COTEC Corporation. Electroless Nickel Plating

Electroless Nickel Plating

COTEC

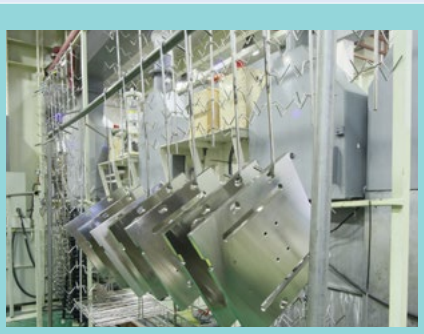
COTEC has various surface treatment technologies and the company concentrates on products development and quality control to develop various surface treatment items

Production items and applications

Department / Material		Aircraft, Defence, Semiconductor parts, Machinery for general industries / Fe, STS, Cu, Al	
Usage		Memory disc, Plating on non-conductive metals, Replacement of hard chromium plating for computer parts and through hole plating on PCB	
Thickness (General criteria)		1~70㎛ hours	
Applied specifications	National defense 0115-0018 (1.4) MIL-C-26074 AMS-C-26074 ASTM-B-733, 656 FEIS 114 AMS 2404 KS D 8344 AIPS 02 04 008	Thickness	38㎛ for type 1 (No heat treatment) 13㎛ for type 2 (Heat treatment)
		Adhesiveness	No separation of coating from the base metals
		Hardness	Limited to type 2 (Rockwell tester) and type 3 (Vickers tester)
		Stress relief	At 191±14°C, for more than 3 hours
		Relief of hydrogen embrittlement	The brittle time depending on material organization state and hardness At 191±14°C, for more than 3 hours (HRC 32~39) At 191±14°C, for more than 8 hours (HRC 40~47) At 191±14°C, for more than 23 hours (HRC 48)
Acceptance		External	NADCAP, BOEING, AIRBUS, PARKER, MHI
		Internal	HYUNDAE WIA, DOOWON, KAI, ADD

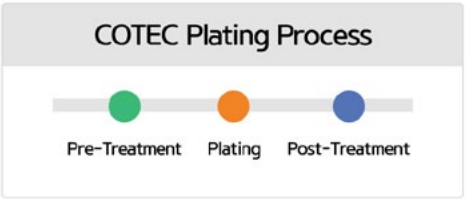
Equipment condition

COTEC	2,000 × 900 × 1,500 mm (4 Units)



Electroless Nickel Plating

Capable of coating complex parts



Our technologies and their applications

Strength

- Forms a uniform coating layer even on a complex surface.
- Less porous than electric coating.
- No need for complicate racking.
- Forming a coating layer on non-conductors with a proper pre-treatment.
- Has physical properties that are different from the electric plating.

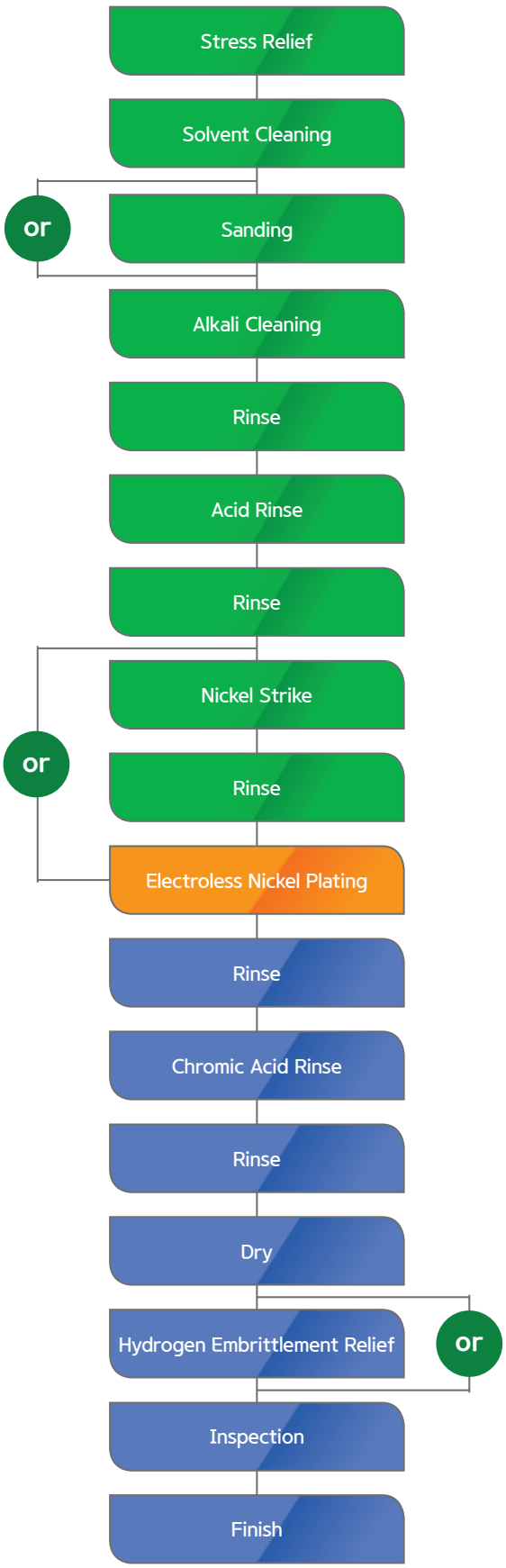
Weakness

- Its production cost is higher than the electric coating.
- Short life due to unstable coating solution.
- Difficult control of coating solution.
- Slow coating speed.

Applicable parts

Memory disk, Coating on non conductive material, Replacement of hard chromium coating, Plating on Computer parts, Through Hole on PCB

Process



Silver Plating

COTEC

COTEC has various surface treatment technologies and the company concentrates on products development and quality control to develop various surface treatment items

Production items and applications

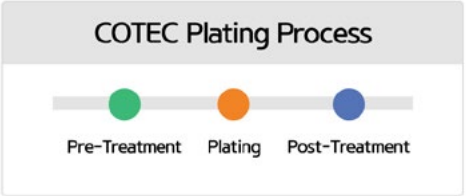
Department / Material			Aircraft, Defence, Atomic power, Electric products, Electronic products / Fe, STS, Al, Cu
Usage			Parts for soldering, Product with its electric conductivity to be enhanced and products, Electrical contact parts
Thickness (General criteria)			1~30㎛ hours
Applied specifications	National defense 0115-0015 (Yeon) AMS QQ-S-365 ASTM B 700 KS D 8339	Thickness	12.5㎛ minimum ↑
		Adhesiveness	No trace of separation of coating from substrate.
		Relief of hydrogen embrittlement	The brittle time depending on material organization state and hardness At 191±14°C, for more than 3 hours (HRC 32~39) At 191±14°C, for more than 8 hours (HRC 40~47) At 191±14°C, for more than 23 hours (HRC 48)
		Soldering test	No mass should be generated on the coated surface and the uniform soldering. The coating should not fall or break from the surface.
Acceptance		External	HAMILTON
		Internal	DOOWON, HANHWA, KAI, LIG NEX 1, ADD

Equipment condition

COTEC	800 × 600 × 1,200 mm
	1,600 × 600 × 1,000 mm
	9,000 × 200 × 350 mm

Silver Plating

Capable of coating complex parts



Our technologies and their applications

Hardness

The hardness of silver, which is acquired from the basic component bath, is only Hv 70-90. But one of the silver, which is changed into crystal form by adding the brightener, increases up to Hv 110-130. If a small volume of hardener is added, the hardness can increase up to Hv 140-160.

Lubricity

Even though the lubricity of silver plating is relatively good, it can be bad when the hardness is increased. This is thought to be the cause of breakage of the crystalline form and wearing caused by the loss of ductility.

Conductivity

The coated silver is a little higher in electric resistance than pure silver. That is similar to the resistance level of copper or aluminium.

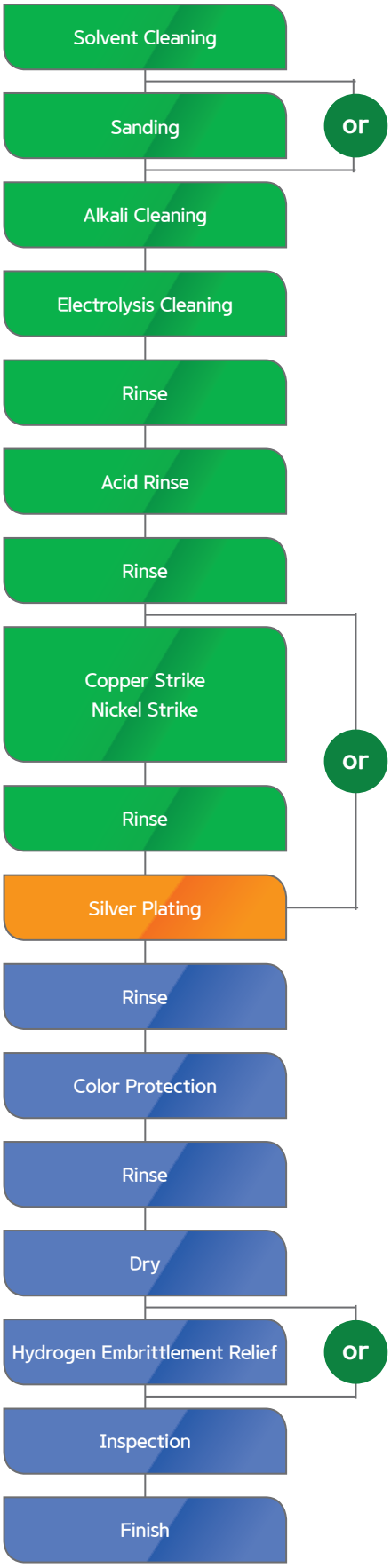
Solderability

It is widely used in the semiconductor field, excellent solderability.

Resistance to tarnish

Even though tarnish is unavoidable, the metal is to be slightly protected from tarnish by chromating it thinly or by implementing other coating

Process



Nickel Plating

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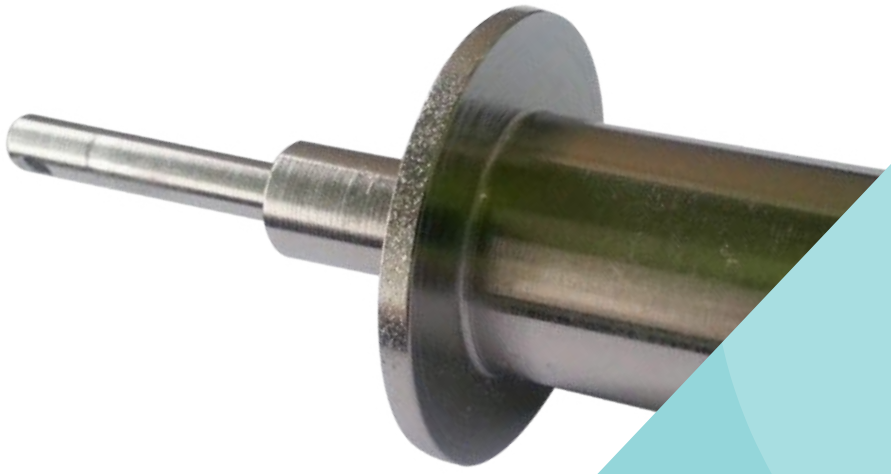


Production items and applications

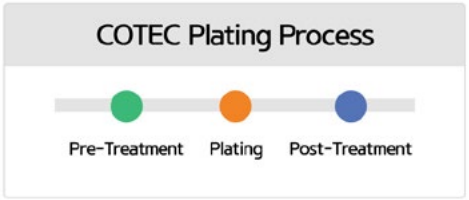
Department / Material		Aircraft, Defence, Atomic power, Electronic products, Machinery for general industries / Fe, STS, Al, Cu	
Usage		Corrosion prevention and decoration purposes	
Thickness (General criteria)		1~70㎛ hours	
Applied specifications	National defense 0115-0012 AMS2403 QQ-N-290	Thickness	It varies depending on the specification requirements According to the class applying 5~40㎛
		Adhesiveness	No trace of separation after bending
		Stress rellef	At 191±14°C, for more than 3 hours
		Relief of hydrogen embrittlement	The brittle time depending on material organization state and hardness At 191±14°C, for more than 3 hours (HRC 32~39) At 191±14°C, for more than 8 hours (HRC 40~47) At 191±14°C, for more than 23 hours (HRC 48)
Acceptance		External	
		Internal	DOOWON, HANHWA, KAI, LIG NEX 1, ADD

Equipment condition

COTEC	2,400 × 900 × 1,200 mm

Nickel Plating

Capable of coating complex parts



Our technologies and their applications

Nickel strike plating

Characteristic

- As a plating for good adhesion on stainless (Pre-treatment), it is good for triple nickel plating.
- Ventilation is to be installed as it discharges chlorine gas.

Applicable parts

- for various primer coating

Black nickel plating

Characteristic

- Black nickel is good for decoration, optical instruments or military equipment as it prevents the reflection of light and gives a good feeling.
- Generally, it is for decoration as it has low corrosion resistance.
- The thin coating's adhesiveness is good but the wear resistance and flexibility are not good.
- Transparent lacquer coating is done to prevent tarnish.
- The bath has two different solutions such as nickel sulfide baths and nickel chloride bath. The nickel chloride bath is excellent.

Nickel plating

- Nickel sulfate, nickel chloride, boric acid, are used as base solution with acetylene, alchols as smoothing agent.
- Surface is semi-gloss finish, which could acquire polished and buffed finish at the same time.

