

# SurTec® 854

## Semi Bright Nickel Process

### Properties

- for deposition of sulphur-free semi bright nickel layers as basis for successive bright nickel plating
- high potential difference between semi bright and bright nickel deposit
- best corrosion protection in combination with SurTec 857 Bright Nickel Process
- good throwing power
- high ductility
- IMDS-number: 748769

### Application

The process SurTec 854 includes the following products:

- SurTec 854 Additive
- SurTec 854 L Wetting Agent
- SurTec 854 A Conditioner

make-up values:

nickel sulfate · 6 H <sub>2</sub> O	240 g/l	
nickel chloride · 6 H <sub>2</sub> O	70 g/l	
boric acid	45 g/l	
SurTec 854 Additive	3 ml/l	(1 - 3 ml/l)
SurTec 854 L Wetting Agent	2 ml/l	(2 - 3 ml/l)
SurTec 854 A Conditioner	10 ml/l	(10-15 ml/l)

analytical values:	nickel (Ni <sup>2+</sup> )	70 g/l	(65-75 g/l)
	chloride (Cl <sup>-</sup> )	20 g/l	(15-25 g/l)
	boric acid	45 g/l	(40-45 g/l)

make-up: Steps for make-up:

1. In a separate tank dissolve both nickel salts and boric acid in very hot (at least 60°C) deionised water of about 1/3 of the final volume, stirring well.
2. Add 5 g/l active carbon and stir again for about 2 hours.
3. Then allow it to settle and filter into the active tank.
4. Fill up to the final volume with deionised water.
5. Dummy plate in the bath for about 4 hours at 0.4 A/dm<sup>2</sup>.
6. Then plate a test panel at 3 A/dm<sup>2</sup> for 15 min.
7. If the panel is ductile, add the additives, if not, continue dummy plating.

temperature: 55°C (50-60°C)

pH-value: 4.4 (4.0-4.8)  
adjust with sulfuric acid or increase by plating

cathodic		
current density:	3 A/dm <sup>2</sup>	(1-5 A/dm <sup>2</sup> )
current efficiency:	98 %	
deposition rate:	0.6 µm/min	at 3 A/dm <sup>2</sup>
ratio		
anode/cathode:	2:1	
anodes:	pure nickel anodes according DIN 1702, anode bag or diaphragm frame of pre-cleaned PP	
agitation:	mechanical movement with 3-6 m/min (barrel: 6-12 rpm) or air agitation (oil free!)	
tank material:	polypropylene (PP) or steel coated with heat resistant plastic	
filtration:	continuously: with 1-5 x the bath volume per hour	
heating:	necessary (automatically regulated): of acid resistant material (e.g. porcelain, PTFE)	
exhaust:	required for worker's protection	

## Maintenance and Analysis

Compensate evaporation losses with deionised or distilled water.

Analyse and adjust the concentration of nickel, chloride, boric acid and SurTec 854 A Conditioner regularly.

The analytical values must be restrained: A loss of nickel or boric acid will lead to burnings, an excess of boric acid will lead to pitting. A loss of chloride causes a lower anodic dissolution.

Dose SurTec 854 A Conditioner according to the analysis. Add SurTec 854 Additive and SurTec 854 L Wetting Agent according to ampere-hours and control it by the way of Hull cell tests.

### 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.

### Nickel – Analysis by Titration

reagents:	0.1 mol/l EDTA (Titrplex III) ammonia solution (conc.) indicator: murexide
procedure:	<ol style="list-style-type: none"> <li>1. Pipette 1 ml bath sample into a 250 ml Erlenmeyer flask.</li> <li>2. Dilute with approx. 100 ml deionised water.</li> <li>3. Add 12 ml ammonia solution.</li> <li>4. Add a spatula tip of indicator.</li> <li>5. Titrate with 0.1 M EDTA from yellow to violet.</li> </ol>
calculation:	consumption in ml · 5.87 = g/l nickel
correction:	rise by 1 g/l = addition of 4.5 g/l nickel sulfate · 6 H <sub>2</sub> O or: 4.1 g/l nickel chloride · 6 H <sub>2</sub> O

### Chloride – Analysis by Titration

- reagents: 0.1 N silver nitrate solution  
indicator: potassium chromate solution (5 %)  
or: 5 g  $K_2Cr_2O_7$  + 95 g  $NaHCO_3$
- procedure: 1. Pipette 1 ml bath sample into a 250 ml Erlenmeyer flask.  
2. Dilute with approx. 100 ml deionised water.  
3. Add some indicator (pH-value has to be between 6.5 and 10.5).  
4. Titrate with 0.1 N silver nitrate solution from yellow to brown.
- calculation: consumption in ml · 3.54 = g/l chloride
- correction: rise by 1 g/l = addition of 3.0 ml/l hydrochloric acid (30 %)  
or: 3.4 g/l nickel chloride · 6  $H_2O$

### Boric Acid – Analysis by Titration

- reagents: 0.1 N NaOH solution  
EDTA sodium salt  
mannitol  
NaOH solution (15 %)
- procedure: 1. Pipette 2 ml bath sample into a 250 ml Erlenmeyer flask.  
2. Dilute with approx. 50 ml deionised water.  
3. Add 2-4 g EDTA salt.  
4. Adjust the pH-value to pH 7.9 with 15 % NaOH solution.  
5. Add so much mannitol to the **clear** solution, until the pH is not changing more than 0.1 points (approx. 10 g).  
6. Titrate with 0.1 N NaOH solution to pH 7.9 again.
- calculation: consumption in ml · 3.09 = g/l boric acid

### SurTec 854 A Conditioner – Analysis by Photometry

- instruments: photometer with adjustable wave length (267 nm)  
and a 10 mm rectangular cuvette of quartz glass  
10 ml volumetric pipettes  
100 ml volumetric flask
- procedure: 1. Pipette 10 ml of the filtrated bath sample into a 100 ml volumetric flask.  
2. Fill up to its final volume with deionised water and mix well.  
3. Pour some ml of this dilution into the cuvette and measure the absorbance at 267 nm against deionised water.
- calculation: absorbance · 24.51 = ml/l SurTec 854 A

## Technical Specification

(at 20 °C)	Appearance	Density (g/ml)	pH-value (conc.)
SurTec 854	liquid, yellowish	1.070 (1.06-1.08)	1-3
SurTec 854 L	liquid, colourless-yellowish	0.997 (0.98-1.01)	3-5
SurTec 854 A	liquid, colourless	1.036 (1.02-1.05)	6-8

## 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 10,000 Ah can be taken as estimated average consumption:

SurTec 854	2 l
SurTec 854 L	0.5 l
SurTec 854 A	0.5 l

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

SurTec 854	25 kg
SurTec 854 L	20 kg
SurTec 854 A	25 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:

<u>product</u>	<u>hazard designation</u>	<u>water hazard class</u>
SurTec 854	Xn - Harmful	WHC 2
SurTec 854 L	Xn - Harmful	WHC 1
SurTec 854 A	-	WHC 1

## 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>