



Patent Pending

No Drainage

Zinc Electroplating
Equipment

CAELAR[®]-SYSTEM

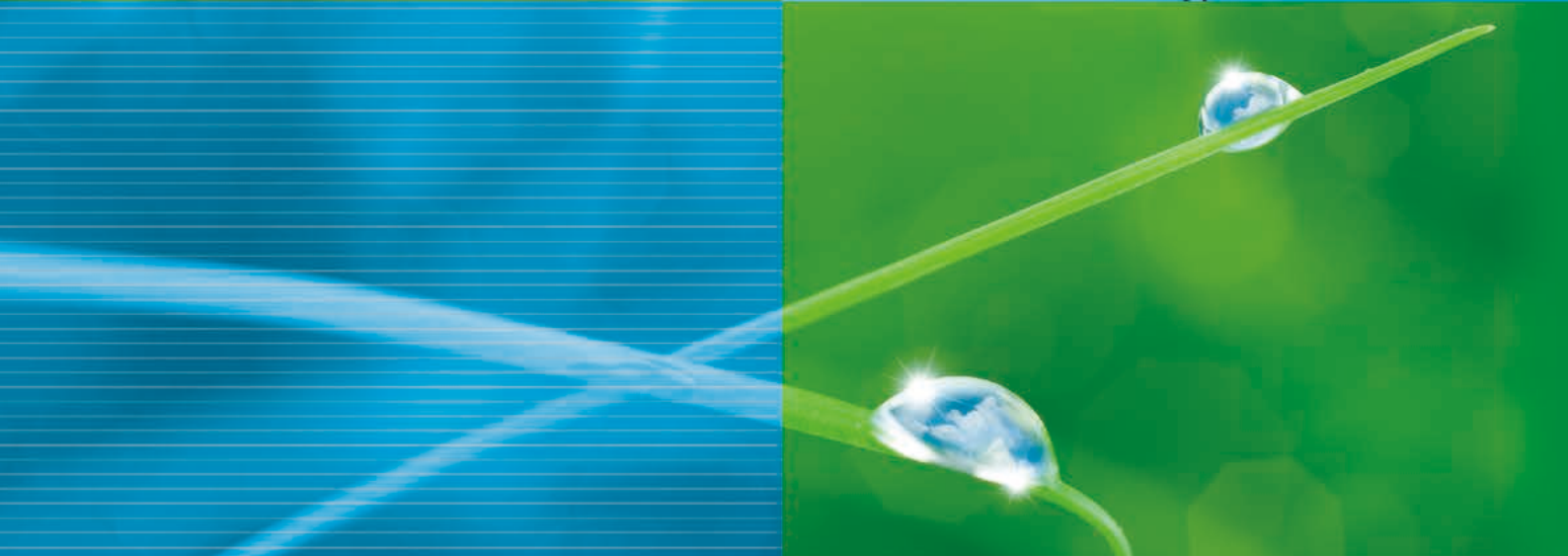


No
Drainage

Low
Hydrogen
Embrittlement

Only
for
Barrel

Improving
the Work
Environment





CAELAR[®]-SYSTEM

CAELAR[®]-SYSTEM is

a no drainage electroplating system using the non aqueous pre-treatment with the recovering and recycling of the water to make the next generation plating system which brake the common sense with inspired idea becoming possible.

Features

01 No Drainage Barrel Plating System

With the most developed technology and suitable design to realize the no drainage of the whole barrel plating system.

02 Dry Type Pretreatment

The water using for pre-treatment and emulsion decreased to zero thanks to the dry type pre-treatment way.

03 Water-saving Design

Rinse Water has been decreased because of the inhibition of carrying out extra plating solution. The burden reduction of water treatment process make the no drainage plating line become possible.

04 Reduction of Hydrogen Embrittlement

Since there is no pickling process, the risk of hydrogen embrittlement has been decreased. And there is no need to do the baking after plating, which can cut the production cost and shorten the delivery date.

05 Quality Stability

The bath stability ensured since there is no acid and alkaline carried into the plating solution from pre-treatment. Decreasing and rust removing status can be checked separately, through which the quality stability can be realized.