Single and multiple nickel plating

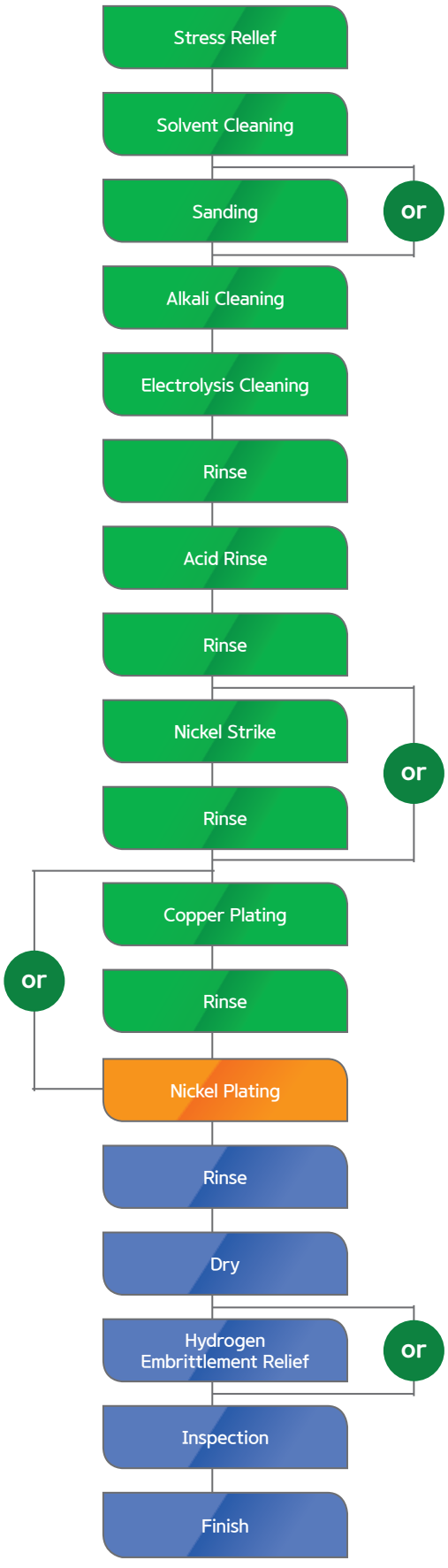
Characteristic

- Single nickel plating is usually used for decorative purposes. As the coating layer is 5 to 12㎛, it can be used in a corrosive environment.
- Double nickel plating is to conduct the coating on a substrate with high level nickel and also to conduct the sufficient bright nickel layer on the coated surface which does not require expensive mechanical buffing.
- Triple nickel plating is done to add nickel plating between the semi-bight nickel layer and bright nickel layer with the highly active electrochemical nickel.

Applicable parts

- Various under coating parts

Process



Tin Plating

COTEC

COTEC has various surface treatment technologies and the company concentrates on products development and quality control to develop various surface treatment items

Production items and applications

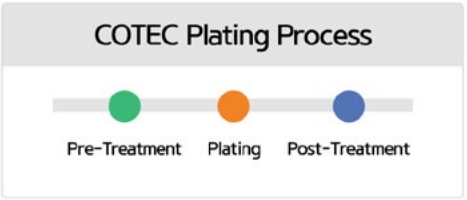
Department / Material		Defence, Atomic power, Electric products, Semiconductor parts / Fe, STS, Al, Cu	
Usage		Soldering, Corrosion, Prevention of corrosive hardened layer during nitrification, Prevention of adhesion	
Thickness (General criteria)		1~20㎛	
Applied specifications	National defense 0115-0019 (Yeon) MIL-T-10727 ASTM B 545 FEIS 104 KS D 8330	Thickness	2.5㎛~6.4㎛ for soldering 5.0㎛~10㎛ for prevention of adhesion 7.5㎛ for corrosion prevention 5㎛~15㎛ for prevention of hardening during nitrification
		Adhesiveness	No trace of separation of coating from substrate when bending 180 degree.
		Corrosion resistance test	Salt spray test with 20% NaCl for 24 hours (less than 6 pits within 2.5㎠)
Acceptance		External	
		Internal	DOOWON, HANHWA, KAI, LIG NEX 1, ADD

Equipment condition

COTEC	1,500 × 600 × 1,200 mm

Tin Plating

Capable of coating complex parts



Our technologies and their applications

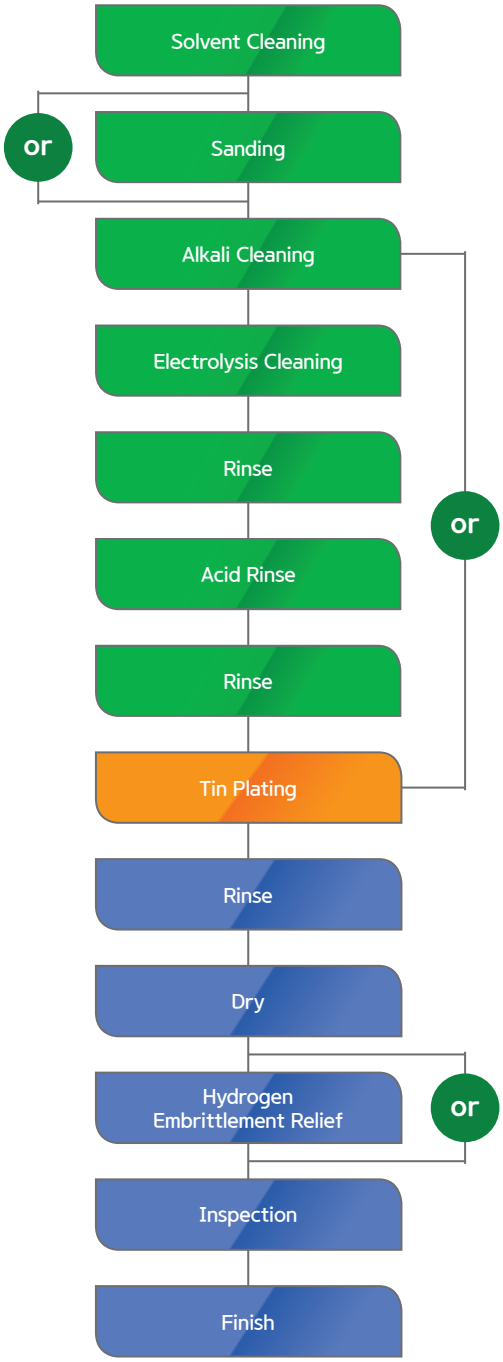
Characteristic

- Tin is soft and malleable and it has a low melting point of 231.9°C.
- As a silvery metal, its heat conductivity is one third of that of silver while its electricity conductivity is one seventh of that of silver.
- Tin provides little hazard to human health; it is used as a coating for bowls. It is also resistant to acid, so it is used as a coating for food cans.
- Excellent soldering and widely used as a coating for electric and electronic parts.
- Different from zinc plating on ferrous metals, the corrosion rapidly progresses when there is a pin hole on the surface of the metal substrate because the ferrous metal becomes anodic.
- Lubrication and moving capability can be enhanced with tin replacing plating and electric tin plating on the moving parts and pistons.

Applicable parts

- Defense equipment, Aircraft parts, Automotive parts, Architectur al sash

Process



Copper Plating

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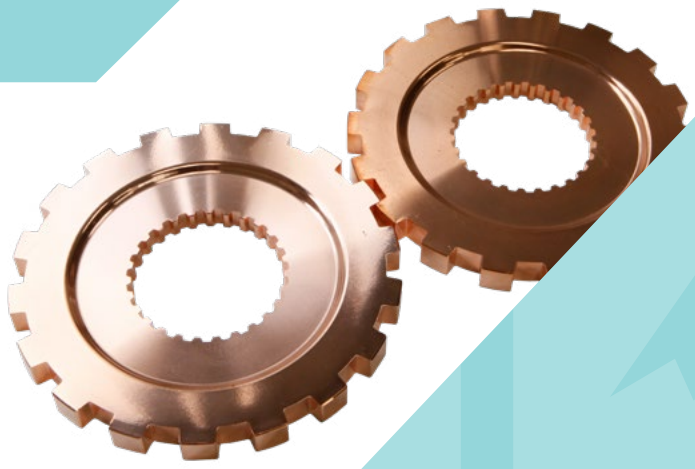


Production items and applications

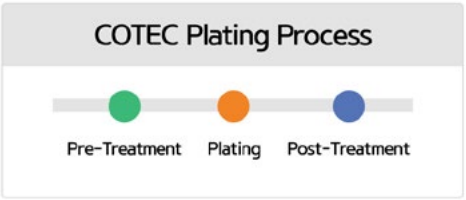
Department / Material		Aircraft, Defence, Atomic power, Machinery for general industries / Fe, STS, Al			
Usage		Undercoat for Ni, Ni-Cr plating, Carburization prevention			
Applied specifications	MIL-C-14550 National defense 0115-0025 AMS2418	Thickness	CLASS	Thickness(㎛)	Application
			0	25 - 127	Shield for heat treatment
			1	25 or thicker	Prevention of carburization and decarburization, Coating for hole in PCB
			2	13 or thicker	Undercoating for nickel and other plating
			3	5 or thicker	To prevent th substrate from moving to tin layer and so damaging the solderability
			4	3 or thicker	Same as class 3
		Soldering	Solder shall be easy and fully conver the substrate. No foam, Blowhole, Pore or other defects allowed. Solder shall be securely adhesive to the substrate. (No trace of separation allowed. It shall not be peeled with sharp tool in testing)		
		Stress removal	At 191±14°C, for more than 3~4 hours		
		Relief of hydrogen embrittlement	The brittle time depending on material organization state and hardness At 191±14°C, for more than 3 hours (HRC 32~39) At 191±14°C, for more than 8 hours (HRC 40~47) At 191±14°C, for more than 23 hours (HRC 48)		
Acceptance		External			
		Internal	HANHWA, KAI, KAL, LIG NEX 1, ADD		

Equipment condition

COTEC	1,500 × 700 × 1,200 mm

Copper Plating

Capable of coating complex parts



Our technologies and their applications

Cyanated copper plating

Characteristic

- It can directly coat the steel.
- Its plated surface is better than copper sulfate plating.
- Copper crystals geenrated from it is very small.
- Plating speed is very fast.
- It can be applied to almost all materials.
- It is toxic as it has cyanide in it.
- Waste disposal and ventilation are required.

Applicable parts

- Defense equipment parts, Aircraft parts

Copper sulfate plating

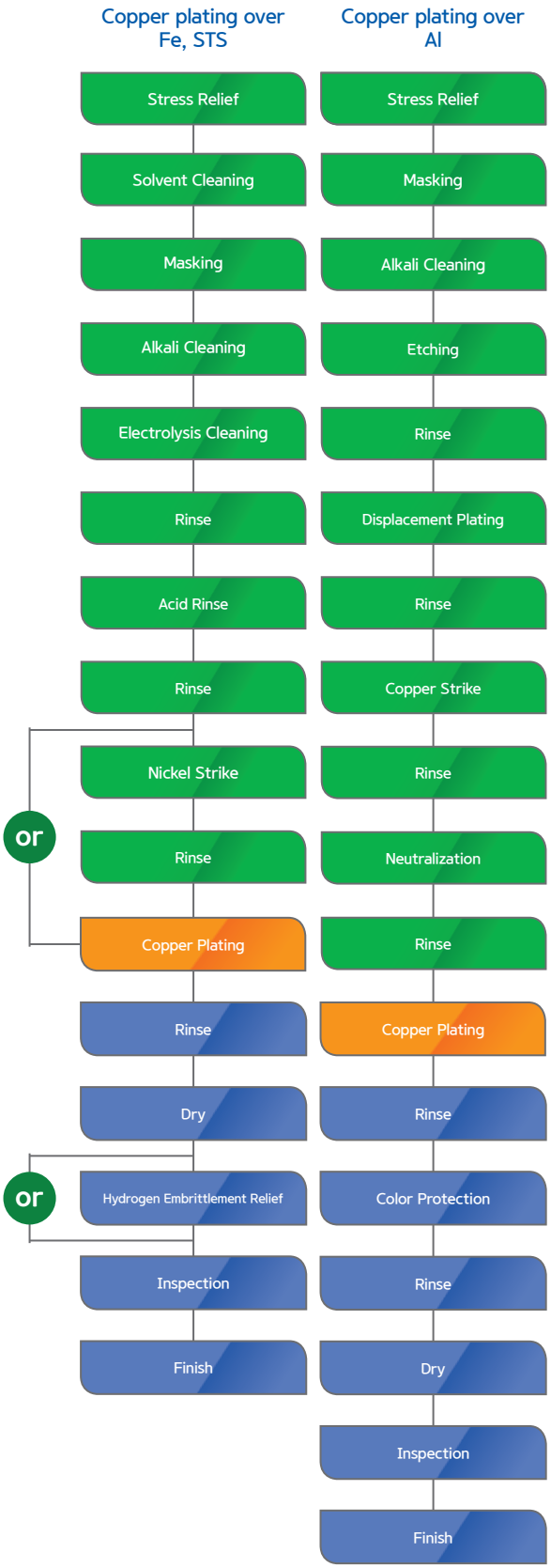
Characteristic

- Less contaminating, less costly and good smoothness.
- Used for undercoating for top coat, color coat, electroforming and plating on PCB.
- Bad adhesion on steel or zinc diecasting materials, thus difficult to direct coat them.
- Good smoothing, and easy to get brightness by removing the buffing trace.
- Its adhesiveness is inferioir to alkaline bath.
- It is indispensablt to electroplating on plastics after chemical plating.
- High currency density can be applied.
- Electric conductivity is good.

