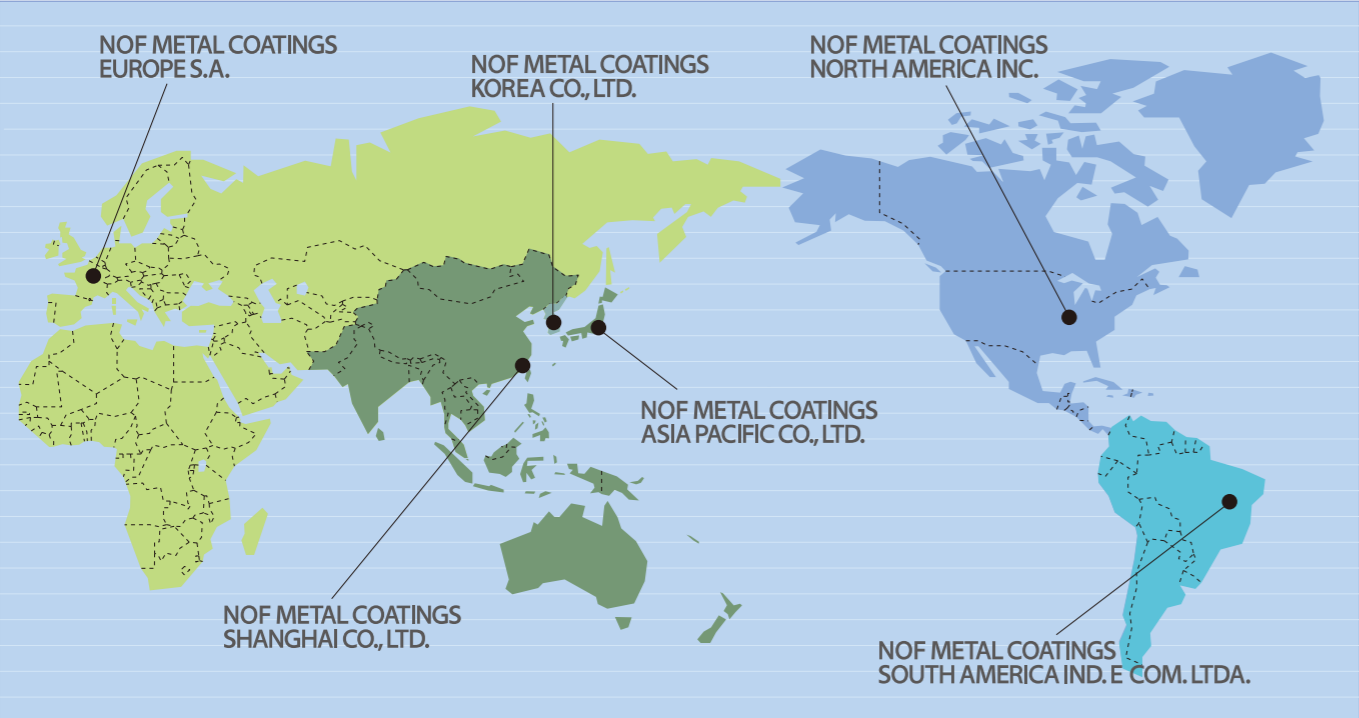


DACROTIZED® is spreading all over the world

DACROTIZED® is the epoch-marking system for corrosion protection, patented in many countries, which was developed by the integrated chemical company “Diamond Shamrock Co., Ltd”, now “NOF METAL COATINGS NORTH AMERICA (Formerly Metal Coatings International Inc.)”.

The DACROTIZED® coating service is offered in the four key territories comprising the world wide market, with NOF METAL COATINGS Group companies, maintaining close ties with one another in the research, development and marketing of products for corrosion resistance, achieving results that have mutually benefited their business.

■The Network of NOF METAL COATINGS GROUP




A Note to the Customer The performance data shown in this catalog was obtained using the internal test procedures of NOF METAL COATINGS. NOF METAL COATINGS shall not guarantee that the user will obtain identical performance levels, given the varying conditions in which DACROTIZED® is applied.

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NOF METAL COATINGS EUROPE S.A.	NOF METAL COATINGS SOUTH AMERICA IND. E COM. LTDA.

DACROTIZED®

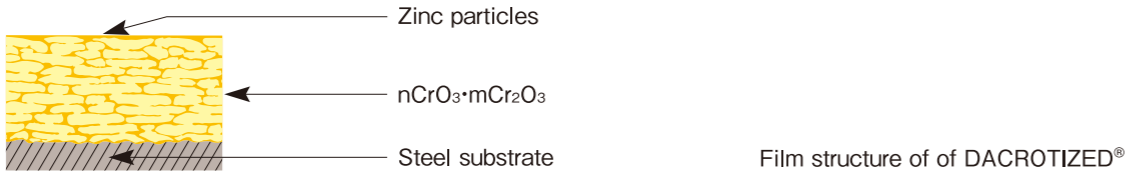


Innovation links us together



What is DACROTIZED® ?

