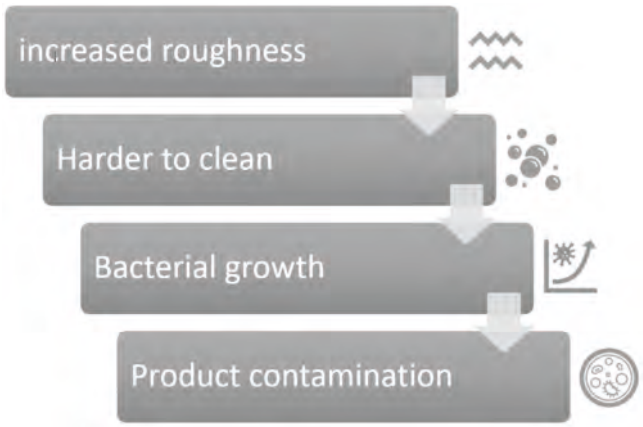
Rouge & Derouging

Rouge is a common problem in pharmaceutical facilities, most often found in high-purity water and clean-steam systems fabricated in austenitic stainless steel.

Stainless steel corrosion, or rouge, is an industry-wide problem that, left untreated, can cause product contamination.

Removing rouge and maintaining the passive layer of stainless-steel equipment are essential preventative maintenance requirements for any manufacturing facility.



Where does rouge come from?

There are various theories on how rouge manifests itself, including; the passive dissolution of the chromium-oxide layer by the low-ion water, metal oxide particles released via pump cavitation and the more obvious sources of iron contamination from defective welding, heat-tints and poor cleanliness controls during fabrication/installation. Any or all of these can result in the formation of rouge. Cold water systems are not immune. Particularly ones that are treated with ozone.

Planned preventative maintenance

Effective passivation carried out pre-commissioning reduces the rate at which rouge will develop.
Routine, scheduled re-passivation will reduce the rate and severity of rouge development.
If left unattended, rouge will progressively intensify, corroding the underlying stainless surface.
Cleaning (derouging) systems that have been contaminated for a long period of time often reveals pitting and a deterioration of the surface profile.

Biofilm removal

Systems with rouge are more vulnerable to developing bio-films (the crystalline nature of iron hydroxides provides a site for bacteria to take up residence).

The derouging process

An effective derouging process will remove the iron oxide deposits without damaging the underlying surface. Highly corrosive products, containing hydrofluoric acid can be effective at removing rouge.
But they will also etch the stainless steel. The polished/machined surfaces are ruined and corrosion sites are exacerbated. As such, they should be avoided whenever possible.
Following the derouging, a thorough passivation treatment should be carried out to create a high chromium-iron ratio on the stainless surface. This will optimise the passive layer and the equipment's corrosion-resistant qualities.

PROTECT YOUR INVESTMENT, MINIMISE DOWNTIME AND OPTIMISE YOUR PROCESS.

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Class I

These rouges are generated from external sources by erosion or cavitation. Class I rouge is weakly attached to the surface and migrates through your system. Light accumulations are relatively easily removed and dissolved. Phosphoric acid can be blended with other acids, compounds, and surfactants to assist in its derouging effectiveness.

Class II

This rouge consists mostly of hematite or ferric iron oxide with some amount of chromium and nickel oxides as well as small carbon content. It is removed with chemistries that are very similar to the above processes with the addition of oxalic acid, which improves the effectiveness in removal of this type of rouge.

Rouge contamination

Derouging

All of the above chemistries remove the rouge without damage to the surface finish with the exception of oxalic acid, which may etch the surface depending on conditions and concentration processed. Class II rouges are more difficult to remove than Class I and may require additional time, even though these processes are often run at slightly higher temperatures and and increased concentrations.

Purple/black Class III

Class III

The chemical composition and the structure of class III rouge are different. It is much more difficult to remove compared to Class I and Class II.

In high-temperature systems a magnetite iron oxide deposit is formed with some substitution of chromium, nickel, or silica in the compound structure. Significant amounts of carbon are generally present in these deposits due to reduction of organics present in the water, which sometimes produces the “smut” or black film that may form during derouging. The chemistries used to remove Class III rouge are very aggressive and will affect the surface finish to some degree.

Standard Operating Procedure (SOP)

We are able to derouge your process pipework, pumps, vessels, WFI stills, lyophilisers, autoclaves or any other equipment. Each project is taken on a case-by-case basis as it is rarely a situation where one solution fits all. Our chemical derouging processes are in accordance with ASME-BPE.
Before job commencement, we will attend your site and produce cGMP compliant documentation for the process, including a detailed step-by-step protocol, marked-up P&ID's to identify the system boundaries and flushing loops and define the testing/verification methodology at each relevant stage.

CONTACT US IF YOU NEED ASSISTANCE WITH YOUR PROJECT

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