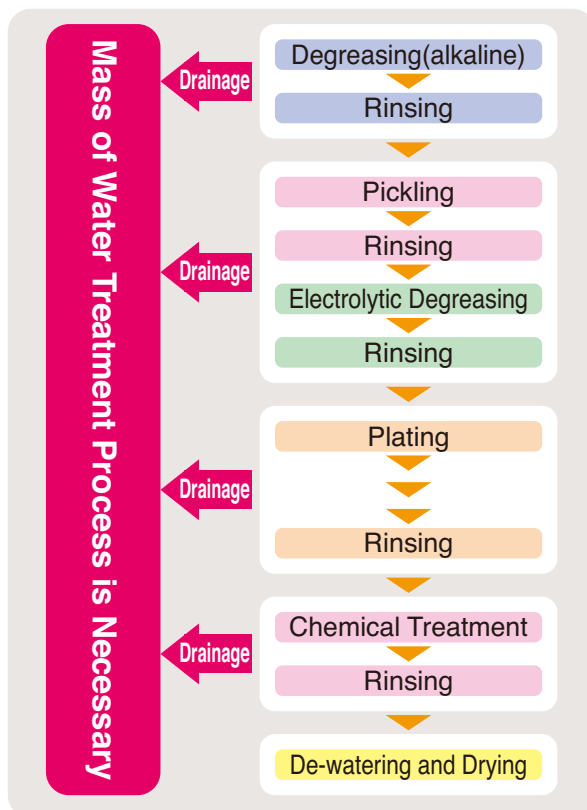
06 Improving the Work Environment

Since no strong acid and alkaline in the process, the safety of work environment has been improved. And because there is no corrosive gas happen, it is much easier to do the equipment maintenance work which make the trouble happening risk decreased too.

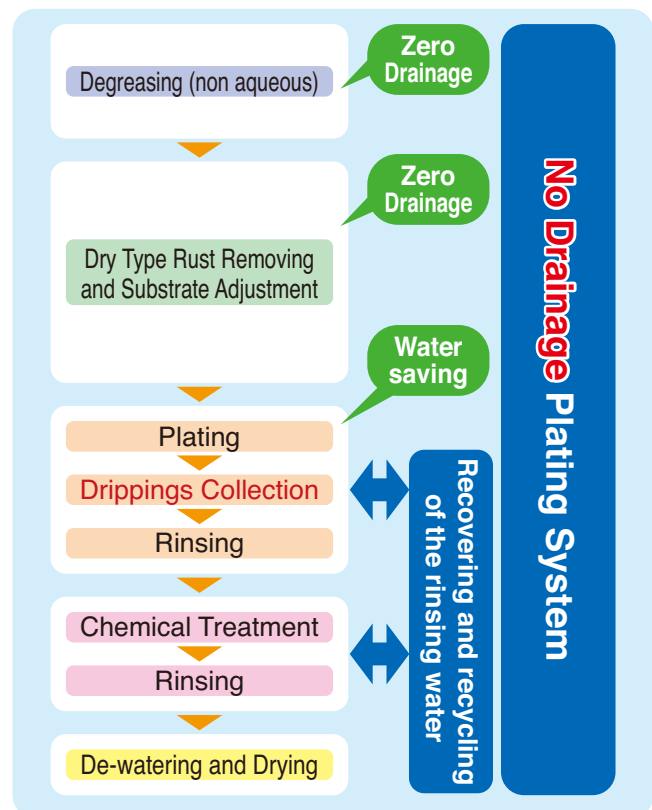


Plating Process of CAELAR System

Traditional Process Flow Chart



CAELAR[®]-SYSTEM Flow Chart



CAELAR System Introduction Results

Equipment Name:CAELAR System Barrel Type Zinc Electroplating Machine

- Barrel : 450×900L 10pieces
- Capacity : Hex BT...6t/8Hours,Screws...4t/8Hours
- After-treatment : Phosphating,Chromium free sealer
- Water Consumption : 2m³/8Hours ※Over 80% using for supplementary facility
- Drainage Recycling Capacity : 1~1.5m³/8Hours
- Waste : 20kg/8Hours
- Drainage Discharge : **ZERO!**

※The data shown above may varied upon the scale of the system and the products themselves which does not guarantee all the performances for any products or under any operating.





Reduction of Hydrogen Embrittlement and Baking Process

The traditional electroplating process is always with a risk of hydrogen embrittlement issue.

Normally, in order to inhibit the hydrogen embrittlement problem, there is always a baking process after the plating. Since only baking can not solve the problem completely, the breaking accident risk lead to the claim still exists.

