DIPPING ZINGA

For some applications, it can be beneficial to dip steel structures in a bath of ZINGA. This includes structures that are very small (bolts, nuts, fittings,...), structures with small openings (pipes, grids, hollow beams, ...), and other difficult to coat steel structures (ornamentals, rebars, frames, chains, ...).
Dipping ZINGA can be a very cost-efficient system with minimal waste and environmental impact, but it is vital that all factors of the dipping process are carefully assessed to ensure good application and consequently good galvanic protection of the ZINGA layer.

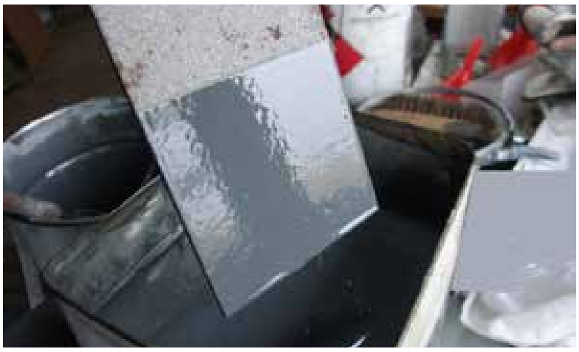
ASSESSING THE PARAMETERS

The following parameters are of big importance when setting up a ZINGA dipping system:

1. Density / solids by volume

   This parameter is related directly to the amount of dilution (with Zingasolv) and is the most important parameter for ZINGA dipping.

   A density of ZINGA which is too high (no sufficient dilution) will lead to a very high Dry Film build up and consequently problems with solvent retention, bubbling, pinholes and adhesion failures. It will also lead to sagging of the layer.

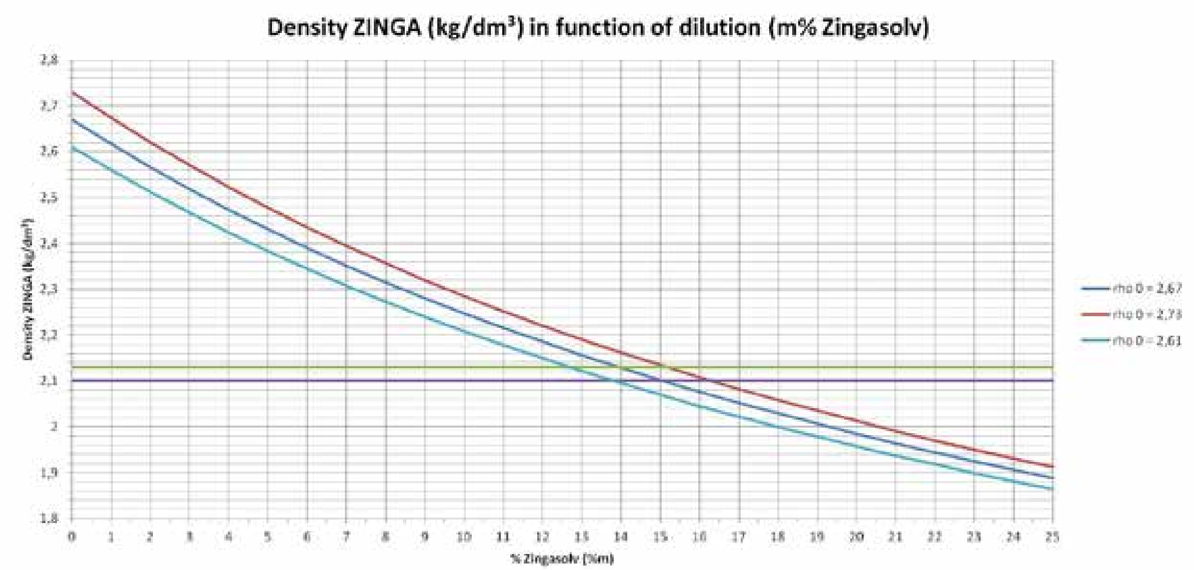


This panel was removed too quickly from the tank and has a 'fat edge'

Excessive layer build up of ZINGA with pinholes

   A density of ZINGA which is too low (too much dilution) will lead to insufficient layer thickness and consequently insufficient galvanic protection of the steel substrate. It will also lead to running off of the ZINGA. Keep in mind that it is pointless to dip the structure for a second time in the ZINGA bath, as the ZINGA will reliquidise the first layer and this will lead to no build up of the layer thickness.

