temperature and nickel concentration intersect above the curve, then no increased dross formation should be expected. However, if they intersect below the curve, than an increased amount of dross will be produced and occurrences of floating dross may also be evident. When the nickel concentration is targeted and maintained at around 0.05%, there should be no significant increase in the amount of dross produced for most galvanizing temperatures.

Continued on page 19

Range for Dross Participation



Reference: "Hot Dip Galvanizing with Zinc-Nickel Alloy"
Union Miniere

When used properly, nickel additions to the galvanizing kettle can be very useful in controlling the reactivity of some steels. Due to its shinier appearance, the final coating of the galvanized steel produced by nickel-containing baths is often preferred to that produced by a non-nickel-containing bath. There is a potential for low coating weights on some low-silicon, very smooth steel pieces such as pipe or tubing. Nickel users should run trial pieces of this type of steel to adjust their process, if necessary.