SurTec® 833
Electroless Nickel
with High Content of Phosphorous

Properties

- electroless nickel process, fulfils the requirements of ELV and RoHS
- phosphorous content of the layer: 10-13 %
- hardness (Vickers) of the deposited layer: 500 HV, it can be increased by heat treatment to 1000 HV
- good corrosion resistance (> 1000 in the neutral salt spray test)
- stable bath with long service life
- suitable for application on steel parts or on aluminium parts, pre-treated with zincate treatment SurTec MS 12/07

Application

SurTec 833 is applied in rack or barrel application. The process includes the following products:

- SurTec 833 I Make-up Reductor contains the reduction additives and the stabilisers for the new bath make-up
- SurTec 833 II Nickel Concentrate for the new bath make-up and to correct the nickel content
- SurTec 833 III Maintenance Reductor contains the reduction additives in the correct ratio for maintenance (for each 1 part SurTec 833 II, also 2 parts SurTec 833 III have to be added)

make-up values:	SurTec 833 I	15 %vol	
	SurTec 833 II	6 %vol	
	SurTec 833 III	only for maintenance	
analytical values:	nickel	6 g/l	(4.9-6.4 g/l)
	sodium hypophosphite	30 g/l	(26-34 g/l)

make-up: Steps for make-up:

1. Fill 50 % of the deionised water into the tank.
2. Add the calculated amount of SurTec 833 I and stir well.
3. Add the calculated amount of SurTec 833 II and stir well.
4. Fill up to the final volume with deionised water.
5. Check the pH-value (at room temperature) and adjust with sulfuric acid (10 %) or ammonia solution (1:1), if necessary.
6. Start the filtration of the bath and heat up to working temperature.

temperature:	88 °C	(85-92 °C)
pH-value:	4.8	(4.6-5.2)

The pH measurement should be done at room temperature or with a freshly calibrated pH meter with temperature compensation.
Adjust with sulfuric acid (10 %) or 25 % ammonia solution (1:1).

deposition rate:	depending on temperature, pH-value and bath age: 7.5-10 μm/h
agitation:	strong electrolyte circulation or air agitation (no compressed air, because possible impurities may disturb the bath).
tank material:	stainless steel (type 316) with anodic protection; or PP tanks
filtration:	Filtration with filter bags, filtering 10 times the total volume per hour. Pore size: 1-10 μm. Rinse new filter bags several times alternating with hot and cold water. Do not use magnetic valve pumps.
heating:	Tanks with outside wall heating are recommended. Indirect heating with steam tubes is possible (to cool down the bath quickly, the tubes can be fluted with cold water). By use of immersion heaters, they have to be fluted very strongly to prevent an overheating of the solution near the heater (this can lead to bath destruction).
cooling:	required, out of acid resistant material
exhaust:	required for worker´s protection
hints:	The bath should not be allowed to remain idle at operating temperatures for longer time without use. If there are longer rest periods, cool down the bath.

recommended process sequence (for iron parts):

1. hot degreasing
   emulsifying: e.g. SurTec 188 + SurTec 415
   demulsifying: e.g. SurTec 188 + SurTec 089
2. hydrochloric acid pickling, e.g. with SurTec 424
3. anodic electrolytical cleaning, e.g. SurTec 171
4. neutralisation, e.g. SurTec 481
5. Electroless Nickel SurTec 833
6. hot air drying
7. if necessary, heat treatment for 1 hour at 400 °C

Between the immersing steps, there has to be rinsed. The rinsing methods have to be adapted to the plating line.

Technical Specification

(at 20 °C)	Appearance	Density (g/ml)	pH-value (conc.)	
SurTec 833 I	liquid, light blue/green, clear	1.242 (1.23-1.26)	5.0	(4.8-5.2)
SurTec 833 II	liquid, green, clear	1.262 (1.24-1.28)	3.2	(2-4)
SurTec 833 III	liquid, blue, clear	1.156 (1.14-1.17)	6.0	(5-6.5)

Maintenance and Analysis

Check the pH-value regularly (best in a bath sample at room temperature). At growing service life of the bath, pH-value and temperature have to be adjusted to higher values to get a constant deposition rate.

Analyse the nickel content regularly and adjust by dosing SurTec 833 II. For each part SurTec 833 II, add also two parts SurTec 833 III.

Sample Preparation

Take a sample at a homogeneously mixed position. Let it cool down to room temperature. If the sample is turbid, let the turbidity settle down and decant or filter the solution with a fluted filter.