Applicable parts

- Electronic parts, Defense equipment parts, Decorative parts

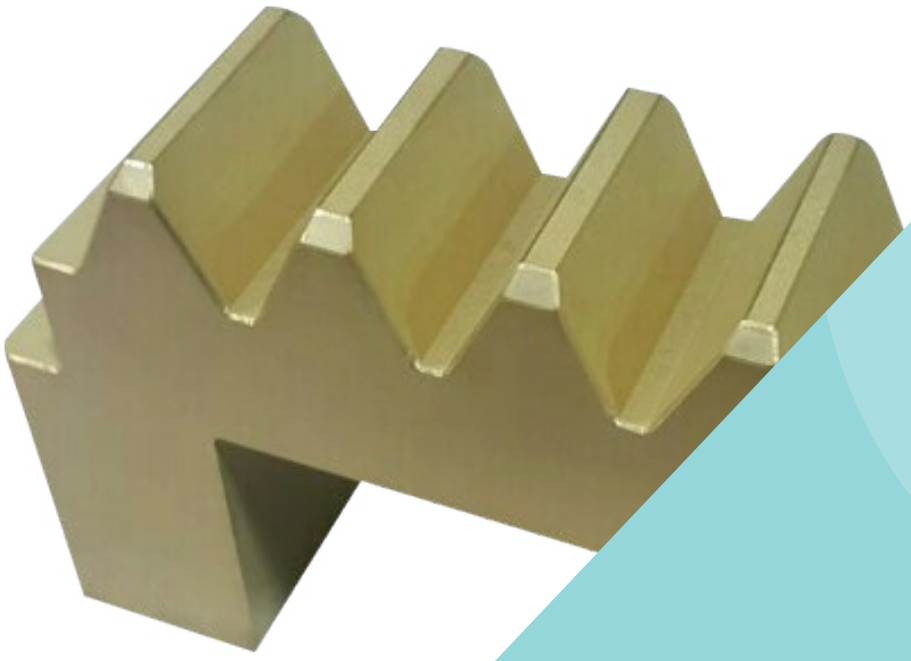
Process



Copper Cleaning

COTEC

COTEC has various surface treatment technologies and the company concentrates on products development and quality control to develop various surface treatment items

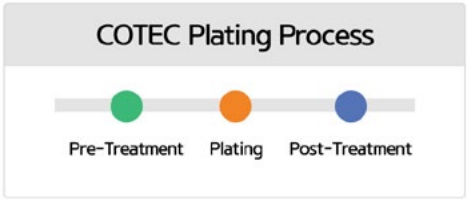


Equipment condition

COTEC	700 × 600 × 1,200 mm

Copper Cleaning

Capable of coating complex parts



Our technologies and their applications

Copper cleaning

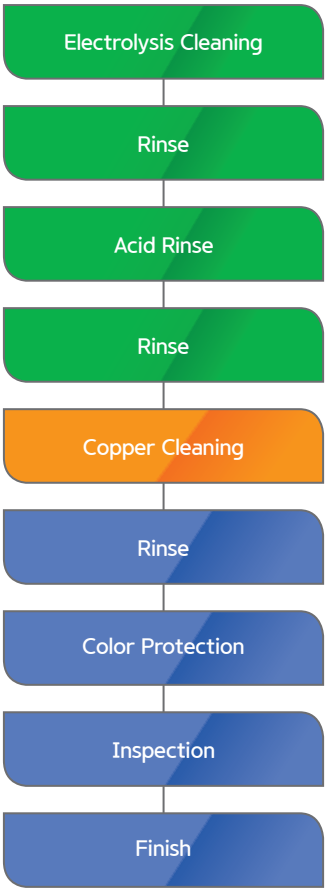
Characteristic

- If copper part's friction resistance are increased due to contamination or oxidation, simple washing process can be used to revive the lost charicteristics. it could also improve electrical conductivity.
- Also for decoration, it provides additional discoloration resistance and contamination resistance.

Applicable parts

- Bus bar, Socket, Machined products

Process



Anodizing

COTEC

COTEC has various surface treatment technologies and the company concentrates on products development and quality control to develop various surface treatment items

Our technology

1. Chromic acid anodizing
2. Sulfuric acid anodizing
3. Hard anodizing
4. Titanium anodizing
5. Boric-sulfuric acid anodizing
6. Magnesium anodizing
7. Tartaric acid anodizing
8. Phosphoric acid anodizing

Production items and applications

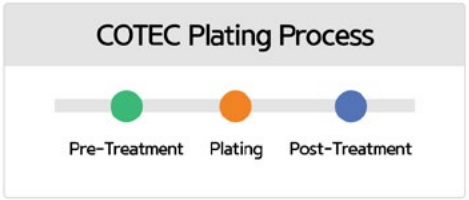
Department / Material		Aircraft parts, Defence, Automobile parts, Semiconductor device / Al, Mg, Ti	
Usage		Aircraft parts, Electricity resistant products, Parts requiring wear resistance, Hardness, Corrosion resistance and decoration	
Thickness (General criteria)		Soft white 1-15㎛, Soft colored 10-25㎛, Hard 1-80㎛, Hard black 25-80㎛	
Applied specifications	MIL-A-8625 BAC5019 BAC5632 80-T-35-2100 IFC 40-761-01MD IFC 40-761-02MD IFC 40-761-03MD FEIS 101 NE 40-030 NE 40-016 PPS 32.03 BAPS 160-010 IFMA 826 MP62.41.31	Thickness	13-100 ㎛ unless otherwise specified
		Corrosion resistance	Subject to salt spray test for 336 hours
		Weight of coatings	Type I - class 1 : 2.2 g/㎡, Type I - class 2 : 5.4 g/㎡ Type 2 - class 1 : 6.5 g/㎡, Type 2 - class 2 : 26.9 g/㎡
		Wear resistance	40 mg or less for Al2024, copper containing aluminium 20 mg or less of weight reduction for other aluminium alloys
Acceptance		External	BOEING, AIRBUS, MBD, AH, HS, CLAVERHAM, EMBRAER, BOMBARDIER, NADCAP
		Internal	HYUNDAE WIA, DOOWON, HANHWA, KAI, KAL, LIG NEX 1, ADD

Equipment condition

COTEC	Chromic acid process 1,800 × 900 × 1,500 mm	Sulfuric acid process 3,000 × 900 × 1,500 mm	Boric acid-sulfuric acid process 4,500 × 900 × 1,500 mm	Tartaric sulfuric acid process 4,500 × 900 × 1,500 mm
AERO COTEC	Chromic acid process 8,000 × 1,200 × 3,000 mm	Sulfuric acid process 8,000 × 1,200 × 3,000 mm	Hard anodizing 8,000 × 1,200 × 2,500 mm	Boric acid-sulfuric acid process 8,000 × 1,200 × 3,000 mm

Anodizing

Capable of coating complex parts



Our technologies and their applications

Chromic acid anodizing

Characteristic

- Suitable for assembly parts due to small dimensional change.
- Corrosion resistance for defense equipment and aircraft parts.
- Utilized in the inspection of cracks in aluminium materials.
- Excellent fatigue strength.
- Utilized in the inspection of cracks in aluminium materials.
- Better corrosion resistance than sulfuric acid method.

Applicable parts

- Parts for defense equipment and aircraft

Magnesium anodizing

Characteristic

- Short time (about 10 minutes) for the formation of a 30㎛ layer of coating.
  (Conventional surface treatment requires about 60 minutes)
- Various colors can be realized.
- Mass production of as much as 250 pieces is possible for 1 lot.
- Process is simple and easy to control.
- Uniform surface of the material anodized.
- Environment friendly process without using 6 hazardous substances.
- 100% coating efficiency.

Applicable parts

- Construction structure, Defense equipment, Home appliances

Soft anidizing

Characteristic

- Its transparency enables the use of the materials showing their appearance.
- Due to high lubricity, adhesion of organic or inorganic paints are well dyed.
- It is used for decoration since it can have various colors.
- Good corrosion resistance.
- Availability of various colors depending on the components of alloys.

Applicable parts

- Construction structure, Defense equipment, Home appliances

Titanium anodizing

Characteristic

- Improved wear resistance and lubricity. (NaOH solution)
- Color change depending on the current density.
- Variations in color. (from transparent garnet to cobalt blue)
- Decorative purpose. (with phosphate or sulfuric acid solution)
- Used for functional purposes. (such as medical transplanting tissue or dental tools)
- Increased wear resistance.

Applicable parts

- Aircraft parts, Artificial bone, Dental tools

Hard anidizing

Characteristic

- Less porosity on the coating and the coating is dense and strong.
- Excellent wear resistance.
- Lubricity can be enhanced with solid film lubricants.

Applicable parts

- Defense equipment parts, Aircraft parts

Boric-Sulfuric acid anodizing

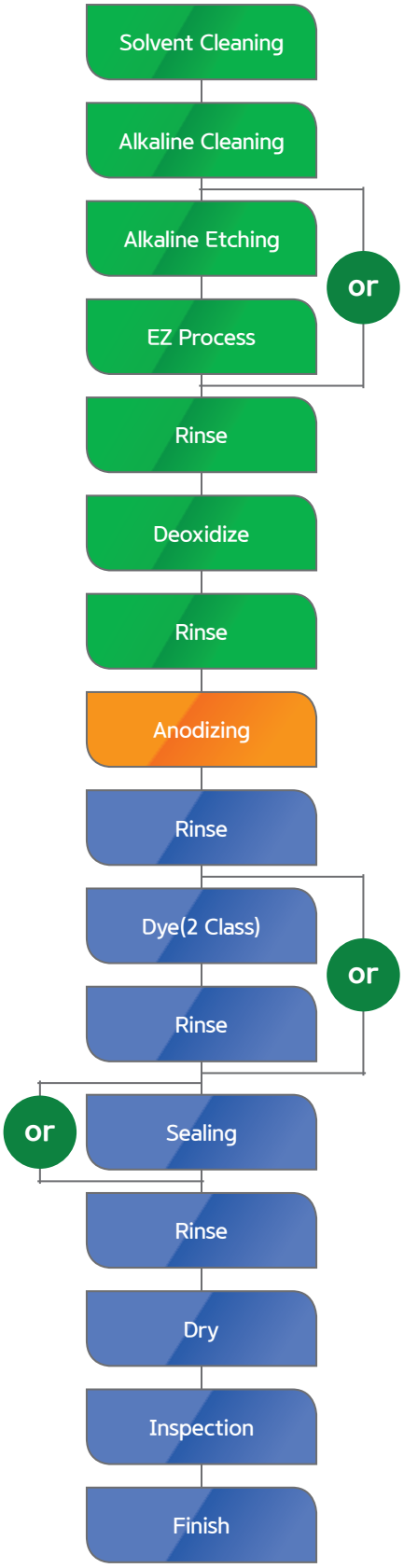
Characteristic

- Suitable for assembly parts due to small dimensional change.
- Suitable for use in maritime climates
- Used for the pre-treatment of aircraft parts.

Applicable parts

- Aircraft parts

Process



Parkerizing

COTEC

COTEC has various surface treatment technologies and the company concentrates on products development and quality control to develop various surface treatment items

Production items and applications

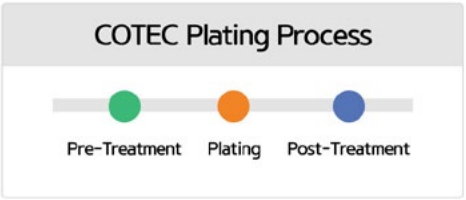
Department / Material			Aircraft parts, Defence, Automobile parts, Atomic power, Machinery for general industries / Fe
Usage			Corrosion resistance, Wear resistance, Cold machining and undercoating
Applied specifications	National defense 0115-0027 (Yeon) MIL-DTL-16232 AMS 2480 FEIS 105 P.S. 13205 IFC 40-740-01 / 02MDE DIN 50942 KS D ISO 9717 KS D 8352	Thickness	1~30㎛
		Corrosion resistance	Type M : Salt spray test for 1.5 hours Type Z : Salt spray test for 2 hours
		Weight of coatings	Type M : 5~30g/㎡ Type Z : 1~40g/㎡
		Corrosion resistance during post treatment	Type M : Salt spray test for 48 Hrs Type M : Salt spray test for 72 Hrs
		Stress removal	Keep them at 130~230°C, for more than 1hours
		Relief of hydrogen embrittlement	Keep them at 99~107°C, for more than 8hours or keep them at room temperature for 128 hours
Acceptance		External	MOOG, AH, GD, NADCAP
		Internal	HYUNDAE WIA, DOOWON, HANHWA, KAI, KAL, ADD

Equipment condition

COTEC	Mn	2,500 × 800 × 1,500 mm (2 Units)
	Zn	2,500 × 1,400 × 4,000 mm
AERO COTEC	Automated Zn	13,200 × 1,350 × 1,100 mm
	Manual Mn	2,000 × 1,000 × 1,500 mm

Parkerizing

Capable of coating complex parts



Our technologies and their applications

Manganese based phophating

Characteristic

- Gray or grayish black appearance. If scratched with a fingernail, a white streak is generated.
- Its appearance is black as there are more iron components in the coating layer or the crystal grain is bigger.
- Coating is composed of dense fine grains.
- Coating is thicker compared to zinc phosphating.
- It is used for parts requiring wear resistance.

Applicable parts

- Defense equipment parts, Industrial machinery parts, Automotive parts, Ship structure, Heavy equipment parts

Zinc based phosphating

Characteristic

- Thick coating shows a grey or greyish black appearance. It is similar to the manganese phosphating in terms of appearance but a little lighter than phosphating.
- The coating conducted with dipping for surface treatment is a dense and non-crystal coating. Excellent in adhesion and corrosion resistance, it is suitable as a fine undercoating for paints as well as coating for rust prevention.

Applicable parts

- Defense equipment parts, Industrial machinery parts and automotive parts, Undercoating for painting, Tools and freezer parts and construction parts

Iron based phosphating

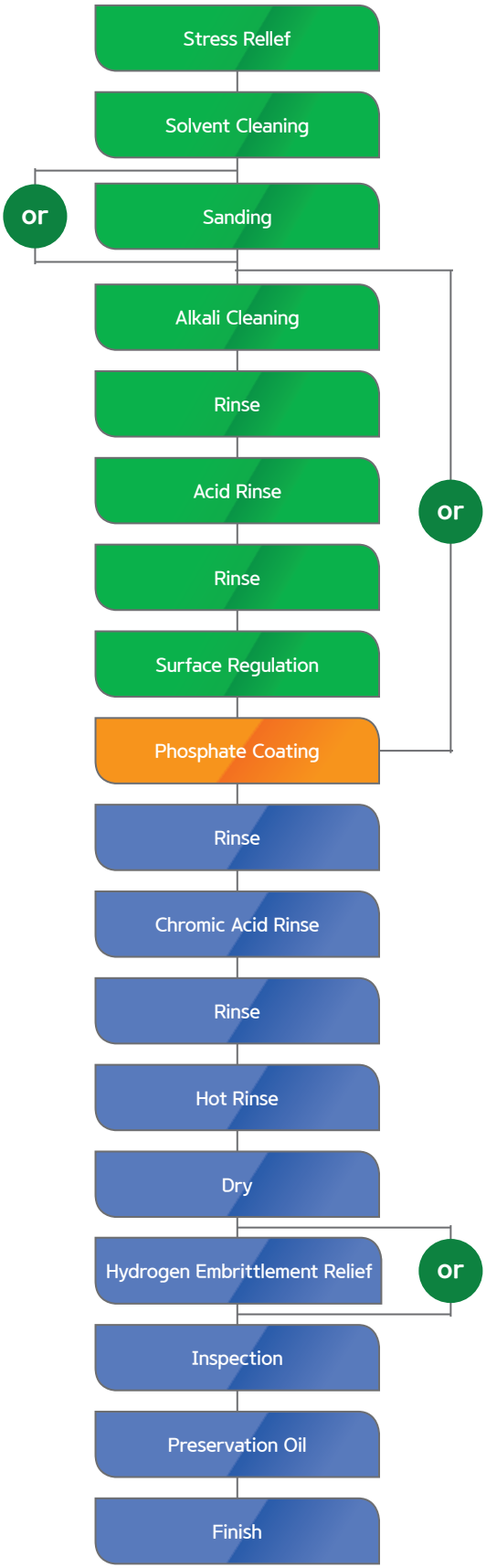
Characteristic

- It is yellow, blue or jade green (Iridescent) in color.
- A thin layer can be formed in a relatively short period of time.

