D•O•K Chemie

Nanoceramics

New Pretreatment for 4- to 6-Zone Systems

- For steel, aluminum, and zinc
- No sludge, no heavy metals
- Replaces iron phosphating
- Easy to handle
- Environmentally safe
- Quality similar to that of zinc phosphating

Iron phosphating is a standard method for applying a conversion coating prior to applying a subsequent layer of paint. Adhesion and corrosion resistance are better on iron-phosphated surfaces than on surfaces that have merely been washed. While zinc phosphating improves the quality still further, it does have disadvantages: it involves the use of heavy metals, it is a complicated process, and it results in excessive sludge buildup.

Production part after nanotreatment

Nanoceramics, on the other hand, can be used for generating conversion coatings on steel, aluminum, and zinc with little difficulty. The process is environmentally safe (no heavy metals), requires only one bath setting, and protects against corrosion virtually as well as zinc phosphating.

Above: Nanoceramic treatment
Below: Untreated steel

Because it produces the characteristics of a coating (extremely thin, very large surface area), nanoceramic treatment yields better adhesion properties than zinc phosphating. No nanoparticles are present in either the as-received state or during processing.

This eliminates any health risks posed by contamination, as the deposited layer is

the only nanomaterial involved.

System concept:

A 5-zone spraying system provides the optimum conditions for nanopretreatment (see system diagram).

1. Alkaline degreasing with Eupur builder and Euclean degreasing agent, 90 – 180 seconds, 45 – 60°C
2. Rinse
3. Rinse with deionized water
4. Nanoceramic treatment, 30 – 120 seconds, pH 4 – 6, room temperature
5. Rinse with deionized water

Alkaline cleaning and the initial rinse step are followed by a second rinse step with deionized water, a process that decreases the consumption of nanoceramics. The concentration of the nanoceramic bath should be adjusted automatically using a timer. The cascade in the illustration shows how water is fed from the final DI (deionized) water ring back into the alkaline degreasing zone as a way of reducing the use of fresh water, chemicals, energy, and wastewater.

Initial colors for steel range from gold to blue to shades of pale violet.

Consumption:

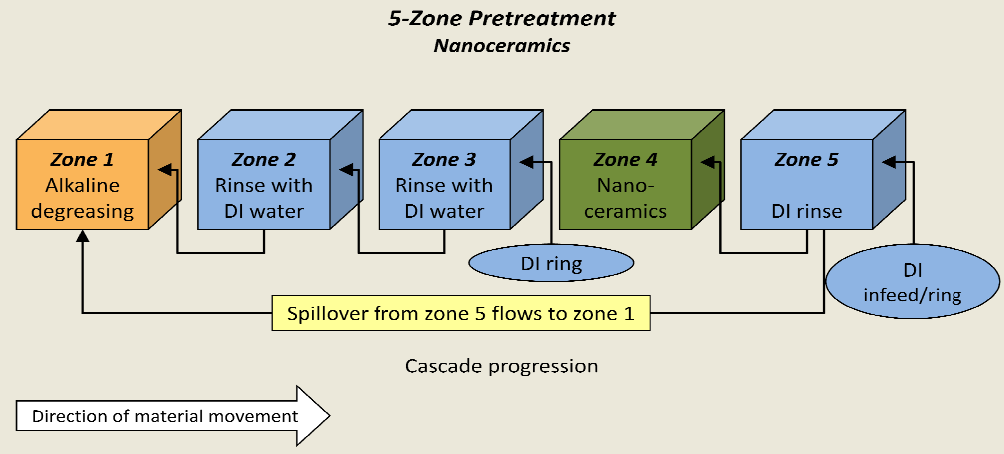
Consumption of nanoceramics is very low and does not generally exceed 2 g/m^2.

Quality:

Average corrosion creep as measured by the salt spray test (defined in DIN EN ISO 9227) was reduced to at least half of that measured for iron phosphating. Typical values after 240 hours are <1 mm for steel, 0 mm for aluminum, and 0 – 3 mm for galvanized surfaces (depending on the zinc coating). After 720 hours, values of 0 mm are generally achievable for aluminum and hot-dip galvanized metals. Values below 2 mm can be achieved for steel.

Under certain circumstances, similar values can also be achieved in shorter 2- or 3-zone systems.

*Diagram showing a **5-zone system and water cascade***



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