BRIGHT NICKEL GIT-H700 & GIT-SLUX 800

(Ultra Performance Bright Nickel Process)

GIT-H700 process is an ultra high performance addition agent system for bright nickel plating.
The process has been formulated to give superior levelling, brightness, coverage, better chrome receptivity and extremely good brightness at medium and low current density areas.

The **GIT-H700** process is designed to produce excellent deposit of nickel on different base metals, with maximum rate of brightness and levelling and gives an outstanding performance with air agitated solutions. The brightener system employed is versatile and gives excellent result in watts nickel formulation. **GIT-H700** process employs two addition agents namely **GIT-H700** brightener and carrier brightener additive **GIT-SLUX 800** Both are to be used for initial make up and to replenish the brightener components in an operating bath. Occasional separate addition of Wetting agent may be required. The process is an extremely flexible process, which can be used to suit wide range of operating bath concentration, temperature and current densities. **GIT-H700** process can be used for either rack or barrel plating applications and both with air or mechanical agitation. The performance can be improved on unpolished steel by the addition of separate levelling additive **GIT-H700** leveler enabling the user considerable flexibility in controlling the process.

FEATURES BENEFITS OF GIT-H700

Features	**Benefits**
GIT-H700 produces the ultimate in levelling.	Shorter plating time required. Fewer polishing operations required.
GIT-H700 builds brightness faster	Less deposit thickness for the desired finish.
GIT-H700 has a wide bath chemistry	Will deposit over a wide range of operating conditions.
GIT-H700 is very receptive to chrome Over plate.	Fewer rejection due to mis plates and passive nickel deposits.
GIT-H700 employs only two addition agents	Fewer materials to add low inventory cost.

SOLUTION COMPOSITION AND OPERATING CONDITIONS

		RANGE	**OPTIMUM**
RACK BRIGHT NICKEL SALT	:	250-400 g/l	350 g/l
ADDITIVE **GIT-SLUX 800**	:	8.0 – 10 cc/l	8.0 cc/l
BRIGHTENER **GIT-H700**	:	0.2-0.25 cc/l	0.25 cc/l
GIT-WETTING AGENT, Rack/Air	:	6 – 10 cc/l	8.0 cc/l

OPERATING CONDITIONS		
PH	4.0-4.6	4.4
Temperature	50-65 °C	55 °C
Cathode Current Density	2.0-6.0 A/sq.dm.	4.0 A/sq.dm.
Anode Current Density	1.0-3.0 A/sq.dm.	2.0 A/sq.dm.
Agitation	Cathode rod	Air/Low pressure air
Filtration	Continuous	

The optimum bath composition depends upon the particular requirements unique to the processing equipment and the parts to be plated. This includes Cathode Current Density type and finish of basis metal plated; deposit thickness; part geometry and so on. Similarly, addition agents consumption also varies depending upon the above mentioned factors.

Analysis Values :	nickel	65 - 80 g/l	(optimum 75 g/l)
	boric acid	40 - 50 g/l	(optimum 45 g/l)
	chloride	15 - 25 g/l	(optimum 18 g/l)

Brightener, softener and wetting agent are continuously consumed during the electrolytic process. The following amounts per 10.000 Amh. may serve as not binding information:

GIT-H 700	0.4 – 0.6 l depending on the desired finish
GIT-SLUX 800	4.0 -6.0 l
Wetting agent (rack or air)	approx. 0,5 l

Analysis methods may be sent on demand.

Product specifications:

Product name	Density	PH	Safety
GIT-H 700	1.10-1.12 g/ml	4.2 – 4.6	In case of contact with skin wash with water
GIT-SLUX 800	1.06- 1.08 g/ml	6.0 -6.5	In case of contact with skin wash with water
Wetting agent (rack or air)	1.005-1.006 g/ml	6.7 -7.0	In case of contact with eye wash with water

INDICATIONS TO POSSIBLE FAULTS OR TROUBLES

A lack of brightener first shows itself in a veiling in the medium C.D. range. The addition of the brightener GIT-H 700 may take place in small portions only, to avoid overconcentration.