Applicable parts

- Automotive parts, Electronic and industrial machine parts, Construction equipment parts, Undercoating for painting

Process



Aluminum Chromate

COTEC

COTEC has various surface treatment technologies and the company concentrates on products development and quality control to develop various surface treatment items

Production items and applications

Department / Material		Aircraft parts, Defence / Al	
Usage		Decorative, Undercoating, Electric conductivity and corrosion resistance	
Applied specifications	MIL-DTL-5541 MIL-C-5541 BAC 5719 AIPI 02-05-001 FEIS 1111 NE 40-006 PPS 32.01 MP 62.41.10 KS W 1120	Weight of coatings	0.43g /㎡ for Type 1A Not specified for Type 3
		Corrosion resistance	Type 1A and 3A : salt spray test for 168 hours less than 15 spots which are less than 0.794 mm each within the spray area of 0.81㎠
		Adhesiveness	After coating, scrape the coated surface with knife in cross strips and conduct the adhesive test with tape
		Adhesion of paint	Scribe two crossing lines on the primer. Paint should not be peeled off after 24 hours of drying preceded by 500 hours of salt spray test
		Adhesion of film	Bending test using 6mm bar according to ISO 1519 after primer coating
Acceptance		External	BOEING, AIRBUS, MBD, CLAVERHAM, EMBRAER, BOMBARDER, AH
		Internal	HYUNDAE WIA, DOOWON, HANHWA, KAI, KAL, LIG NEX 1, ADD

Equipment condition

COTEC	Small	800 × 600 × 1,200 mm
	Medium	4,000 × 800 × 3,000 mm
	Large	8,500 × 4,000 × 3,500 mm
		4,000 × 8,000 × 3,000 mm
AERO COTEC	8,000 × 800 × 3,000 mm	

Aluminum Chromate

Capable of coating complex parts

COTEC Plating Process

Pre-Treatment Plating Post-Treatment

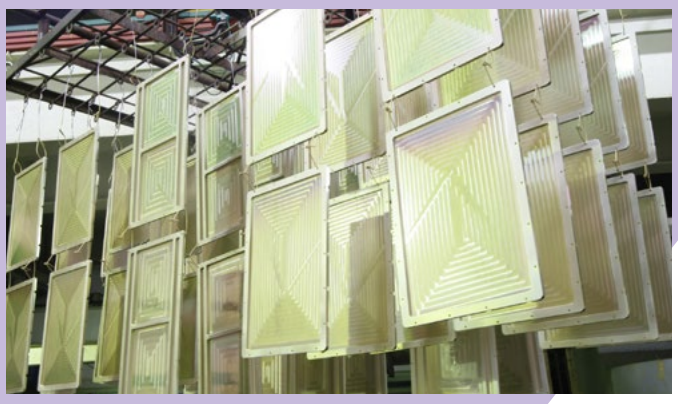
Our technologies and their applications

Characteristic

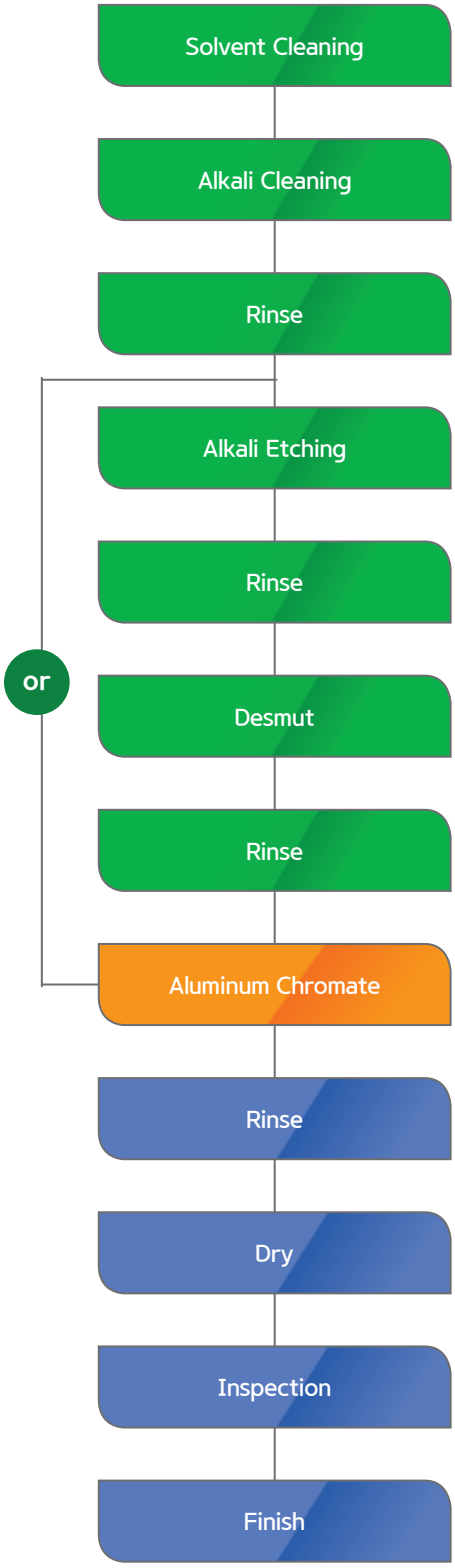
- It is beautiful and resistant to fingerprints.
- Used for undercoating for corrosion resistance and improvement of adhesiveness for aluminium coating.
- Good effect on the contact point of electric parts by giving conductivity and corrosion resistance.
- Dyeing is possible.
- The coating layer is the inert oxide coat that is around 0.25 μm thick.
- It has a self-healing effect on worn out coating surfaces. The coating is generated without the thin coating layer.

Applicable parts

Defense equipment parts, Aircraft parts, Automotive parts, Architectural sash



Process



Passivation

COTEC

COTEC has various surface treatment technologies and the company concentrates on products development and quality control to develop various surface treatment items

Production items and applications

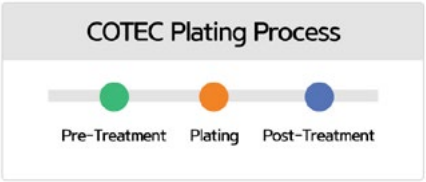
Department / Material		Aircraft parts, Defence, Atomic power / STS	
Usage		Corrosion resistance (Thin film)	
Applied specifications	QQ-P-35 ITF 40-742-01 MD FEIS 115 NE40-081 NE40-081 National defense 0115-0013 AMS 2700 KS W 1115 ASTM A 967 AIPI 02-05-005	I	Low temperature, Sodium dichromate is added nitric acid solution
		II	Medium temperature, Sodium dichromate is added Nitric acid solution
		III	High temperaure, Sodium dichromate is added Nitric acid solution
		IV	S, Se are included Corrosion resistant steel
		V	Anodized, High carbon martensitic corrosion resistant steel
		VI	Low temperature, Nitric acid solution
Acceptance		External	AH, CLAVERHAM, HS, PARKER, AIRBUS, MBD, NADCAP, BOEING, EMBRAER, BOMBARDER
		Internal	HYUNDAE WIA, DOOWON, HANHWA, LIG NEX 1, KAI, KAL, ADD

Equipment condition

COTEC	800 × 800 × 1,000 mm(4 Units)
	1,000 × 800 × 1,000 mm
AERO COTEC	1,000 × 700 × 1,100 mm

Passivation

Capable of coating complex parts



Our technologies and their applications

Characteristics

- Stainless steel is not a special steel but just an iron-based steel that has a corrosion resistant. Its main component is iron. The reason why stainless steel does not corrode is because very thin oxide film (30-60 Å, the passivation film) forms on the steel surface. This oxide film contains iron oxide generated from many causes. Since the iron can corrode easily when it comes into contact with Cu, Al, rubber or ebonite, or under the wet conditions, it should be passivated to remove the causes of generation of contaminants that damage corrosion resistance and cause future contamination. Contaminants are removed from the surface of stainless steel and passivation film is formed on it.

- Carburized chromium is formed on the surface of stainless steel that is heat treated for carburizing, making it unsuitable for passivation. In addition, the nitrided product cannot be treated with a solution as it corrodes the nitrided layer. If passivation is required, it shall be conducted before carburizing.

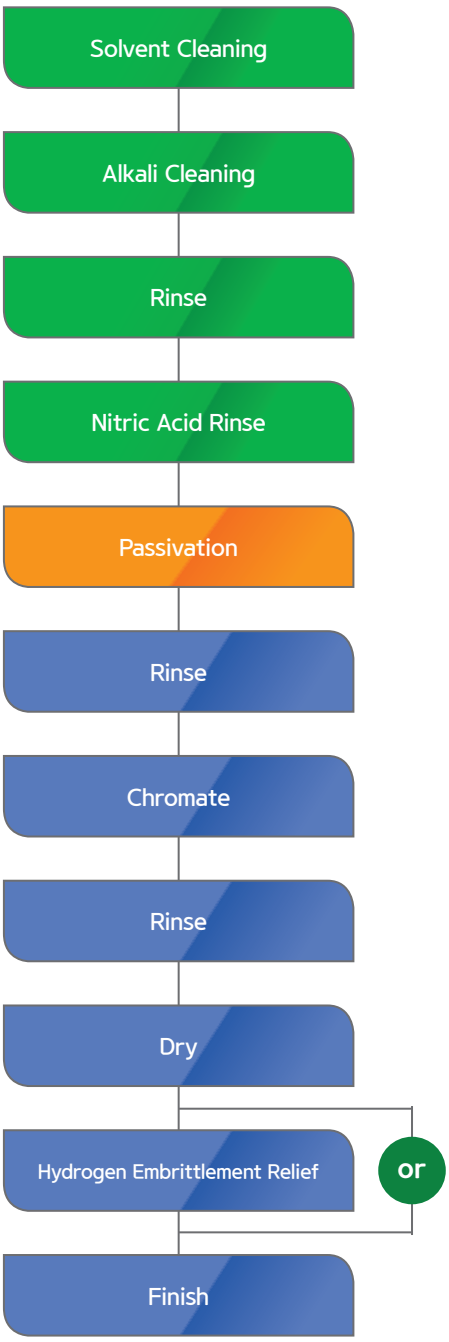
- If the parts that underwent mechanical machining and grinding are conducted with plating or electro polishing, and the iron contaminants are all removed during the process, the passivation treatment is not required.

- Parts to be soldered or brazed are to be processed with soldering or brazing prior to passivation because the passivation solution can corrode the materials for soldering or brazing.

Applied parts

General decoration, Car decoration, Cosmetic case / Accessory industrial products, etc.

Process



Black Oxide Coating

COTEC

COTEC has various surface treatment technologies and the company concentrates on products development and quality control to develop various surface treatment items

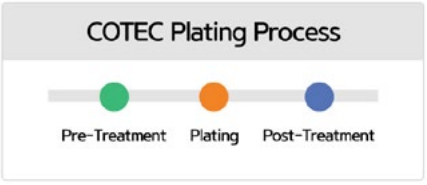
Production items and applications

Department / Material		Defence, Automobile parts, Machinery for general industries / Fe	
Usage		Proper for moving parts which should not have any dimensional changes after coating Used for decoration applications or reducing the light reflection	
Applied specifications	National defense 0115-0023 (Yeon) MIL-C-13924 MIL-F-495 MIL-DTL-13924 KS D ISO 11408	Thickness	less than 0.2㎛~5㎛
		Corrosion resistance	For 96 hours (Applied to 300 series corrosion resistant steel)
		Oxalic acid test	Black or blackish brown is to be kept for Class 1, 2, and 3 for 30 seconds to 90 minutes
		Smut test	Uniform black (No reddish brown or green smut)
Acceptance		External	
		Internal	HYUNDAE WIA, DOOWON, KAI, ADD

Equipment condition

COTEC	600 × 600 × 600 mm (3 Units)

Black Oxide Coating



Our technologies and their applications

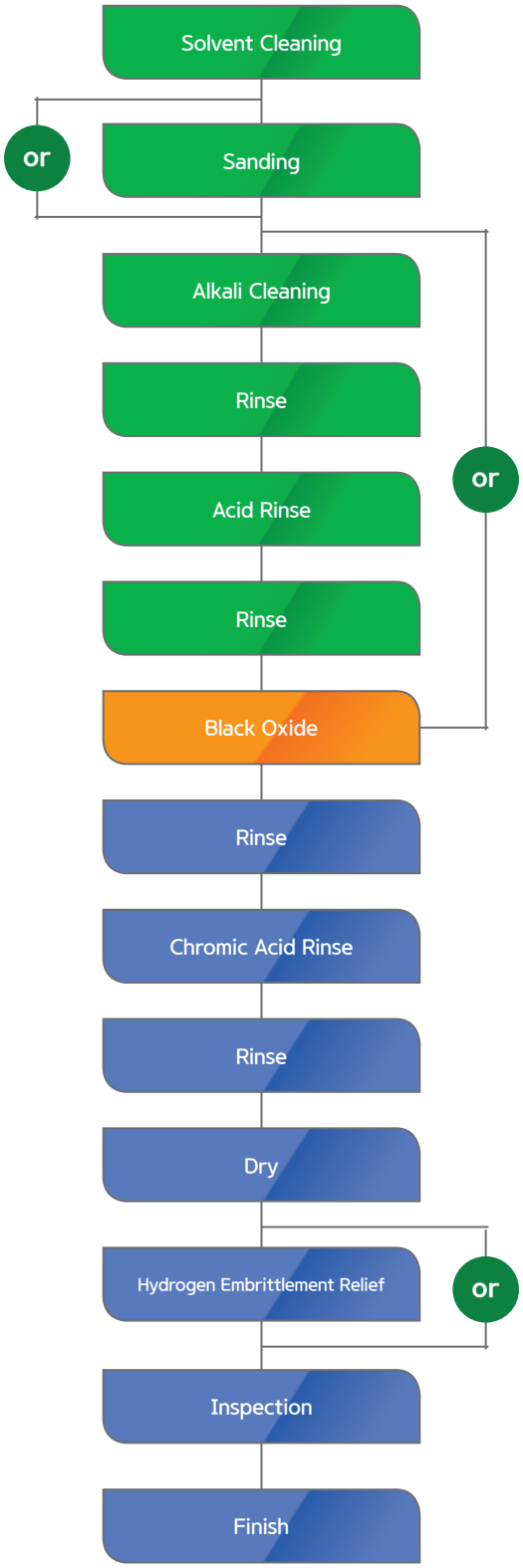
Characteristic

- It has good adhesion and resistant to shock or abrasiveness.
- Almost no dimensional change making it proper for rust prevention for precision parts.
- It is a thin film of 0.2 - 0.5㎛.
- The coating is stable Fe3O4 (Similar to FeO-Fe2O3).
- It can withstand temperatures up to 400°C.
- Due to large quantities of inherit cracks, this process requires rust preventiove coatings.