The treatment chemical (DACRODIP®) for DACROTIZED® coatings is a dispersed aqueous solution made from metallic zinc flake, chromic acid, glycol etc. By dipping the substrate into DACRODIP®, removing the excess chemical by draining or spinning, and then heating the coated substrate at approx. 300°C in a baking oven, the hexavalent chromium is reduced to an insoluble amorphous oxide, $nCrO_3 \cdot mCr_2O_3$, by the organic substance such as glycol. This acts as a binder for the many overlapping flakes of zinc to form a film. At the same time, the chromic acid in DACRODIP® reacts with the metal surface of the substrate forming a chemical bond providing strong adhesion. The corrosion prevention mechanism of the DACROTIZED® film comes from the "controlled galvanic protection" of zinc particles, the "passivation" of the object surface by chromic acid, and the "barrier effect" of zinc flakes and chromium compound. The combination of corrosion protective mechanisms provide superior anti-corrosion characteristics not found in other products.



Feature 1 Superiority in Salt Spray Test and Cycle Corrosion Test

The anti-corrosion performance of the DACROTIZED® coating is superior to other surface treatment technologies. Compared with Electro-zinc Plating Yellow-chromate (JIS H8610, category 2, class 3), Hot Dip Galvanizing (JIS H8641, category 2, HDZ35) or Alloy Plating, the DACROTIZED® coating provides superior rust inhibiting characteristics in Salt Spray Test (SST, JISZ2371) and Cycle Corrosion Test (CCT).

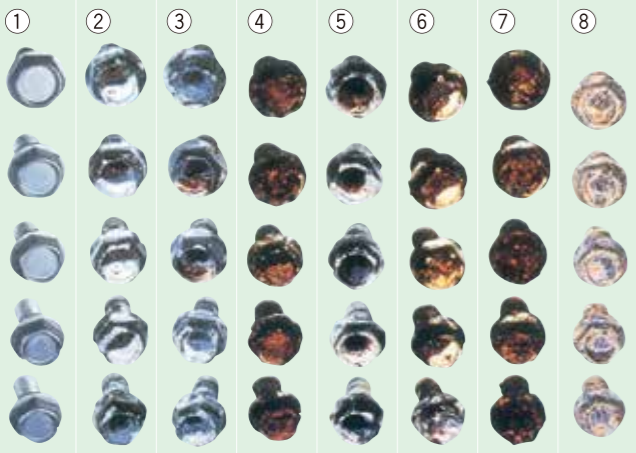
▼SST 480 hrs



▼SST 2000 hrs



●Fastener for buildings



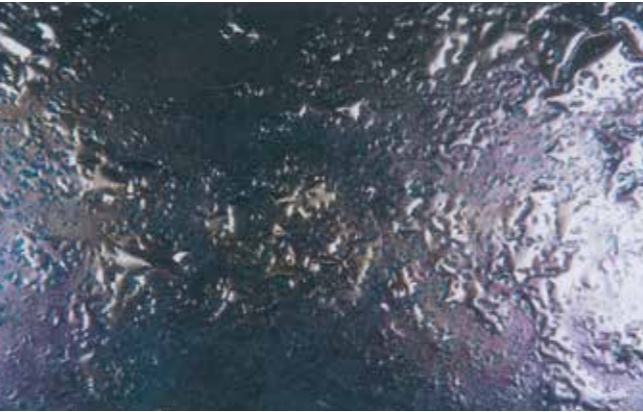
- ①DACROTIZED®
- ②Ni/Zn : yellow chromate
- ③Ni/Zn : black chromate
- ④Fe/Zn : yellow chromate
- ⑤Fe/Zn : black chromate
- ⑥Electro-zinc plating : yellow chromate
- ⑦Electro-zinc plating : green chromate
- ⑧Hot dip galvanized

Feature 2 Superiority of heat resistance and anti-corrosion performance

The DACROTIZED® coating, which also has superior heat resistant and anti-corrosive characteristics, is durable in elevated temperatures for a long time. Take electro-zinc plating (yellow chromate) for example, the chromate film on the surface can be destroyed at approx. 100°C, deteriorating its performance rapidly.

