

## Zinc phosphating: applying zinc nickel phosphate complexes on carbon steel surfaces *Metal conversion layers for a more sustainable protection*

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### Introduction

Vecom Metal Treatment B.V. in Maassluis had changed to a different chemical process for phosphating the pickled steel parts since the last quarter of 2010.

A stronger metal conversion layer was required than the iron phosphate layer that was applied until then. A conversion treatment is the chemical process that is applied to obtain a finishing coat (conversion layer). Conversion layers consist of oxides, chromates, phosphates or sulphides. It are therefore inorganic finishing coats. The fluid in which the process takes place contains constituents that initially dissolve a part the metal surface. The dissolved metal ions react directly with constituents from the fluid itself and form the precipitation or conversion layer.

### Zinc nickel phosphate complex

After degreasing and pickling, the surface of the carbon steel is very reactive, there is no protection layer anymore between the clean steel surface and the air humidity. As a result the steel surface will therefore corrode very fast. In order to combat this very quick corrosion, the steel is immersed in a hot diluted phosphoric acid solution after pickling, which is done in an inhibited diluted hydrochloric acid solution. This is the so-called phosphating.

In the past an iron phosphate layer precipitated on the surface of the steel through phosphating. This a temporary protection layer on the steel that offers a protection against the corrosion. However, this layer is not very stable and will decompose under the influence of the air humidity, after which there may be corrosion again. The basis for zinc phosphating is still diluted phosphoric acid. However, zinc and nickel has been added. This means that no iron phosphate layer precipitates anymore on the steel, but a zinc nickel phosphate complex. The advantage of this new layer is that it is more stable than the iron phosphate layer.

As a result it is less sensitive to air humidity and the steel surface remains corrosion-free for a longer period. An additional advantage is that a zinc nickel phosphate complex gives the steel an even dark-grey surface and shows much less stain development than the iron phosphate layer.



Attention: both the iron phosphate layer and a zinc nickel phosphate complex are temporary protection layers and disappear easily through (rain) water.

After the (zinc) phosphating it will therefore be necessary to apply a more permanent conservation layer in the form of, for example, a coating (exterior) or conservation oil (internal). When piping or tanks can be used again, they can obviously also be protected (preserved) by the product itself, which can be found in the piping or tanks, for example a lubricant or fuel.

Another additional advantage of a zinc nickel phosphate complex is that it results in a good paint adhesion on a clean and corrosion-free steel surface.

### Cold phosphating

Vecom B.V. also has this zinc phosphating fluid in a variant that can be used cold under the name of Cold Phos/Aro.

Cold Phos/Aro can be safely used on almost all metal and painted surfaces. Cold Phos/Aro is applied everywhere where metal surfaces have to be painted, and where sandblasting, hot phosphating or pickling in baths is not possible. For example, when pipes and large constructions have to be stored and transported. This product is also often applied for the removal of rust stripes on painted surfaces.



Carbon steel is being immersed in the zinc phosphate bath