The hydrogen embrittlement which caused by the hydrogen occlusion normally happen in the pickling process. Since the pre-treatment of CAELAR system is dry type without pickling, so the risk of the hydrogen embrittlement has been highly decreased. Though the hydrogen comes from the electrolytic process can not be avoided, with the choice of high efficiency electric current bath and a proper control of the plating solution, the after-treatment of baking process can be omitted.

Compared with the tradition baking process of the electroplating(electroplating+baking), the CAELAR system for electroplating has a lower hydrogen embrittlement as confirmed by the test of Delta Gauge.

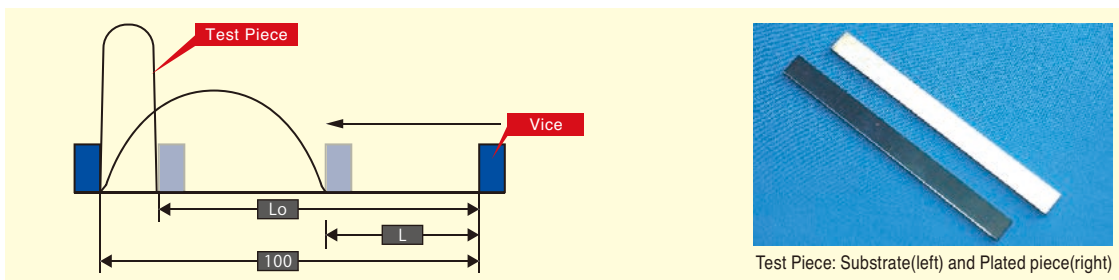
Evaluation on the Hydrogen Embrittlement(Delta Gauge Method)

The Delta Gauge method is invented by the Delta Research Company in Japan. To bend the steel plate which is sensible to the hydrogen embrittlement with low speed and then test the falling rate of its tenderness so as to get its hydrogen embrittlement happening rate.

[The Principle of Evaluation Measurement]

$$\text{Hydrogen Embrittlement Rate (\%)} = (L_0 - L) \cdot 100 / L_0$$

- L₀ : Bending until broken distance using the test piece(substrate) without possibility of hydrogen embrittlement issue (mm)
- L : Bending until broken distance using the test piece treated by pickling process with possibility of hydrogen embrittlement issue (mm)



※ The hydrogen embrittlement rate is relatively compared with the one without any surface treatment. It is not the common data about the happening rate of hydrogen embrittlement by itself. And the hydrogen occlusion quantity can not be measured directly.

[Test Result]

Test Piece : SK5 10x100x1t

Sample A : Substrate(without treatment)

Sample B : Electroplating Treated by CAELAR system

Sample C : Traditional Zinc Electroplating with after treatment of baking under 200°C for 4 hours

Sample D : Traditional Zinc Electroplating

Description	Risk of Hydrogen Embrittlement			
	None	Low	High →	
Distance until Broken	Sample A	Sample B	Sample C	Sample D
	83.4	79.7	56.5	25.8
	83.9	81.0	60.2	30.5
	84.2	82.2	60.7	34.5
	84.6	82.5	60.9	38.5
Average Distance until Broken	84.1	81.8	60.1	34.8

The test results show that comparing with the traditional electroplating and after-treatment of baking, CAELAR system treated pieces have lower happening rate of hydrogen embrittlement.

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Low Cost and No Drainage Line Achieved

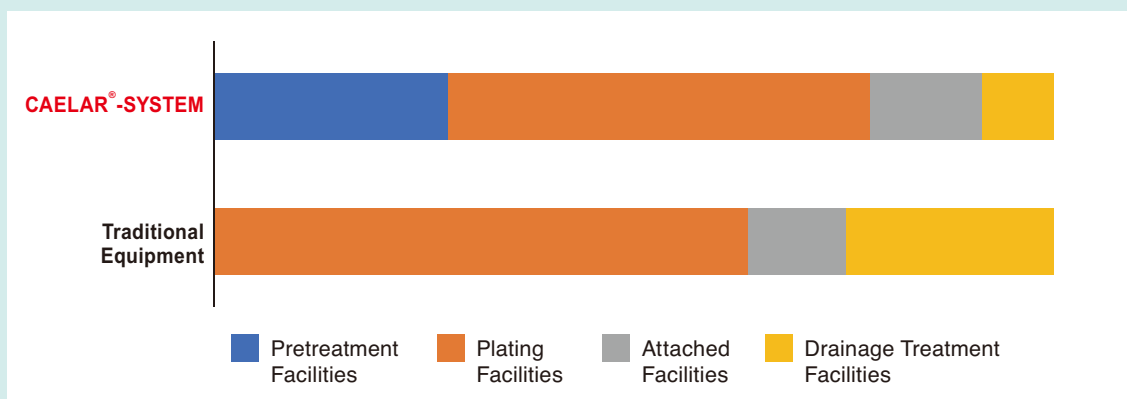
There are a lot of extra equipments in need to do the after-treatment of the drainage from the traditional electroplating line.