Applicable parts

- Defense equipment, Commercial (Except machine tools)

Process



Electro Forming

COTEC has various surface treatment technologies and the company concentrates on products development and quality control to develop various surface treatment items

Production items and applications

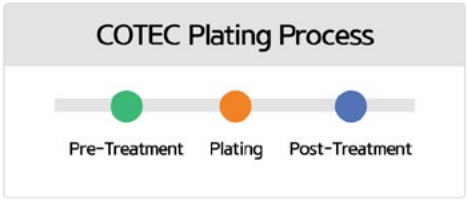
Department / Material	Electric and electronic parts, Optical parts (lens, rear mirror), Video disc, Rocket nozzle, Replica of crafts	
Usage	Increases the fatigue life of products and inhibit stress corrosion crack	
Characteristic	It is possible to make a precise duplicate of complicate model. It is easy to control the thickness of duplicates. It is possible to revive fine patterns. It does not require expensive equipment.	
Applied specifications	Internal	ADD, KAI

Equipment condition

AERO COTEC	1,000 × 1,000 × 1,300 mm

Electro Forming

Capable of coating complex parts

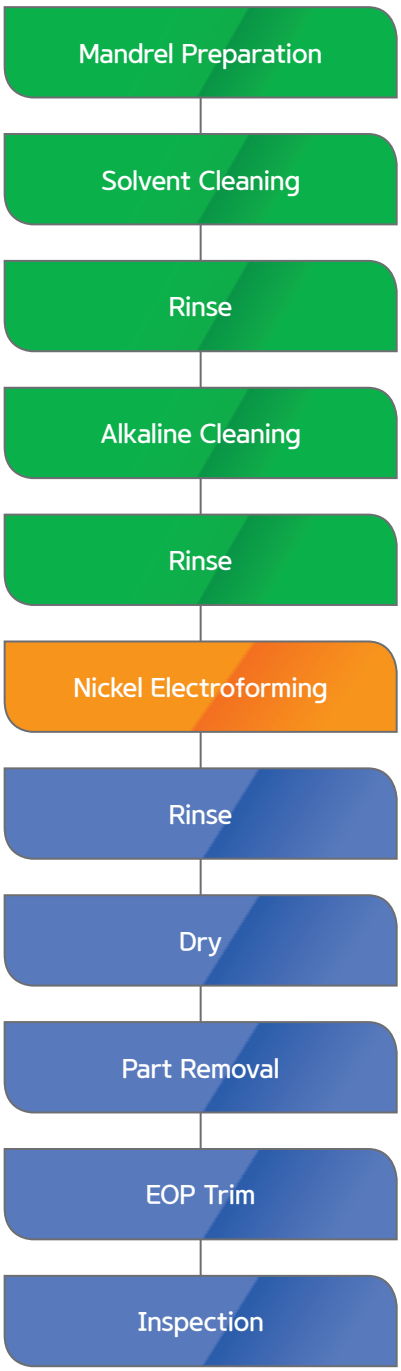


Our technologies and their applications

Characteristic

- Create parts by electroplating the model then releasing the plated surface to creat couterpart.
- The model has little size deviation.
- There is no limitation of the shape or size.

Process



Ion Vapor Deposition

COTEC

COTEC has various surface treatment technologies and the company concentrates on products development and quality control to develop various surface treatment items

Production items and applications

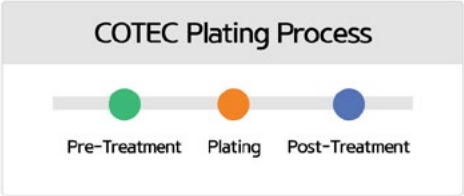
Applied specifications	MIL-DTL-83488 PS13143 (Al plating)	Class	Class 1 : 26㎛ ↑
			Class 2 : 13~26㎛
			Class 3 : 8~13㎛
		Type	Type - Type 1 : As coated
			Type II : With supplementary chromate treatment
	AMS-C-8837 PS13145 (CD plating)	Class	Class 1 : 13㎛ min
			Class 2 : 8㎛ min
			Class 3 : 5㎛ min
		Type	Type 1 : As plating
			Type II : With supplementary chromate auxiliary treatment
Applied specifications		External	BOEING, BOMBARDIER
		Internal	KAI, HANHWA, KAL, ADD

Equipment condition

AERO COTEC	1,300 × 2,500 mm

Ion Vapor Deposition

Capable of coating complex parts



Our technologies and their applications

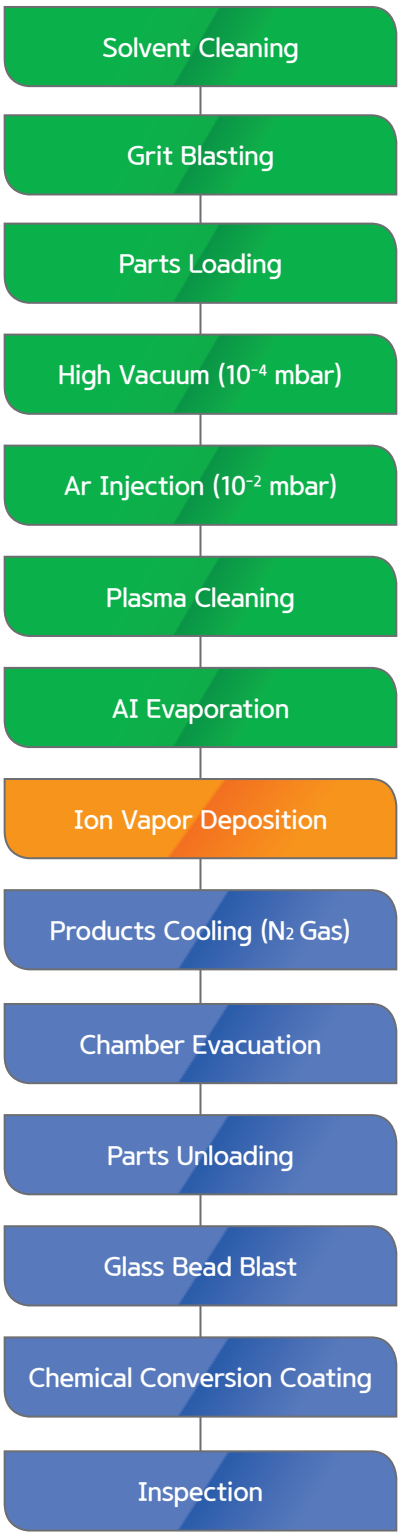
Object items

- Aerospace and electronics.
- Magnet and sintered products.
- Highstrength bolt and stainless steel, bolt replacement, spring, washer, pin, hardwares, etc.
- Anodizing replacement aluminium alloy structure, steel, stainless steel, titanium, powder metals.
- Cadmium plating replacement or other plating replacement purpose.

Applications

- Places where corrosion occurs by industrial contaminants such as sulphur, base and organic substances and electric corrosin occurs between dissimilar metals.
- For prevention of electromagnetic interference. (EMI)
- Places which require high temperature corrosion resistance and electric corrosion resistance.
- Places where hydrogen embrittlement is not susceptible.
- Useabel for the contact surface of fuel and inflammable materials.
- Heat exchange devices.
- Places where color is required depending on use.

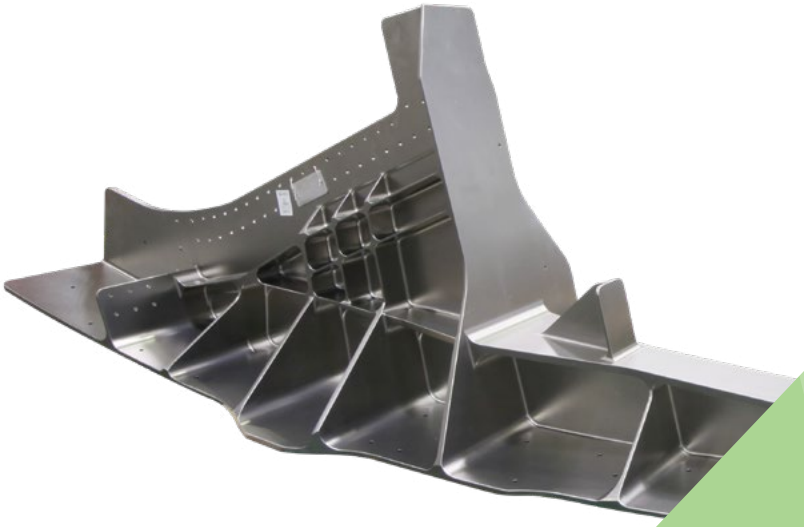
Process



Titanium Cleaning and Chemical Coating

COTEC

COTEC has various surface treatment technologies and the company concentrates on products development and quality control to develop various surface treatment items



Production items and applications

Department / Material	Aircraft / Ti	
Usage	Cleaning	Appearance, FPI pre-treatment, Primer painting
	Chemical conversion film	Appearance, Corrosion resistance, Primer painting
Applied specifications	External	BOEING, AIRBUS, LOCKHEED MARTIN, SAGEM
	Internal	HANHWA, KAI

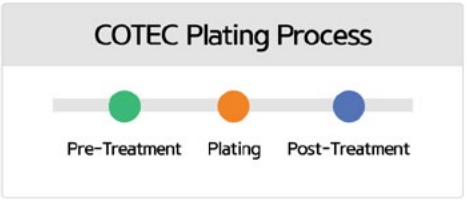
Detailed approval of titanium cleaning and chemical conversion film process

Cleaning	BOEING, AIRBUS, LOCKHEED MARTIN
Chemical conversion film	THALES HANWHA, SAGEM

Equipment condition

AERO COTEC	Titanium cleaning	4,100 × 970 × 1,600 mm
	Chemical conversion film	480 × 470 × 1,000 mm

Titanium Cleaning and Chemical Coating



Capable of coating complex parts

Our technologies and their applications

Characteristic

- To remove contaminants by etching.

- An etching when
  - Prior to thermal treatments.
  - Prior to welding.
  - Prior to application of conversion coating.
  - Prior to priming or painting.
  - Prior to steel shot peening.

Process

Painting

COTEC has various surface treatment technologies and the company concentrates on products development and quality control to develop various surface treatment items

Production items and applications

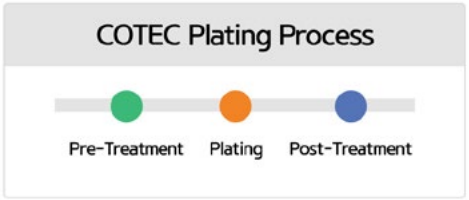
Department / Material	Aircraft parts, Defense parts / Fe, Al, STS, Pvc	
Usage	Appearance, Corrosion resistance	
Applied specifications	External	BOEING, AIRBUS, MBD, NADCAP, BOMBARDIER, EMBRAER AH, CLAVERHAM
	Internal	HYUNDAE WIA, HANHWA, KAI, KAL, LIG NEX1, DOOSAN, ADD

Equipment condition

COTEC	Paint booth	6,000 × 9,000 × 4,350 mm (Large)	8,000 × 6,000 × 4,500 mm (Medium)
	Drying Room	5,200 × 8,200 × 4,000 mm (Large)	5,000 × 8,000 × 3,500 mm (Medium)
	Conveyor Line	4,200 × 6,200 × 33,280 mm	
	Putty line	14,000 × 5,000 × 4,000 mm	
	PVC paint (Specialized line)		
AERO COTEC	Paint booth	6,000 × 8,000 × 4,400 mm (Large)	
	Automated paint booth(skin)	4,000 × 8,000 × 4,400 mm (Medium)	
	Paint booth	4,200 × 8,000 × 4,400 mm (Medium)	
	Semi-auto conveyor paint booth	5,200 × 9,600 × 4,400 mm (Large)	
	Drying room	8,000 × 13,200 × 4,400 mm (Large)	
	Semi-auto conveyor drying room	4,900 × 15,200 × 3,000 mm (Small)	