A dull effect on current-favoured spots can lead to the conclusion that there is a lack of brightening carrier.
The addition of the carrier should be done analogous to that of the brightener.

From holes and smears can be concluded that there is a lack of wetting agent or of boric acid.
An analysis - if such would be necessary - will show which measure will have to be taken to eliminate the fault.

Dark deposits in the lowest D.C. range may be caused by metallic impurities. This will require a selective cleaning which has to be performed during non-work shutdowns with smooth metal sheets at 0,1 - 0,4 A/dm2.

The removal of most of the organic impurities is possible in pumping the solution into a reserve tank, and adding 0,1 to 0,3 l per 100 l of 30 % hydrogen peroxide. After about 1 hour of time of reaction, add approx. 1 kg of active carbon to 100 litres of electrolyte, while stirring. Stir up the electrolyte vigorously several times within the 2 hours following and allow the active carbon to settle. After about 10 - 15 hours filter the liquid back into the working tank. Stir up the electrolyte vigorously several times within the 2 hours following and allow the active carbon to settle. After about 15 hours filter the liquid back into the working tank and adjust the PH-value by means of 10 % sulphuric acid to 4,2 - 4,5. After this purification refill wetting agent and brightening carrier, in case that these were partially removed in the purification process. Known from experience, appx. 0,1 l of wetting agent and 0,5 litres of GIT-SLUX 800 will be the quantities necessary for 100 litres of bath.

Function of Solution constituents

NICKEL SULPHATE
Nickel sulphate is the main source of nickel ions for the solution, the concentration of nickel ions largely determines the limiting current density.

Low nickel sulphate concentration will reduce cathode efficiency; thus the plating time has to be increased to deposit the desired thickness of nickel metal.

A high nickel sulphate concentration allows the bath to operate at higher current densities, but also increases the requirement of brightener concentration in order to achieve proper plating quality.

NICKEL CHLORIDE
The Chloride ion is essential in nickel bath in order to improve the anode dissolution without polarization and improves the electrical conductivity of the solution.
A High concentration should be avoided since it will decrease ductility. Additionally higher chloride concentrations can lead to increased attack on processing equipment.

BORIC ACID
Boric acid acts as an overall buffer for the solution. Its effects is most noticeable in higher current density areas where it
1) Prevents burning and pitting.
2) Helps to provide deposit ductility, and
3) Maintain the proper Cathode efficiency.

The proper concentration of boric acid minimizes an increase in bath pH in the areas close to cathode. This in turn, minimize, the formation of metallic hydroxides from any metallic impurity present especially iron in the solution. This is important since this hydroxide
compounds would otherwise be included in the deposit, resulting in brittle and burned plate.
high concentration of boric acid is not detrimental to the bath performance, except that it can lead to shelf roughness if it is present in a concentration above its solubility limit. In the advent of high boric acid concentration, the solution can be cooled to 35 C and filtered to remove excess boric acid and also, boric acid additions should be stopped until the concentration drops to the optimum level.

ADDITIVE GIT-SLUX 800
This is a carrier brightener to provide the basic brightness and ductility to the deposit, and also acts synergistically with the main brightener **GIT-H700** to maintain maximum, brightness and levelling. It also insures proper chrome receptivity.

A high concentration has no harmful effect on performance, unless it is extremely high, in which case, and extra addition of **GIT-H700** brightener is required to produce high quality bright deposits.

GIT-H700 BRIGHTENER
This is the main brightening. agent used to control the high rates of levelling and brightness as well as the low current density brightness and coverage.

A low concentration reduces overall performance, but slight to moderate excess has no harmful effect, other than it needs closer plant control and increase in operating cost. Very high concentration can cause ductility and chrome coverage problem as well as low current density dullness but this normally can be brought under control by adding extra quantity of rack additive **GIT-SLUX 800** to correct the bath. It is depleted primarily by electrolysis although minor losses can occur through carbon treatment absorption by anode bags, tank lining etc.

WETTING AGENT Air & Rack
Wetting agent Air should be used when the solution is operated with mechanical agitation and Wetting agent Rack is an antipitting agent of a low foam type suitable for air agitated nickel plating solution. Both antipitting agents are removed by treatment with carbon.