▼ Appearance of surface after 12 hrs heating at 300°C

Electro-zinc plating (yellow)

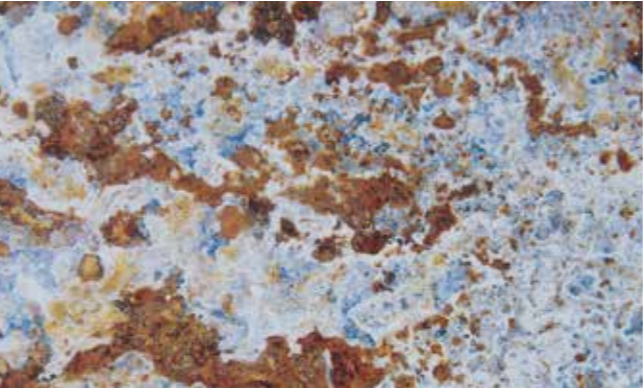


DACROTIZED®



▼Appearance of surface after SST, following 12 hrs heating at 300°C

Electro-zinc plating (yellow)



240 hrs

DACROTIZED®

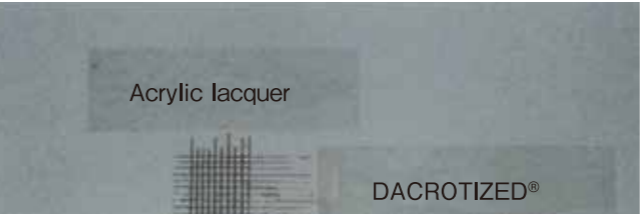


1000 hrs

Feature 3 Paint can be applied to DACROTIZED® surface

Test sheets, which had the DACROTIZED® coating and electro-zinc plating applied respectively, were coated with the same paint, and adhesion was compared. The results show that DACROTIZED® is superior to the electro-zinc plating in adhesion of paint (according to a cross-cut test).

▼ Cross-cut adhesion test (JIS K5400)



Feature 4 Preventive effect on bi-metarcic corrosion with aluminum

When different metals or alloyed metals that have different electric potentials make contact, galvanic corrosion will occur. This phenomena is also assumed to occur in the combination of aluminum parts and zinc galvanized parts or DACROTIZED® parts.

In case of galvanized parts especially, the anti-corrosion effect is mainly due to the sacrificial corrosion of zinc, and the higher zinc consumption results in exposure of steel substrate.

After exposure of steel substrate, galvanic corrosion between aluminum and steel will occur because of the difference of their potentials, resulting in corrosion of aluminum.

On the other hand, in the case of DACROTIZED® parts, the consumption of zinc is restricted due to the corrosion preventing effects of Passivation by chromic acid and Controlled Galvanic Protection. As a result, DACROTIZED® does not promote the corrosion of aluminum.

Experimental example:Galvanic corrosion test of aluminum panel with fastening the steel bolts.

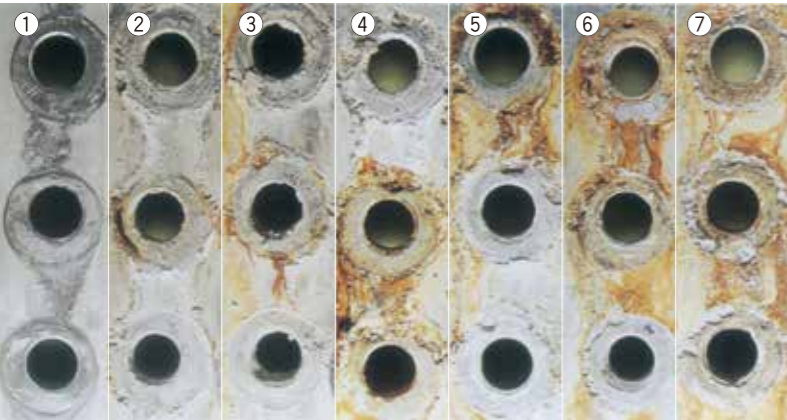
Test sample : DACROTIZED® and other various surface treatment M8 steel bolts and nuts

Assembled parts : Aluminum panels JIS H4000(A1050P)5.0x50x150mm

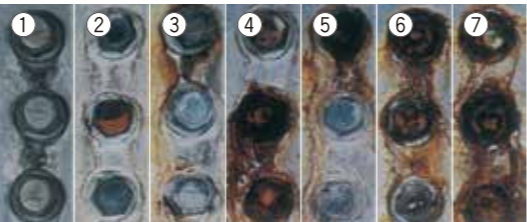
Fastening torque : 100Kgf·cm

Test procedure : Bolts with the various coatings applied were fastened to aluminum panels with the torque described above, and then tested for 4000 hrs SST (JIS Z2371).