Painting

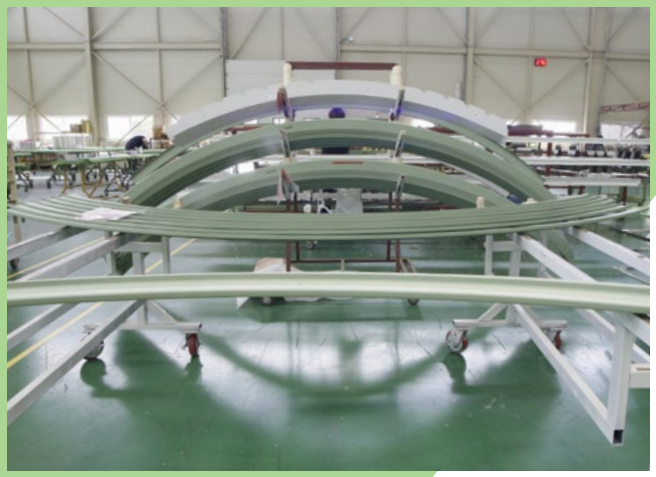
Capable of coating complex parts



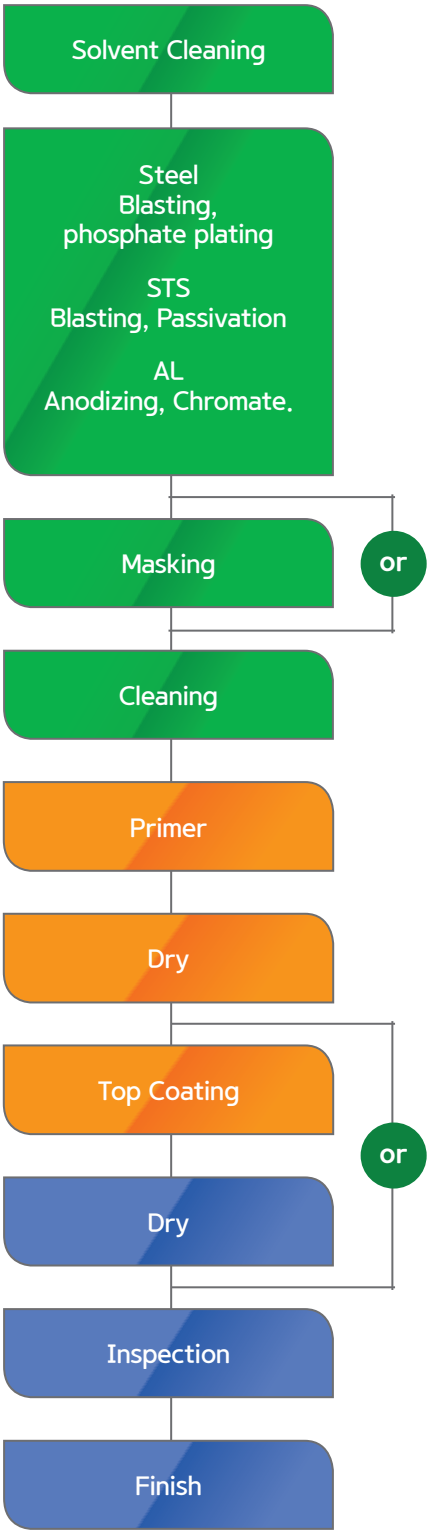
Our technologies and their applications

Characteristic

- Beautiful appearance and protection of parts.
- Good durability and resistance to corrosion.
- Long-term maintenance parts life.
- Aviation paints needs to be resistant to thermal expansion, have good adhesiveness, and weather resistant.
- Such as special purpose operations possible conductivity, heat resistance, condensation prevention, etc.



Process



Solid Film Lubricants

COTEC

COTEC has various surface treatment technologies and the company concentrates on products development and quality control to develop various surface treatment items

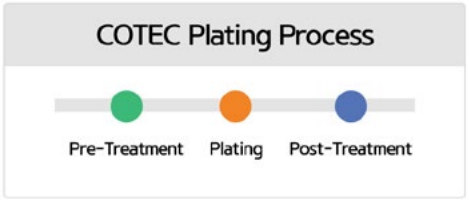
Production items and applications

Department / Material		Steel and non-ferrous metals	
Usage		Lubrication, Corrosion resistance, Wear resistance and prevention of loss due to heat	
Thickness (General criteria)		2~20㎛ hours	
Applied specifications	National defense 0115-1025 (Yeon) National Defense 9150-0024 (Yeon) MIL-L-46010 MIL-PRF-46010	Thickness	5-13㎛ (measuring after baking it for 3 hours under the 162±3°C)
		Corrosion resistance	National Defense 9150-0024 : for 100 hours National Defense 0115-1025 : rust spots within 3 for 144 hours
		Adhesiveness	No trace of separation of coating from substrate
Acceptance		External	CLAVERHAM, MBD, GD
		Internal	DOOWON, HANWHA, HYUNDAE WIA, KAI, KAL, S&T, ADD

Equipment condition

COTEC	2,000 × 3,000 × 2,000 mm

Solid Film Lubricants



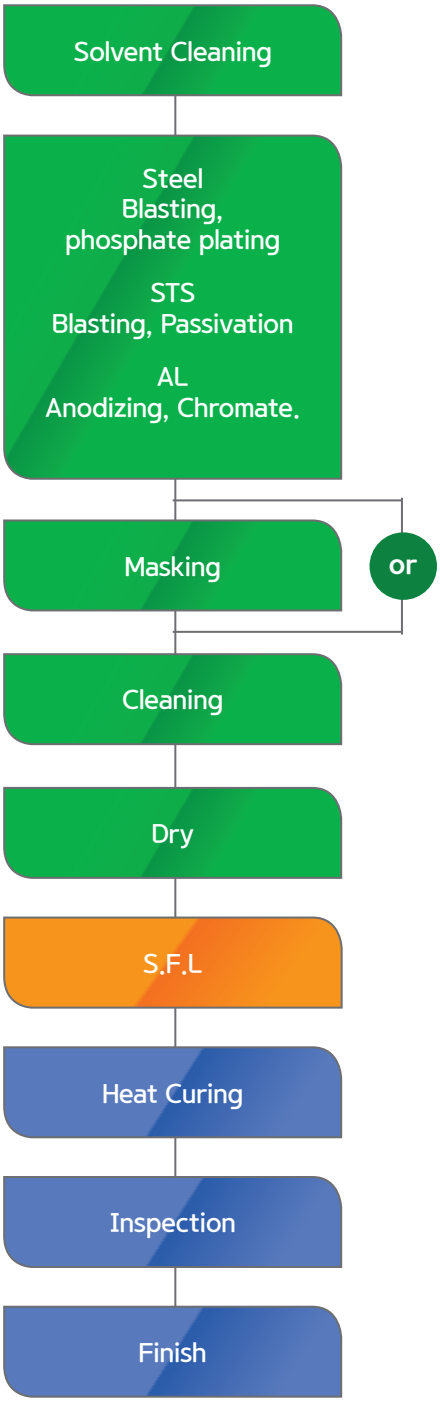
Capable of coating complex parts

Our technologies and their applications

Characteristic

- Excellent corrosion resistance, wear resistance and heat resistance.
- Excellent lubrication withstanding the severe shock and loading.
- Can be applied to most metals and when other lubricants cannot be applied. Excellent properties that are far better than other surface treatment methods. Has a good prospect for the future.
- Very dark non-bright color.

Process



Chemical Milling

COTEC has various surface treatment technologies and the company concentrates on products development and quality control to develop various surface treatment items

Production items and applications

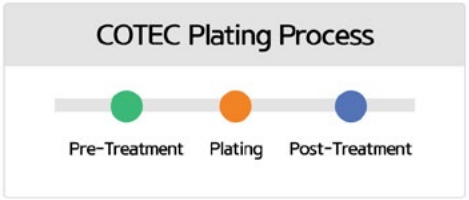
Department / Material	Aircraft, Mobile, Artificial satellite / Aluminium and aluminium alloy parts	
Usage	Product is manufactured by chemical milling	
Applied specification	MIL-C-81769	
Acceptance	External	BOEING, AIRBUS, BOMBARDIER
	Internal	KAI, KAL, KARI, DOOWON

Equipment condition

AERO COTEC	Maskan	8,300(8,000) × 1,220(1,000) × 3,700(2,800) mm
	Etching	8,400(8,000) × 1,520(1,000) × 6,000(2,800) mm

Chemical Milling

Capable of coating complex parts



Our technologies and their applications

Characteristic

- Use corrosion technology.
- Using chemical oxidation-reduction reaction.
- Application of intractable products.
- If the part have intial faults, chemmilling can make it worse.
- Application of aluminum parts.

Applied parts

- Artificial satellite parts, Mobile equipment parts, Aircraft parts, Machining is impossible parts

Process

- Solvent Cleaning
- Alkali Cleaning
- Rinse
- Desmut
- Rinse
- Dry
- Maskant Apply
- Scribing
- Etching
- Rinse
- Dismut
- Rinse
- Hot Rinse
- Inspection
- Finish

Electro Polishing

COTEC has various surface treatment technologies and the company concentrates on products development and quality control to develop various surface treatment items

Production items and applications

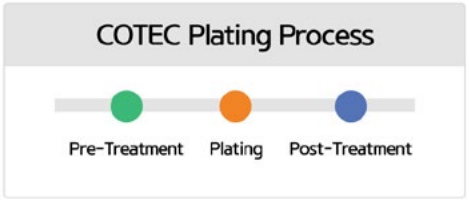
Department / Material	Aircraft, Defense industry, Mobile / Steel and SUS	
Usage	Brightening and removal of burr	
Applied specification	ITF40-723-01 MDE, ITC40-723-01 MDE	
Acceptance	External	MBD
	Internal	HYUNDAE WIA

Equipment condition

COTEC	800 × 800 × 1,000 mm

Electro Polishing

Capable of coating complex parts



Our technologies and their applications

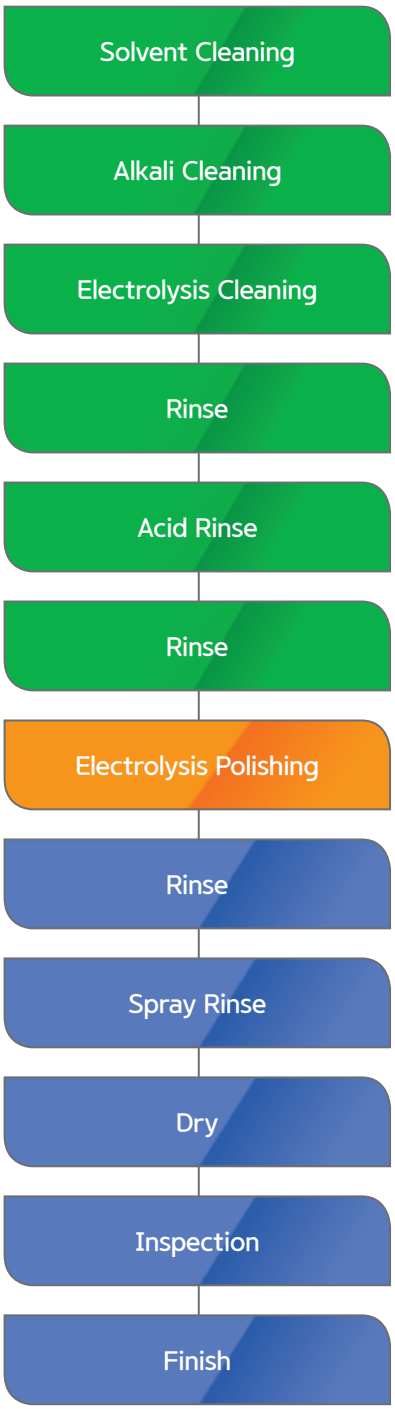
Characteristics

- No degraded layer from processing.
- No effect from heat.
- Excellent smoothing.
- Excellent corrosion resistance.
- Excellent in cleaning and non-adhesion.

Applied parts

- Aircraft parts, Mobile equipment parts, Medical appliances, Dinnerware, Defense industry material

Process



Non Destructive Test (FPI)

COTEC

COTEC has various surface treatment technologies and the company concentrates on products development and quality control to develop various surface treatment items

Production items and applications

Department / Material	Aircraft, Defense industry, Mobile / Al, Ti	
Usage	Test for material defects	
Acceptance	External	BOEING, AIRBUS, EMBRAER, BOMBARDIER, NADCAP, AH, LOCKHEED MARTIN
	Internal	KAI, KAL, ADD, HANHWA, HYUNDAE WIA

Non Destructive Test (FPI)

Capable of coating complex parts

COTEC Plating Process

Pre-Treatment Plating Post-Treatment

Equipment condition

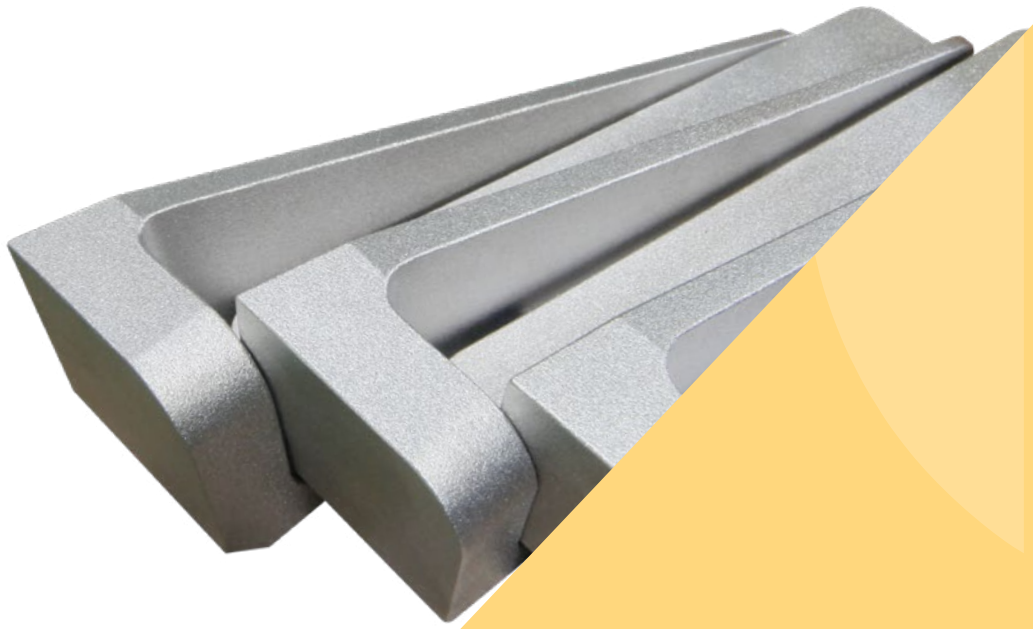
AERO COTEC	Large line : 8,000(7,500) × 1,000(600) × 3,000(2,500) mm
	Small line : 3,200(3,000) × 900(600) × 3,000(2,500) mm

Process

- Solvent Cleaning
- Alkali Cleaning
- Rinse
- Etching
- Rinse
- Dismut
- Rinse
- Dry
- Penetrant Spray
- Dwell Time
- Rinse
- Dry
- Developer
- Dwell Time
- PT Inspection
- Post-Treatment

Shot Peening

COTEC has various surface treatment technologies and the company concentrates on products development and quality control to develop various surface treatment items