REPLENISHMENT ADDITIONS
Both the addition agents namely **GIT-H700** and additive **GIT-SLUX 800** are required to be added regularly to maintain the brightener components at their optimum concentration level.

Replenishment additions should normally be based on the ampere hours of plating done. The correct amount to be added for a given installation depends upon the degree of levelling and brightness required, as well as on drag out, base metal finish, operating temperature etc.
Based on our experience. the replenishment additions are given as under:

The brightener additions can be made manually but better control is achieved by using an ampere hour feeder pump since it reduces the brightener consumption and assures more uniform plating quality.

NOTES ON OPERATING CONDITIONS

(A) Temperature
The bright nickel baths operates normally at elevated temperature and to produce best results the solution should be maintained between 50 -65 °C. Higher temperature permit higher current densities to be used. In case the temperature is low it may cause high current density burning at normal current density. For high temperature operations, suitability of tank, lining anode bags and agitation coils should be considered.

(B) PH Control
It is recommended that the PH of the solution be maintained within the specific range. Low PH Values can cause overall dull deposits. and results in higher PH in barrel plating solutions increases the possibility of contaminated deposits.
In vat plating higher PH can be cause deposit roughness due to the precipitation of metallic impurities 'hydroxide'.
More over, higher PH can reduce the ductility of the deposit and affect the chrome receptivity.

In normal working the PH value of the solution tends to rise and it should be reduced by adding dilute Sulphuric acid (C.P grade) The PH value should be checked and adjusted at least twice in each working shift.

If it is necessary to raise the pH value, Nickel carbonate should be used and this should be added by precoating the filter unit and circulating the solution through the filter unit until the required PH value is obtained. Sodium hydroxide and Sodium Carbonate must not be used to raise the PH value since the build up of Sodium ion concentration above 5 g/l will give porous nickel deposit resulting in reduced corrosion resistance.

The amount of acid required to maintain the bath in the proper range should be relatively constant as long as mix of parts processed does not change significantly. If there is a change in the quantity of acid required, it is an indication that anode is getting polarised. This can be due to low anode area in the bath or to be checked for crusted anode bags.

(C) Cathode Current Density
The Cathode Current Density is the total current to the plating tank divided by the total cathode area in the tank at a given time. The recommended bath composition allows plating over a wide operating current density range with out burning. **GIT-H700** process produces a bright and levelled deposit at a fairly wide current density range and hence close control in not required. However, care should be taken to avoid a very high current density which will result in burning.

(D) Anode Current Density
The Anode Current Density is calculated in the same manner as the Cathode Current Density except that the current to the tank is divided by the total anode surface area. An easy rule of thumb if titanium basket is used so that the current should not exceed 25 amps for each 30 cm of basket length filled with anode material. This will keep the maximum anode current density below 3.5 Amp/dm2, which is the maximum allowable limit.

In practical condition permissible anode current density is affected by many factors such as type of anode material, anode bags, amount of solution agitation, operating temperature nickel chloride concentration and PH. Too low anode current density is not detrimental except that the nickel metal concentration can rise during production.
But too high an anode current density (too low an anode area) can cause anode polarization, and if severe, generation of chlorine gas which has detrimental effects.

First, it can increase the consumption of brightener and secondly the chlorine gas reduces the anode bag life by embrittling the fabric. This will lead to cracked of or split bags, which will introduce fine nickel powder to the bath and cause roughness.

FILTRATION
Continuous filtration through a mixture of filter aid and activated carbon is recommended to ensure good quality bright nickel deposits. Normally the filter unit is precoated and then packed with 0.1 - 0.2 g/l. of activated carbon each week, the filter should be replaced at least once per week and more frequently if an unusually heavy amount of solids or organic contamination is present.

AGITATION
Either air or mechanical agitation is satisfactory. Air agitation is by far more commonly used, and is preferred. Because this permits the use of higher current densities and produces a brighter, levelled deposit. The air must be clean, oil free, supplied by a low pressure blower. The air agitation must be directed at the work being plated. The stroke of cathode rod movement can also be used for solution movement. The stroke of cathode moment should be 7-8 cm, and 5 cycles per minute.