▼Appearance after removing bolts



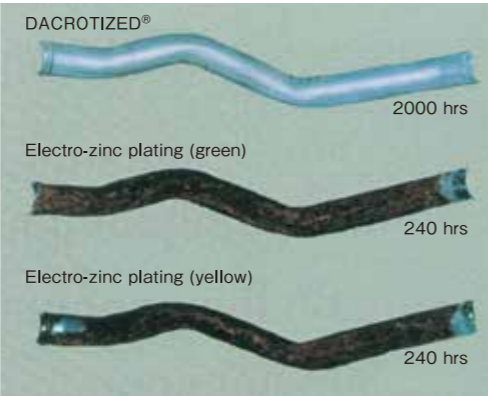
①DACROTIZED® ②Ni/Zn : yellow ③Ni/Zn : black ④Fe/Zn : yellow
⑤Fe/Zn : black ⑥Electro-zinc plating : yellow ⑦Electro-zinc plating : green



Feature 5 Excellent throwing power

The DACRODIP® (chemical) penetrates well into small crevices and gaps providing corrosion resistance in these areas. For example, a closely compressed coil spring with DACROTIZED® coating exhibits the 2000 hrs. rust prohibiting performance of SST under the tense condition. In another example, although the inner surface of pipe shaped parts can not be coated by electro-zinc plating, DACROTIZED® can provide a complete coating and improve the rust-proof capability of both the inner and outer surfaces of the parts. The above examples prove that DACROTIZED® is able to form a film even in the closest gap which is impossible to be covered by the conventional surface treatment.

▼After SST (JIS Z2371)



Feature 6 No hydrogen embrittlement

The DACROTIZED® treatment provides surface treatment which is completely free from hydrogen embrittlement.

The DACROTIZED® process does not include acid treatment. Therefore, it is completely free from the hydrogen embrittlement caused by such processes as electro-zinc plating, in which hydrogen gas is generated and penetrates into the metal substrate, and brings about delayed destruction. For the electro-zinc plating of hardened bolts with high strength, such as tapping screws more than S40C, or various high carbon steel screws like SEMS bolt, the prevention of hydrogen embrittlement is a critical process. In addition, hydrogen embrittlement is not easy to detect, so we have to guarantee the quality by the process itself.

Experimental example : Hydrogen embrittlement induced breakdown in hose clamp

aterial : Carbon steel 1065

Wire diameter : 2.23 mmφ

Nominal inner diameter : 1/2 inch. (12.7 mm)

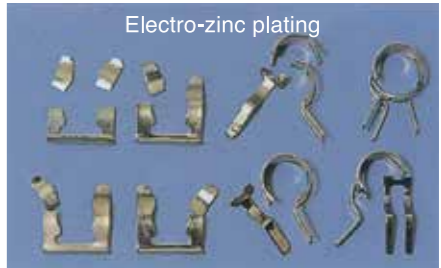
Heat treatment : Transition point 893°C
Oil quenching temperature 315°C~427°C

Hardness : Rc53

Test condition : 3 types of clamps, which were treated by different surface treatments, were tested for defects by having 15 mm φ steel rods inserted.
The quantity of broken clamps were determined before and after 100 hours of steel rod insertion.

	Maintaining time	pass	broken
Dacrotized	Less than 100 hrs	90	0
	More than 100 hrs	90	0
Electro-zinc plating (with out baking treatment) remarks 1	Less than 100 hrs	0	90
	More than 100 hrs	0	90
Electro-zinc plating (with baking treatment) remarks 2	Less than 100 hrs	30	0
	More than 100 hrs	12	18

Remarks 1 : Thickness of plating film is more than 4μ. Yellow chromate
Remarks 2 : Same plating condition as remarks 1. The baking was done for 4 hrs at 200°C.



Feature 7 No possibility of pollution

The motto of the DACROTIZED® process is environmental preservation by preventing pollution and maintaining health in a modern society in which pollution is strictly controlled.

1. Water contamination

In the DACROTIZED® treatment, the coating is completed in a closed system. The toxic substances restricted by law do not enter the waste stream, since water rinse is not used at any point in the processing, from the coating to the baking and finishing.

Cleaning of the parts prior to Dacrotizing uses a variety of methods depending upon the object. Non-polluting processes (Dry blasting for example) will not pose any problems. However, other treatments may require removal equipment if the concentration of the used contaminated substances exceed a certain level of limitation.

2. Air pollution

The exhaust from the baking process consists mainly of water vapor, and does not contain any toxic substances prohibited by law. The specific substances which are restricted by regulation are far less than the limited amounts. In addition, the exhaust gas is almost free of odor.