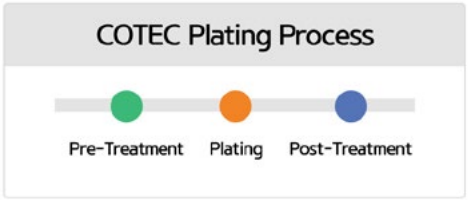


Production items and applications

Department / Material			Aircraft, Defense industry, Atomic power / Ti, STS
Usage			Increases the fatigue life of products and inhibit stress corrosion crack
Applied specifications	AMS 2430 BAC 5730 AIPI 02-02-004 ABP 1-2028/2353 ABP 1-2029 ABP 1-2026 PCS 2300 NE 40-072 KDS85MP0132 TPS 1-434		Almen strip : A, N type Shot : ASH 230 (AMS2431/2), AWCH 32 (AMS2431/8) Intensity : 0.003A~0.0021A
Acceptance		External	BOEING, AIRBUS, BOMBARDIER, NADCAP, MBD, LOCKHEED MARTIN
		Internal	ADD, KAI, KAL

Shot Peening

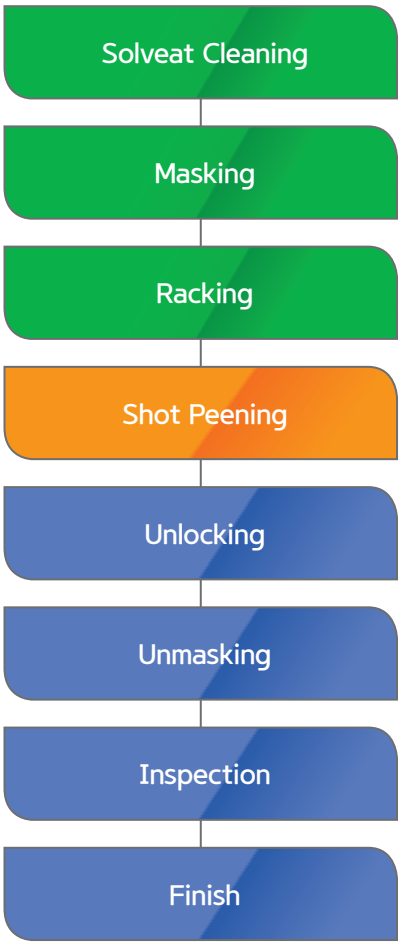
Capable of coating complex parts



Equipment condition

AERO COTEC	
Lance peening No.1 equipment	2,000(500) × 2,400(500) × 3,950(1,600) mm (Applicable length 300 mm)
Lance peening No.2 equipment	2,130(400) × 9,200(8,000) × 2,800(1,200) mm (Applicable length 300 mm)
Lance peening No.3 equipment	2,100(300) × 8,000(4,000) × 2,800(900) mm (Applicable length 1,000 mm)
Portable peening equipment	1,800 × 2,000 × 2,500 mm
Manual peening equipment	1,500(800) × 1,500(500) × 2,000(500) mm

Process



Chromium Plating

COTEC

COTEC has various surface treatment technologies and the company concentrates on products development and quality control to develop various surface treatment items

Our technology

1. Decorative chromium plating
2. Hard chromium plating
3. Chromium plating for inside of long shaft high pressure cylinder
4. High corrosion resistant chromium plating
5. Trivalent chromium plating
6. Chromium plating over plastics
7. Chromium plating over various materials
8. (Corrosion resistant steel, Inconel, Titanium, Castings, Aluminum, Copper)

Production items and applications

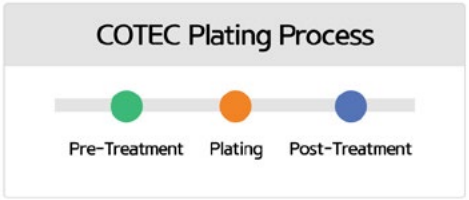
Department / Material		High pressure cylinder for long shaft, Aircraft parts, General industrial machine, Ship, Mold and dies and other steel materials	
Usage		Resistant to wear, Heat, Corrosion and chemicals, Lubrication, Decoration and Special shape	
Thickness		0.25~1000㎛	
Applied specifications	National defense 0115-0011 AMS QQ-C-320 P.S 13118 IFC 40-834-01MD FEIS 106 BPS4517, AMS2460 AMS2438, PCS2110 PCS2111, KS W 1123	Thickness	Type 1 : 0.25㎛ or thicker ↑, Type 2 : 51㎛ or thicker ↑
		Adhesiveness	No trace of separation after bending
		Hardness	Hv850 ↑
		Stress relief	At 191±14°C, for more than 3 hours
		Hydrogen embrittlement relief	Depending on product's microstructure and hardness, relief time differs. 191±14°C, for more than 3 hours (HRC 32~39) 191±14°C, 1for more than 12 hours (HRC 40~47) 191±14°C, for more than 22 hours (HRC 48 or over)
Acceptance		External	BOEING, MBD, NADCAP, CHAVERHAM, PARKER, HS, AH
		Internal	HYUNDAE WIA, HANWHA, KAI, KAL, ADD

Equipment condition

COTEC	
4,000 × 1,200 ×2,000 mm	3,000 × 1,200 ×3,000 mm(2 Units)
3,000 × 1,200 ×2,000 mm	3,000 × 1,200 ×4,000 mm

Chromium Plating

Capable of coating complex parts



Our technologies and their applications

Decorative chromium plating

Characteristic

- Beautiful color and excellent resistance to tarnish.
- Good durability and resistance to wear and corrosion.
- Susceptible to pinholes and cracks. As it is difficult to completely coat the base metal, products are based coated with copper or nickel before coating a thin layer of 0.05 to 0.5㎛ over it.
- It is used for decoration or protection against tarnish.

Applicable parts

- General decorative accessories, Automotive trims, Cosmetics case accessories and industrial products

Hard chromium plating

Characteristic

- Hardness of Hv 600 to 1,000 is possible with fine crystalline particles and high internal stress.
- It has excellent resistance to wearing and heat as well as a low friction coefficient.
- Good lubricity preventing adhesion by other materials; frequently applied to tools and dies.
- As there are cracks inside the coating layer and the lubricant can penetrate through the cracks for increasing lubricity, the plating is adapted for pistons and cylinders.
- Current efficiency is at 10-20% compared to other platings, adhesiveness, coverage, uniformity, bath conditions are very poor.

Applicable parts

- Tools and dies, Automotive parts, Aircraft parts, Ship parts, Parts for equipment used in the tool textile, Printing, Chemical industry, Heavy equipment parts, Nuclear power generation parts, General pistons and cylinders and others

Chromium plating for the interior of long shaft high pressure cylinders

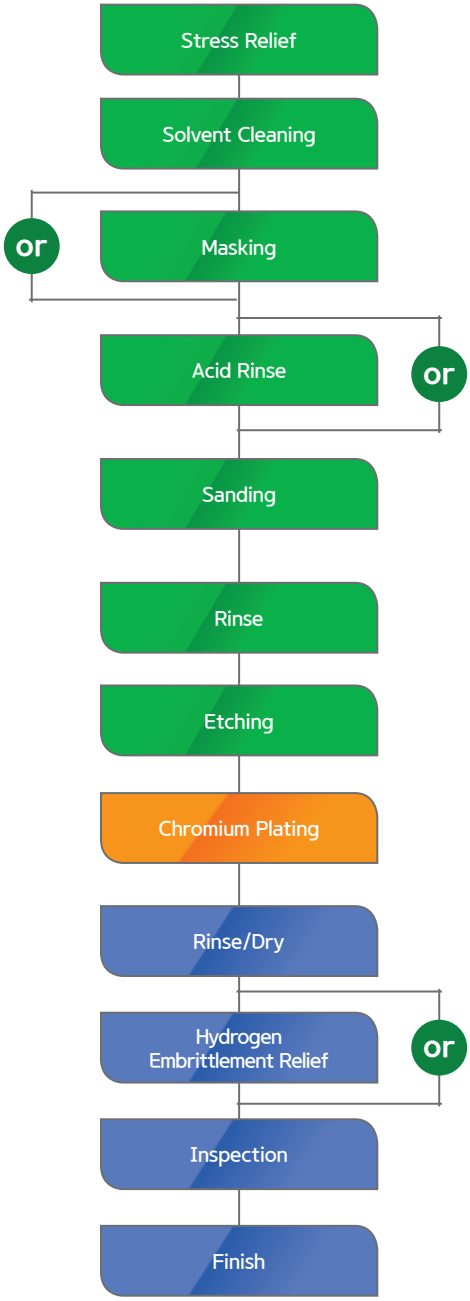
Characteristic

- It has the properties of hard chromium plating.
- As it has the increased adhesiveness, it is excellent in heat and pressure resistance it can withstand an instant temperature of around 3,000°C and pressure of around 110,000 psi.
- It is applied to long shaft products having a cylinder length of 7,000mm, coating thickness of 120-150㎛ and deviation of 20㎛.

Applicable parts

- Interior of the long shaft high pressure cylinder, Defense equipment, Long shaft cylinder and piston, etc.

Process



Zinc Plating

COTEC

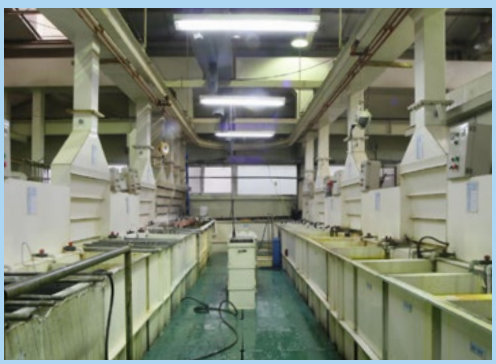
COTEC has various surface treatment technologies and the company concentrates on products development and quality control to develop various surface treatment items

Production items and applications

Department / Material		Aircraft parts, Defence, Atomic power, Machinery for general industries / Fe, STS, Al	
Usage		Corrosion resistance, Primer painting, Appearance	
Thickness		3~30㎛	
Applied specifications	National defense 0115-0016 ASTM B 633 QQ-Z-325 KS D 8304	Thickness	Applied specifications : Thickness, Adhesive, Relese tension, Hydrogen relese
		Adhesiveness	No trace of separation after bending.
		Stress relief	At 191±14°C, for more than 3 hours
		Hydrogen embrittlement relief	Depending on product's microstructure and hardness, relief time differs. At 191±14°C, for more than 3 hours (HRC 32~39) At 191±14°C, for more than 12 hours (HRC 40~47) At 191±14°C, for more than 22 hours (HRC 48 for more than)
		Corrosion resistance	Salt spray test (48~96hrs) For high corrosion resistance, contact for further information
Acceptance		External	
		Internal	DOOWON, HYUNDAE WIA, HANWHA, LIG NEX 1, KAI, ADD

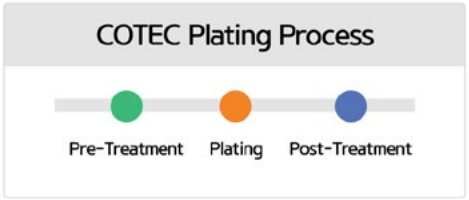
Equipment condition

COTEC	Acid	3,000 × 1,000 × 1,500 mm
	Alkaline	3,200 ×1,000 × 1,500 mm



Zinc Plating

Capable of coating complex parts



Our technologies and their applications

Alkali zinc plating

Characteristic

- It is generally applied electro deposition zinc plating.
- It generates zincate, lowers the concentration of the zinc solution, and promotes good uniformity, thus resulting in bright luster.
- Its bath is relatively easy to control.
- Its waste has a highly concentrated cyanate level, making it expensive to treat the waste.

Applicable parts

- Automotive parts Electric parts, Industrial products

Zinc oxide plating

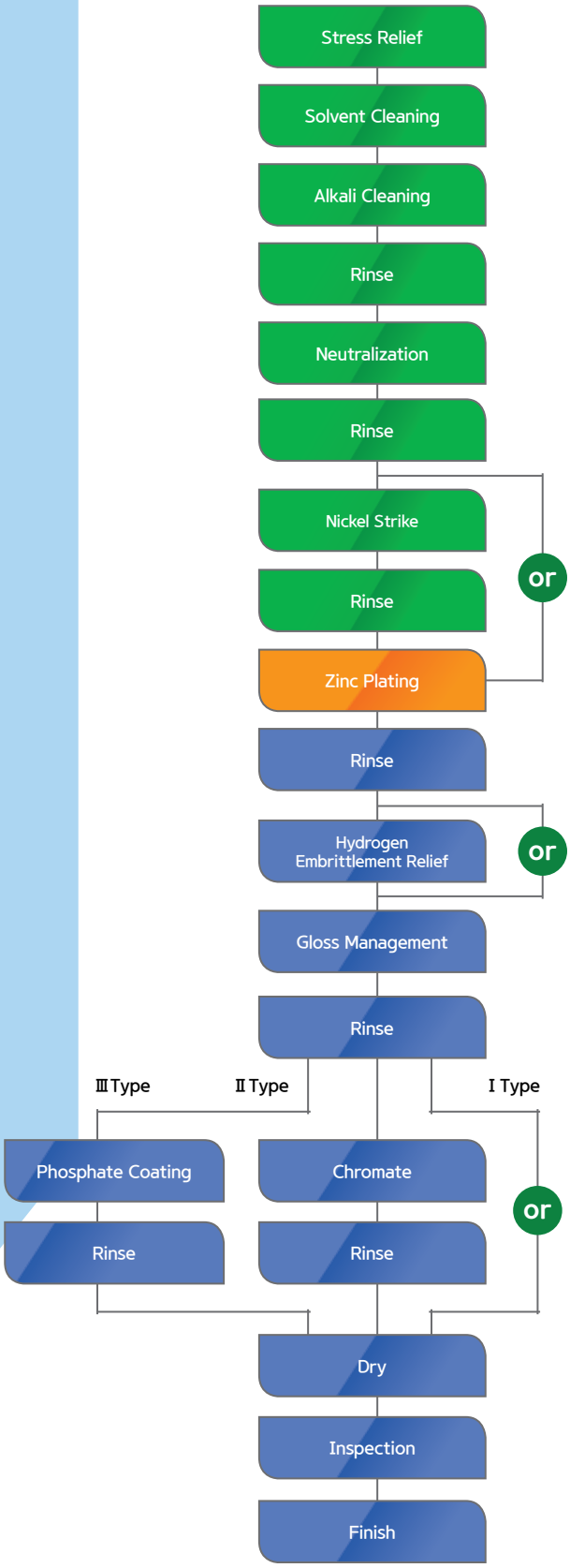
Characteristic

- Zinc sulfate (ZnSO4) is usually used and Zinc chlorine is also used.
- Good for anodic zinc plating.
- Used for plating the steel wire and steel plate.
- Its luster is less bright and is difficult for chromating.
- Its current density is 1 - 3A/dm2 but can be increased to 10 or above if agitated.
- If the anodic mixed solution is not removed, the plating can be rough, generating pinholes on the plating surface.
- Organic impurities shall be filtered out using active carbon while the iron component shall be electrolytically filtered away by using the second iron salt.