The drainage will first be stored in the water storage tank(pit or tank), adjusting the PH, restoring the hexavalent chromium, occlusion and deposition, dewatering by the filter press, and then discharged to the outside environment.

The after-treatment of drainage needs various of chemicals and which lead to the cost increase problem. Nevertheless, hazardous waste leaking accidents happen for the lacking of control.

The CAELAR system is using a simple purifying process for the treatment of the drainage instead of those equipments and chemicals, and the recycling of the water can be realized.

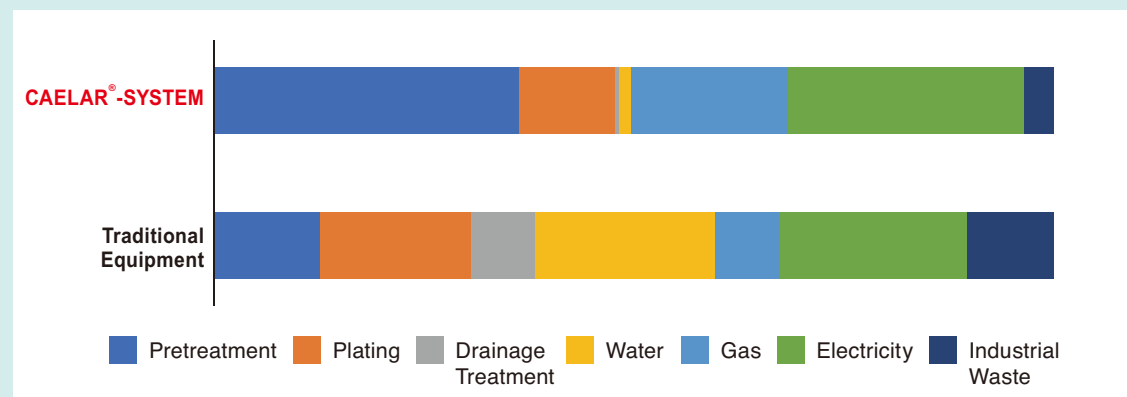
Comparison on the Initial Cost



There is no obvious difference upon the initial cost when bringing the whole system.

Though the dry type pre-treatment and water recycle system will share a part of the initial cost, it is also not necessary to have the degreasing and pickling tank with all the attached rinsing facilities. And the pit, tank, filter press and chemical tank cost for the after-treatment is cut off too.