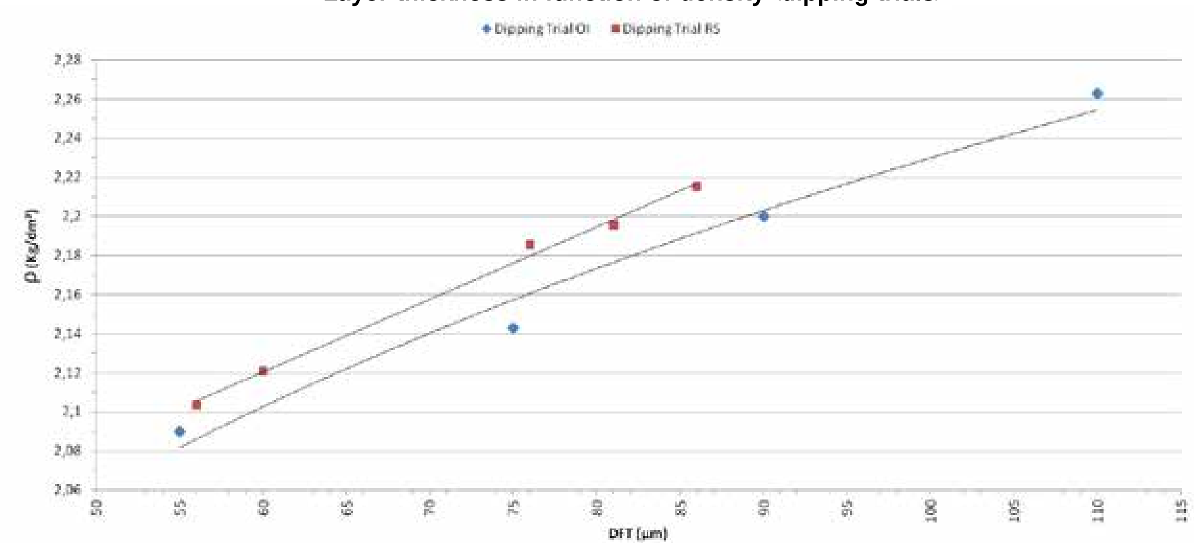
   It has been assessed that the most suitable density for ZINGA dipping is between 2.1 and 2.13 kg/dm³.



This density is achieved by dilution of between 12 and 15% with Zingasolv.

This will result in a Dry Film Thickness between 60 and 80 µm DFT. This is good for a C3 environment or for overcoating.

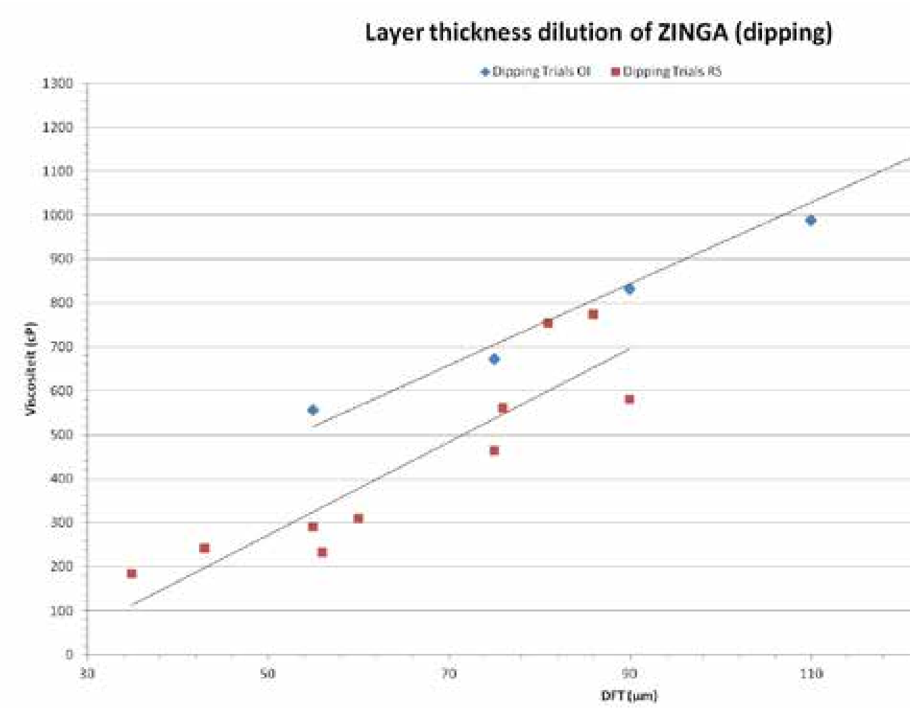
Layer thickness in function of density (dipping trials)

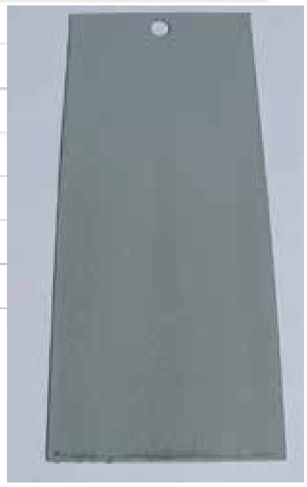


2. Viscosity / temperature

   Though of less impact than density, the viscosity also has an impact on the ability of the ZINGA for dipping. The viscosity is directly related to the dilution (specific weight) and the temperature. Less influence on the layer thickness, and more on aspect of the ZINGA layer after dipping. Since the viscosity is relative to the temperature, it is not a good parameter for ZINGA dipping specifications.