3. Working conditions

The concentrations of the specific substances described are either none or extremely low, and they are far less than the limited amounts allowed by the regulations.

4. Industrial waste

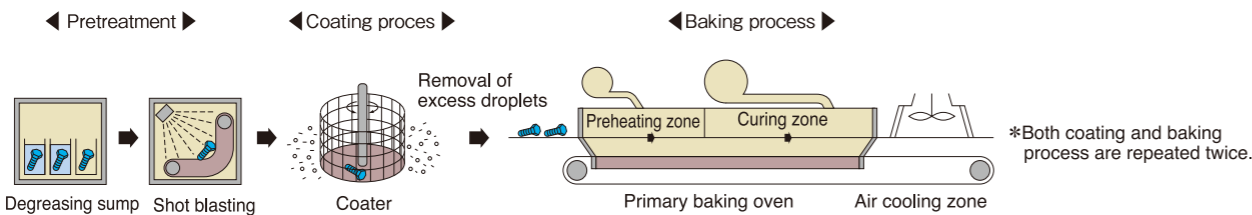
Please consult us, if you find liquid waste due to deterioration of the treatment chemical or instrument cleaning. Normal operation should not give off liquid waste.

DACROTIZED® treatment process

Depending upon the dimensions, configuration and quality of the substrates, and the performance required, DACROTIZED® treatment processes are classified into the following three major categories.

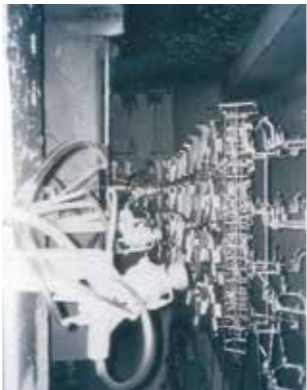
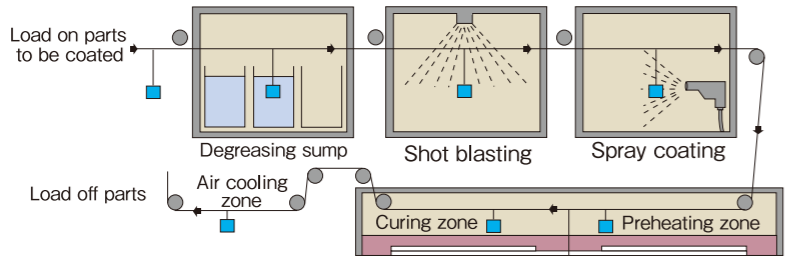
1 Dip-spin method

This method is most suitable for the treatment of bolts, nuts, springs, screws, washers and other small stamped parts. First, the pre-treated metal substrates are put in the basket and coated by a dipping method. After dipping, they are centrifugally spun to remove the excess liquid, then baked. This is the most commonly adopted method and is based on 2-coats 2-bakes, but 1-coat 1-bake is sometimes available according to the requirements of use.



2 Spraying method

This method is suitable to parts whose appearance is important. The parts are hung by a hanger, electrostatically coated, and baked. The standard process is 1-coat 1-bake.



An example of the use of the DACROTIZED® coating

The DACROTIZED® coating is used in a variety of industrial fields due to its advantages in the characteristics of anti-corrosion, heat resistance, hydrogen embrittlement, throwing power, ability to be painted on, anti-galvanic corrosion and so on.

For example, we acquired U.S. Military Standard MIL-C-87115, and now apply rust-proof treatment on military equipment. In terms of the civil construction, DACROTIZED® has been designated as the rust-proof treatment for Seikan tunnels, Tokyo bay traversing road, subway construction, and others. We have also exported the technology to Korea, Taiwan, Australia, Malaysia, Indonesia, Thailand, India and China in our territory. As described above, the DACROTIZED® is highly valued in both domestic and overseas markets.



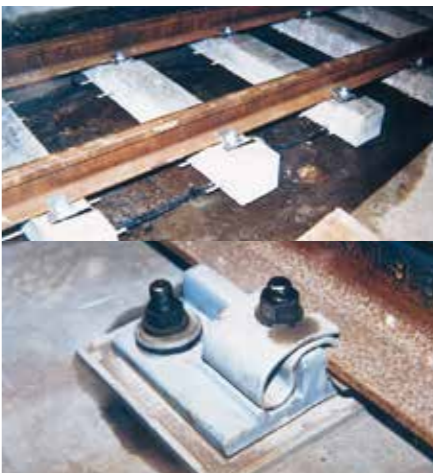
● Bridge(high-tensioned bolts)



● Shield tunnel(segment bolts)



● Fastener for buildings



● Rail clip



● Mesh pallet



● A variety of gas cocks