

SPIROL®

WHITE PAPER

Passivation: Is it really necessary?

by Christie L. Jones
Market Development Manager
SPIROL International Corporation

Stainless steels are called “stainless” because in the presence of oxygen, they develop a thin, hard adherent film of chromium oxide that protects the metal from corrosion. In the event the surface is scratched, this protective layer develops again.

During handling and processing operations such as forming, machining, and tumbling, particles of iron or tool steel may be embedded in or smeared on the surfaces of the stainless steel component. Although stainless steel is highly corrosion resistant, the iron contamination induced during fabrication is subject to rust and corrosion. If allowed to remain, these particles may corrode and produce rust spots or stains on the surface of the stainless steel. While these particles might cause surface blemishes, the base material remains unchanged, and it maintains its basic mechanical performance characteristics.

It has been traditionally thought that passivation is the standard method of cleaning stainless steel; when in fact passivation is not a cleaning process at all. The passivation process removes any residual carbon from the surface of the part by the use of nitric and citric acids. SPIROL utilizes citric acid. The acid dissolves the surface imperfections, such as embedded tool steel or other free iron particles. However, the sole purpose of passivation is to remove embedded iron; not to clean the part. Passivation will not remove any oils or other non-ferrous contaminants. These other contaminants are removed through a vigorous cleaning process, prior to the passivation process. William Snyder wrote in the March 1983 issue of *Plating/Anodizing Forum* in *Industrial Finishing*: “Thousands of dollars are wasted every month by manufacturers going through complete passivation cycles when all they need is a proper cleaning.” In addition to proper cleaning, the use of carbide tooling minimizes iron contaminants in the stainless steel. SPIROL has implemented many carbide tools in order to reduce tool wear, and this has a side benefit of minimizing the particles of embedded tool steel.

SPIROL International is dedicated to helping our customers reduce component costs. One way to reduce costs is to eliminate non-value-added processes; and passivation tends to be one of these. Passivation is a costly operation and is not environmentally friendly. We recommend that a review of the customer’s application requirements be done in order to determine whether or not passivation is really necessary for each particular application. Some typical applications where passivation is appropriate is in medical implants or instruments, components used in the food or drug industry, fuel system applications, and any application requiring a clean environment.

Excluding the above mentioned applications, and others where the user deems it appropriate, there are thousands of applications in which passivation is not necessary. Remember that any residual carbon may cause *superficial* blemishing, however this should not impede the corrosion resistance of the base metal, or impact the basic performance of the part.

The cost differential between a passivated and non-passivated part is approximately 10%. If the customer’s application does not require passivation, you may recommend a part with a plain finish versus passivated.

SPIROL Application Engineers will review your application needs and work with you to recommend the optimum solution. One way to start the process is to visit our **Optimal Application Engineering** portal at **SPIROL.com**.

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Technical Centers

Americas

SPIROL International Corporation
30 Rock Avenue
Danielson, Connecticut 06239 U.S.A.
Tel. +1 860 774 8571
Fax. +1 860 774 2048

SPIROL Shim Division
321 Remington Road
Stow, Ohio 44224 U.S.A.
Tel. +1 330 920 3655
Fax. +1 330 920 3659

SPIROL Canada
3103 St. Etienne Boulevard
Windsor, Ontario N8W 5B1 Canada
Tel. +1 519 974 3334
Fax. +1 519 974 6550

SPIROL Mexico
Carretera a Laredo KM 16.5 Interior E
Col. Moisés Saenz
Apodaca, N.L. 66613 Mexico
Tel. +52 81 8385 4390
Fax. +52 81 8385 4391

SPIROL Brazil
Rua Mafalda Barnabé Soliane, 134
Comercial Vitória Martini, Distrito Industrial
CEP 13347-610, Indaiatuba, SP, Brazil
Tel. +55 19 3936 2701
Fax. +55 19 3936 7121

Europe

SPIROL France
Cité de l'Automobile ZAC Croix Blandin
18 Rue Léna Bernstein
51100 Reims, France
Tel. +33 3 26 36 31 42
Fax. +33 3 26 09 19 76

SPIROL United Kingdom
17 Princewood Road
Corby, Northants
NN17 4ET United Kingdom
Tel. +44 1536 444800
Fax. +44 1536 203415

SPIROL Germany
Ottostr. 4
80333 Munich, Germany
Tel. +49 89 4 111 905 71
Fax. +49 89 4 111 905 72

SPIROL Spain
08940 Cornellà de Llobregat
Barcelona, Spain
Tel. +34 93 193 05 32
Fax. +34 93 193 25 43

SPIROL Czech Republic
Sokola Tůmy 743/16
Ostrava-Mariánské Hory 70900
Czech Republic
Tel/Fax. +420 417 537 979

SPIROL Poland
ul. M. Skłodowskiej-Curie 7E / 2
56-400, Oleśnica, Poland
Tel. +48 71 399 44 55

Asia Pacific

SPIROL Asia Headquarters
1st Floor, Building 22, Plot D9, District D
No. 122 HeDan Road
Wai Gao Qiao Free Trade Zone
Shanghai, China 200131
Tel. +86 21 5046 1451
Fax. +86 21 5046 1540

SPIROL Korea
160-5 Seokchon-Dong
Songpa-gu, Seoul, 138-844, Korea
Tel. +86 (0) 21 5046-1451
Fax. +86 (0) 21 5046-1540

e-mail: info@spirol.com

SPIROL.com