   This aspect needs more investigation.





3. Mixing of the ZINGA

   It is of most importance that the ZINGA is constantly mixed in the bath during application. A good bath design is therefore vital (see below). Insufficient mixing will lead to settlement of Zinc on the bottom of the bath and consequently to “thinning-out” of the ZINGA on the structures.

4. Pull-out speed

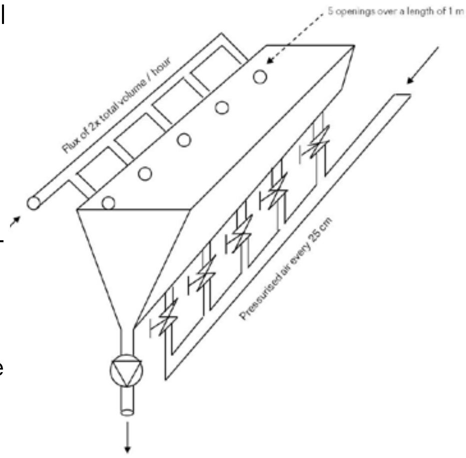
   If the plates/structures are pulled-out of the ZINGA bath too fast, the plates will show run-offs and uneven distribution of the ZINGA on the substrate. It is recommended to pull out the substrate as slowly as possible / feasible.

PREPARING THE SURFACE

For dipping, the steel surface should be prepared as normal for a ZINGA application (see ZINGA TDS). However, for very small applications (nuts and bolts), or structures with small openings (pipes, grids), this might not be feasible.

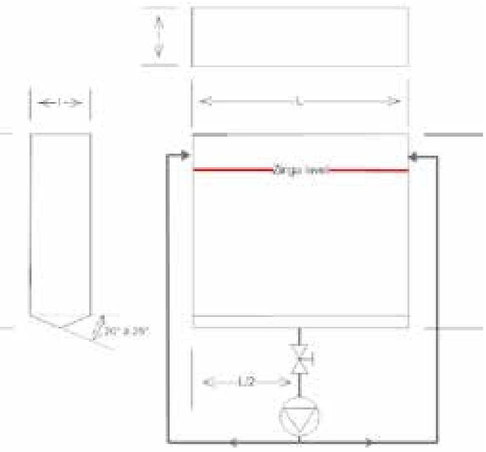
These structures can be phosphatised: a thin layer of a phosphate coating is etched onto the steel surface and forms a rough layer which is suitable for ZINGA adhesion. Always use Zinc phosphate (never iron phosphate) with a minimum weight op 16-20 g/m².
However, it is unsure whether the Phosphate layer is sufficiently conductive to assure galvanic protection. This is requires more research to be carried out.

DESIGNING THE BATH



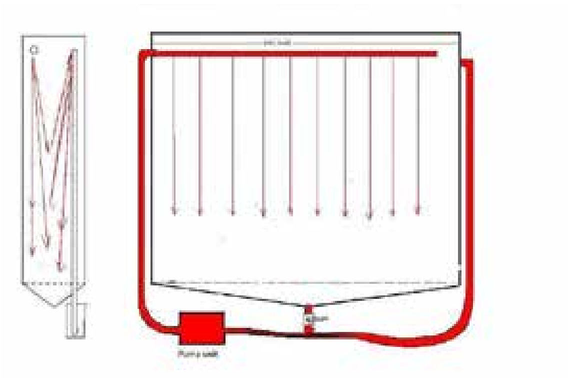
The design of the bath for dipping is crucial to control all the essential parameters for dipping ZINGA.

To ensure that the ZINGA is very well mixed throughout the tank at every level in order to maintain a correct and consistent density, a re-circulating system must always be used.
This system must be capable of re-circulating all of the zinc in the tank at an absolute minimum of three times per hour in order to maintain this consistency.



The return feed-pipe to the tank must have the end below the level of the zinc in the tank, or else it can introduce air into the zinc and this can cause the zinc to make a froth on the surface.
Air blowers must never be used inside tanks to try and mix the zinc, as they cause the solvent to evaporate prematurely, and this increases both the density and DFT of the zinc.

The floor of the dip-tank must be inclined a a minimum angle of 30° to ensure that the zinc will travel easily towards the exit-point at the base of the tank on the low side.
This also prevents the build-up of zinc mud on the tank floor, and helps the pumping system to keep the zinc moving during its re-circulation process.



The pump unit should be located at the side of the tank and not underneath, and this avoids the pump being clogged with zinc mud if the system ever stops working for any reason.
To help with this, a ball-valve should be fitted before and after the pump within the piping system.

On commercial tanks, the minmum diameter of the steel piping in the circulation system should be 75 mm, with the pump having matching inlet and outlet ports.

For testing purposes, two designs of dipping baths have been made. For commercial purposes, the baths should be upscaled.