Nickel – Analysis by Titration

reagents: 0.1 mol/l EDTA (Titriplex III)
ammonia (conc.)
indicator: muredix

procedure:

1. Pipette 10 ml bath sample into a 250 ml Erlenmeyer flask.
2. Dilute to approx. 100 ml with deionised water.
3. Add 12 ml ammonia solution.
4. Add a spatula tip of indicator.
5. Titrate with 0.1 mol/l EDTA from yellow to violet.

calculation: consumption in ml · 0.587 = g/l nickel

correction: rise by 0.1 g/l nickel = addition of 1 ml/l SurTec 833 II

Na-Hypophosphit – Analysis by Titration

reagents: hydrochloric acid (1:1)
0.1 N Iodine solution
0.1 N sodium thiosulfate solution
starch solution (1 %, freshly made)

procedure:

1. Pipette 5 ml bath sample into a closable iodine count flask.
2. Dilute with 50 ml deionised water.
3. Add 30 ml hydrochloric acid.
4. Add 50.0 ml of 0.1 N Iodine solution.
5. Close the flask and store for exact 45 min in the dark.
6. Add some starch solution.
7. Titrate with 0.1 N sodium thiosulfate solution to complete discolouration.

calculation: (50 - consumption in ml) · 1.0575 = g/l Na-hypophosphit

correction: rise by 1 g/l = addition of 3.6 ml/l SurTec 833 III

hint: SurTec 833 III is normally dosed according to SurTec 833 II Nickel Concentrate, in the ratio 2:1. Only in special cases, small amounts of SurTec 833 III can be added separately.

Consumption and Stock Keeping

The consumption depends heavily on the drag-out. To determine the exact amounts of drag-out, see SurTec Technical Letter 11.

The following values per 100 dm^2 and a plated layer thickness of 1 μm can be taken as estimated average consumption:

SurTec 833 II	70 ml
SurTec 833 III	140 ml

In order to prevent delays in the production process, per 1,000 l bath, the following amounts should be kept in stock:

SurTec 833 II	50 kg
SurTec 833 III	100 kg

Product Safety and Ecology

The safety instructions and the instructions for environmental protection have to be followed in order to avoid hazards for people and environment. The Material Safety Data Sheets (according to European legislation) contain explicit details for this.

The following hazard designations and classifications into water hazard classes (WHC) have to be taken into account:

product	*hazard designation*	*water hazard class*
SurTec 833 I	-	WHC 2
SurTec 833 II	Xn - Harmful N - Dangerous for the environment	WHC 2
SurTec 833 III	Xi - Irritant	WHC 2

Warranty

We are responsible for our products in the context of the valid legal regulations. The warranty exclusively accesses for the delivered state of a product. Warranties and claims for damages after the subsequent treatment of our products do not exist. For details please consider our general terms and conditions.

Further Information and Contact

In our forum, you can discuss topics of the surface technology:
http://forum.SurTec.com/

If you have any questions concerning the process, please contact your local technical department: http://SurTec.com/International.html

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Trouble Shooting

If trouble occurs, always control temperature, pH-value and nickel content at first.

problem	possible cause	remedy
skip plating, bad throwing or rough edges	a) pretreatment is inefficient	check the pretreatment
	b) bath agitation is too much	reduce the bath agitation
	c) bath load is to low	increase work load
	d) metallic contamination	analyse; work out or new make-up
	e) organic contamination	throw bath away and make new bath make-up
roughness in the deposits	a) bath contamination by small solid particles, metal abrasion...	control the filtration (pore size approx. 5 µm)
	b) bath solution is turbid	can occur at to high pH-values: check and adjust the pH-value
	c) make-up water is contaminated	check the water quality
	d) too fast or too high dosage of the additives during deposition	dose the additives portion by portion over the day (or automatically) , choice adding place far away from the parts
	e) magnetism in the substrate	demagnetize substrate before plating
	f) filter bag is contaminated	change filter bag regularly
streaks in the deposits	a) gas streaks by sort of agitation/part fixation	control agitation and part fixation
	b) drag-in of silicates	change pretreatment or make a fluoric post-dip
	c) rinsing method is inefficient	improve the rinsing procedure
	d) metallic contamination	analyse, work out or new bath make-up
	e) organic contamination	throw bath away and make a new bath make-up
	f) bath agitation is inefficient	improve the bath agitation
	g) bath load is to low	increase work load
	h) content of reductor is too low	analyse and correct the content
pitting	a) heavy metal contamination	analyse, work out or new bath make-up
	b) too high bath activity	lower pH-value, temperature and bath load
	c) wrong content of reductor	analyse and adjust/work out
matte deposits	a) organic contamination	throw bath away and make a new bath make-up
	b) bath parameters are nor correct	complete analysis of the bath
	c) metallic contamination	analyse, work out onto a large surface
	d) bath is too old	throw bath away and make a new bath make-up
poor adhesion	a) zinc content is too high	throw bath away and make a new bath make-up
	b) pretreatment is insufficient	improve the pretreatment
	c) passivated parts	reduce the transfer times
	d) drag-in of (pickling-) inhibitors	improve the rinsing process
	e) quality of the basic material	control the alloy