Applicable parts

- Automotive parts, Electric parts, Parts for supplies, Daily supplies

Process



Cadmium Plating

COTEC

COTEC has various surface treatment technologies and the company concentrates on products development and quality control to develop various surface treatment items

Our technology

1. Alkaline cadmium plating
2. Low stress cadmium plating
3. Low hydrogen embrittlement plating

Production items and applications

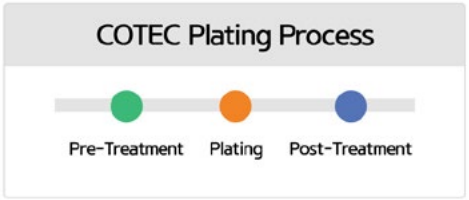
Department / Material		Aircraft, defence, ship and marine structure / Fe, STS, Al	
Usage		Corrosion resistance, Malleability, Conductivity and solderability	
Thickness		3~13㎛	
Applied specifications	QQ-P-416 AMS-QQ-P-416 PCS 2101 IFMA 817 KS W1124 KS D 0231 National defense 0115-0014 FEIS 102	Thickness	13㎛ or thicker for Type 1, 8㎛ or thicker for Type 2
		Adhesiveness	No trace of separation after bending
		Corrosion resistance	No white rust is allowed after 96 hours of salt spray test
		Stress relief	At 191±14℃, 3 to 4 hours depending on the requirements of specification
		Hydrogen embrittlement relief	Depending on product's microstructure and hardness, relief time differs. 191±14℃, for more than 3 hours (HRC 32~39) 191±14℃, for more than 12 hours (HRC 40~47) 191±14℃, for more than 22 hours (HRC 48 for more than)
Acceptance		External	MBD, BOEING, AH, HS, NADCAP, CHAVERHAM
		Internal	ADD, KAI, HANWHA, HYUNDAE WIA, KAL, LIG NEX 1, DOOWON

Equipment condition

COTEC	1,500 ×700 ×1,200 mm
	800 ×800 ×800 mm

Cadmium Plating

Capable of coating complex parts



Our technologies and their applications

Characteristic

Cadmium has similar properties as zinc, but its color is similar to silver rather than zinc.
The standard electrode potential of cadmium is -0.402 while that of iron is -0.44. As for the galvanic electrode potential, iron is high while cadmium is low. Cadmium corrodes because it becomes anodic.

Tooling

With a Mohr's hardness of 2.0, it is a little softer than pure iron. It has very good malleability and good bend-ability after coating. Since it has good ductility compared to zinc coating, it is better than zinc in nut coating.
In addition, its rust can be easily separated from steel parts compared to zinc coating.

Electro conductivities

As the electric resistance of cadmium plating is 7.3 x 10-6 Ωcm, it is a little lower than that of iron of 9.8 x 10-6 Ωcm but a little higher than that of zinc. Its conductivity is maintained for a long time and does not go down even during chromating.

Hydrogen embrittlement

Hydrogen embrittlement of cadmium is much better in comparison with zinc, making it highly recommended for aerospace products. Hydrogen embrittlement occurs during acid bath or plating process causing hydrogen to penetrate product's surface, making it brittle. Embrittlement is affected by surface roughness. rougher the surface, easier for hydrogen to penetrate and to be released. Removal of hydrogen is usually done by oven depending on part's condition, time and temperature may be differ. Average range of heat treatment is done within 4hr of previous treatment, for about 3hrs at around 191'C.

Solderability

It has good solderability compared to zinc plating hence, it is suitable for electric parts. In addition, the post treatment of chromating damages the soldering capability.

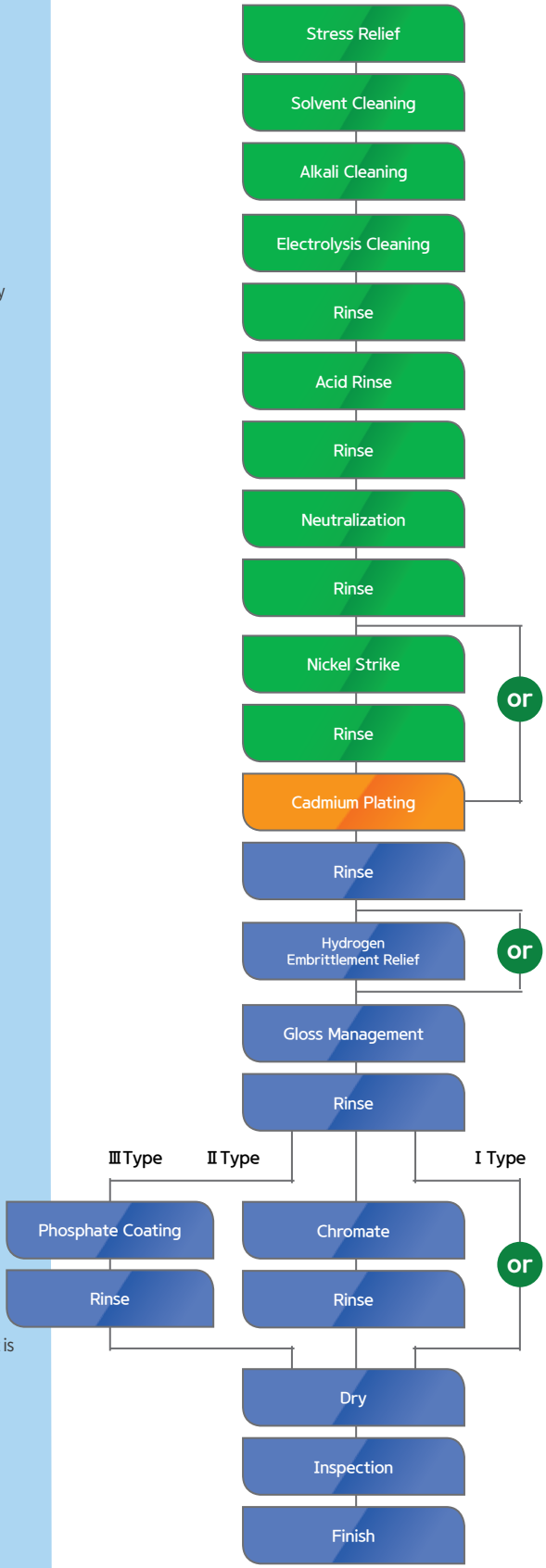
Ease of application

Cadmium plating is easy to work compared to others. It is because there are many plating baths for it and it can be operated under a wide variety of conditions along with its fast plating speed (24μm at 1A hd/dm²). Generally, it can be directly plated on the surface of metals, especially on steel.

Corrosion resistance and other characteristics

Cadmium is easy to tarnish since it is a basic carbonate. With zinc, a whitish rust grows and damages the Mechanical and electric capability. But with cadmium, the corrosion process is slow. It has good capacity when it is used for steel parts, when they are not used for lubrication, and to electric contacts.
In addition, it has much better capability for rust prevention under seawater than zinc. Its corrosion resistance improves even more when the coating is chromium.

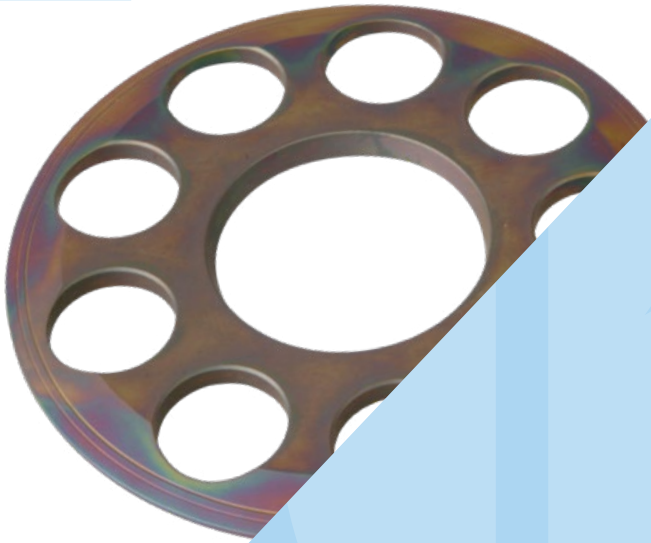
Process



Zn-Ni Alloy Plating

COTEC

COTEC has various surface treatment technologies and the company concentrates on products development and quality control to develop various surface treatment items



Production items and applications

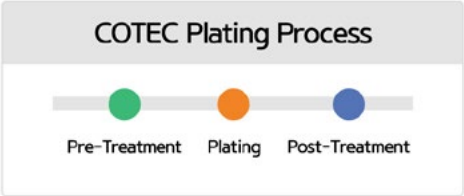
Department / Material		Aircraft parts, Automobile parts / Fe, STS, Al	
Usage		Corrosion resistance, Heat resistance	
Applied specifications	BAC 5637 AMS 2417 AIPS 02 04 006	Thickness	13um min for class 1 8um min for class 2 5um min for class 3
		Adhesiveness	No trace of separation after bending.
		Corrosion resistance	No white rust is allowed after 96 hours of salt spray test Semi-Bright plating : Hv 850 or higher
		Stress relief	at 191±14°C, 4 hours depending on the requirements of specification
		Hydrogen embrittlement relief	Depending on product's microstructure and hardness, relief time differs. 191±14°C, for more than 3 hours (HRC 32~39) 191±14°C, for more than 12 hours (HRC 40~47) 191±14°C, for more than 22 hours (HRC 48 for more than)
Acceptance		External	BOEING, AIRBUS, CLAVERHAM, HS, NADCAP, MOOG, EMB
		Internal	ADD, KAI, HANWHA, KAL

Equipment condition

COTEC	Acid	3,000 × 1,000 × 1,500 mm
	Alkaline	3,200 ×1,000 × 1,500 mm

Zn-Ni Alloy Plating

Capable of coating complex parts



Our technologies and their applications

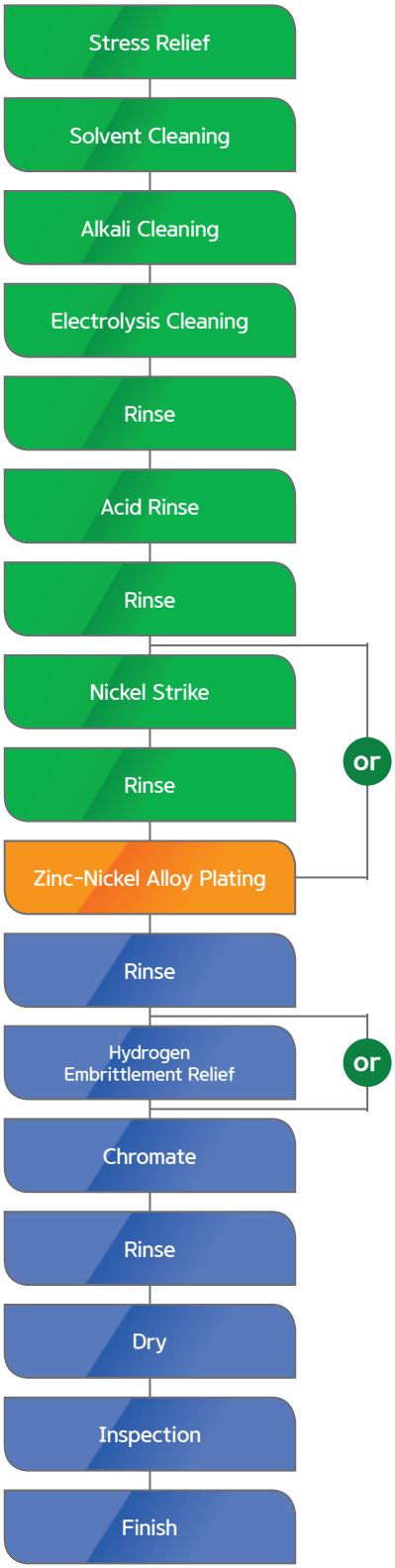
Characteristic

- Improvement of material properties of automobile parts, electric and electronic precision parts.
- High precision corrosion resistance plating.
- It is possible to carry out black, milky and white color chromate treatment on the alloy film containing 5 to 15% of Nickel.
- Excellent in corrosion resistance and heat resistance.

Applicable parts

- Automotive parts, Electronics, Aerospace parts

Process



Trivalent Chromium Plating

COTEC

COTEC has various surface treatment technologies and the company concentrates on products development and quality control to develop various surface treatment items

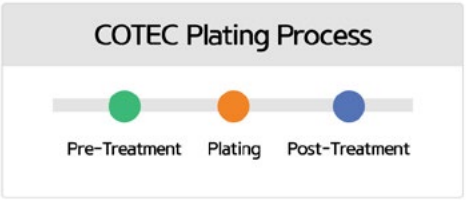
Production items and applications

Department / Material	Electronics, Automobile, Mobile equipment / SUS and steel
Usage	Replacement of hexavalent chromium plating

Equipment condition

AERO COTEC	670 × 1,000 × 1,086 mm

Trivalent Chromium Plating



Capable of coating complex parts

Our technologies and their applications

Characteristic

- Economical. (Considering the waste treatment expense)
- High current efficiency and fast coating speed.
- Uniform coating.
- Good corrosion resistance and abrasion resistance.
- Relatively low toxicity. (For worker's health and safety)
- Specific color. (Hexavalent chromium : blue, trivalent chromium : black)
- Difficult work condition.
- Difficult formation of thick and hard coating layers.
- Slow drying.
- Drying cost is high. (10 times higher than hexavalent chromium plating)

Applicable parts

Automotive parts, Mobile equipment parts, Electronic products

Process