Comparison on the Running Cost



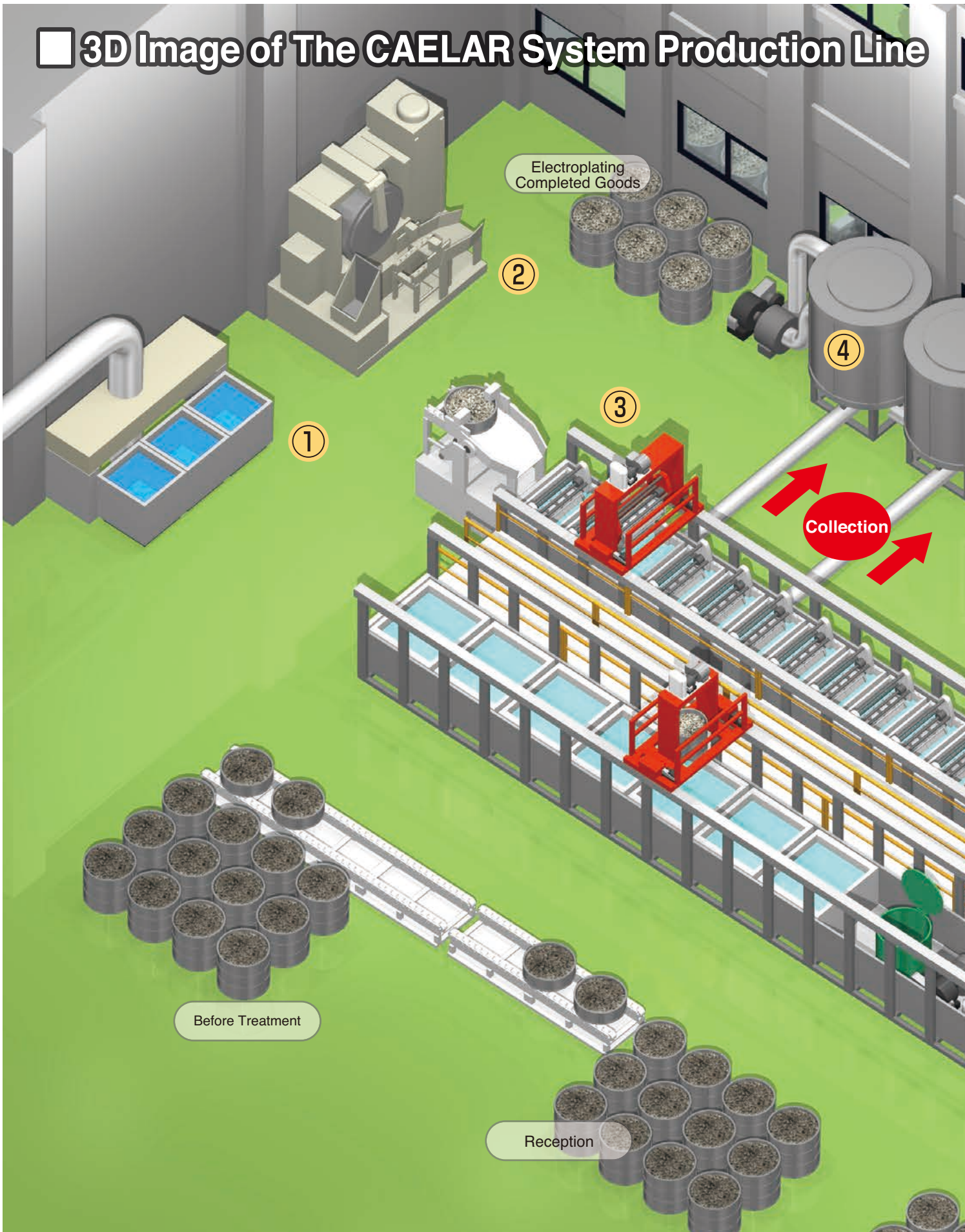
The Merits on Running Cost

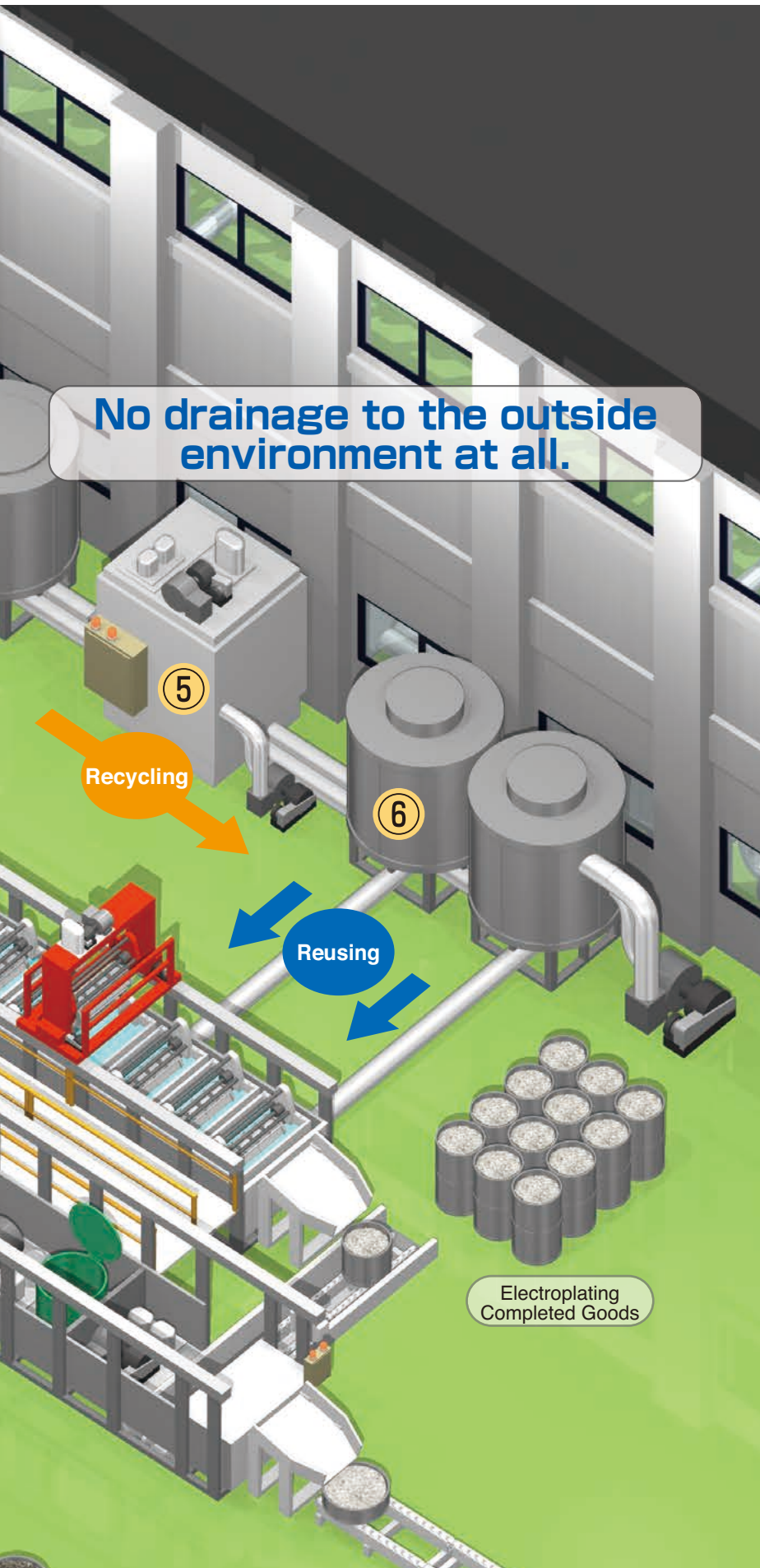
Cost on the dry type pre-treatment is counterbalanced by the cost on drainage treatment and control of chemicals for traditional plating process. Thanks to the limited carrying out of extra plating solution, raw material cost also can be saved for a certain quantity.

The merits on the environment issue and the quality aspect stand out when compared with the tradition electroplating line.



3D Image of The CAELAR System Production Line





① Degreasing Facilities

Using the non aqueous degreasing way to realize the no drainage and select the totally closed type facilities to enhance the work environment.

② Dry Type Rust Remover Facility

Completely adjust the substrate without pickling.

③ Plating Facilities

Using the water-saving rinsing system to make the whole plating process without drainage.

④ The Water Storage Tank before Recycling

The waste water from rinsing tank is temporarily stored in the tank.

⑤ Waste Water Regeneration Facilities

All the waste water from rinsing process will be recycled and reused.

⑥ Recycled Water Tank

The waste water treated by the recycle facilities is stored in this tank to get ready to be used again on the plating line.

Remarks : The experimental data above are the results of tests but the performance may have deviation when used in different conditions.

Developing and Sales



Nihon Ruspert Co., Ltd.

Head Office 18-3, Shin-minato Machi, Kishiwada City, Osaka, 596-0012 Japan.

Osaka Office 3-15-5, Yasuda, Tsurumi-ku, Osaka City, Osaka, 538-0032 Japan.

【Contact Us】

Free Dial 0120-020-308 (Only in Japan)

TEL +81-72-432-8711

FAX +81-72-432-2860

E-mail sales@ruspert.co.jp

URL <http://www.ruspert.co.jp>



<http://www.ruspert.co.jp>

Producing and Maintenance



Total Engineer of the Surface Treatment Machine

Nishida Seisakusho Co., Ltd.

4-5-20, Kamihigashi, Hirano Ku, Osaka City, Osaka, 547-0002, Japan

【Contact Us】

TEL +81-6-6791-3841

FAX +81-6-6791-3808

URL <http://www.nishida-ss.co.jp>