Derouging - Now with pH-neutral cleaner

– CERTIFIED AND ECO-FRIENDLY CLEANING OF STAINLESS STEEL SURFACES –

Stainless steel, an alloy, consisting of a base with at least 11% chromium, forms a paper-thin protective coating rich in chromium oxide. In practical application, this protective or passivation coating over time depletes the chromium. The remaining surface, rich in iron oxide, gradually forms rouge (Figure 1, see page 2). Previously, these iron oxide coatings were removed with relatively high-concentrated acids (e.g., phosphoric acid approx. 30%). However, the handling and disposal of acids is anything but simple. Ateco Services AG, Rheinfelden, has dealt with this problem and developed a new, neutral derouging agent. This agent makes the cleaning process safer, the disposal simpler, and overall is more cost effective than the "acid solution".

PREVIOUS SOLUTION

Even simple hot (high-purity) water in excess of 80°C over time has a damaging effect on the passive coating of stainless steel. Apart from chromium, the alloys also contain additional alloy components, such as nickel or molybdenum. Previous acid derouging agents work very unselectively in that they decompose not only iron oxide components on the surface, but also chromium, nickel and molybdenum components. All three heavy metals, however, should remain at the stainless steel surface to fulfil their function. Furthermore, these metals are not flushed out with the wastewater. Depending on the purifying agent, varying acids are used. Phosphoric acid, sulphuric acid or hydrochloric acid, as well as organic acids, such as oxalic or citric acids, have so far formed the basis of state of technology. All acids necessarily have high acid concentration, which in most cases is in the two-digit percentage range, and thus a high cleaner consumption. In the case of improper use or damage, the nonselective decomposition process can even attack and roughen the surface of the production units. When the work is completed, the entire filling quantities and the rinsing water must be neutralised for disposal and/or, because of the heavy metal content, it requires costly disposal by experts.

NEW PROCEDURE

Ateco wants to avoid these considerable disadvantages of using acid agents, and develop a new cleaning solution. It reliably removes rouging on stainless steel surfaces, such as chromium / nickel steels, steels of grade AISI 316L, AISI 316Ti or AISI 904L. It thus avoids the known disadvantages of previous procedures. The cleaner, of course, is produced under certified conditions and is suitable for all pharmaceutical, food and biotech segments. De-rouging specialist, Marc Vernier commented: "We want to offer our customers an alternative to previous cleaning methods, which also takes into consideration the increased requirements in protecting facilities and the environment".

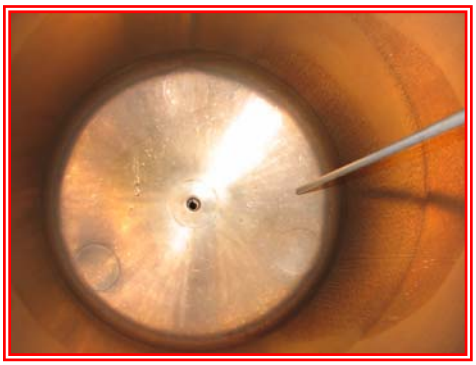
The aqueous cleaning solution "Diruneutra" focuses on the interaction of two components in a neutral medium for a targeted rouging decomposition. Both substances develop their effect in the neutral area. The completed solution therefore has a pH-value of 7. The standard treatment period is approx. one to four hours at 70 ... 80ºC, and thus in most cases is considerably shorter than the time required with acid cleaners (Figure 2, see page 2). By the periodic taking of samples during the cleaning process, one is able to check whether all components of the cleaner still exist in optimum concentration. The addition of a simple indicator, which discolours with sufficient concentration, should be adequate. If needed, insufficient components can be added in a targeted fashion.

This individual procedure also reduces the required use of resources. Instead of a 20 to 30% "acid solution", an aqueous solution with approx. 1 to 5% Diruneutra for filling the system is completely adequate. This material saving is particularly financially noticeable with chemicals produced under GMP conditions and, of course, with certified chemicals. Since cleaners only decompose iron oxides in a targeted manner and neither etch chromium or nickel, an intact production system surface is always ensured (Figure 3a + 3b, see page 2). The completion of the cleaning can be determined by measuring the iron content, e.g., calorimetrically. The cleaning operation is completed, if the Fe content reaches a stable value after a certain period. The cleaning solution is removed and the system is rinsed clean with water. The cleaning solution can be disposed of cost-effectively; the rinsing water requires no neutralisation.

The new process for removing surface changes rich in iron oxide on stainless steel surfaces sets standards. ***The pH-neutral cleaner is much less aggressive than the previous acid solutions. Since the low cleaner concentrations are sufficient and, upon request, can be replenished, the costs for materials and disposal drop drastically. The costly system always is protected by the removal process, which selectively only focuses on iron oxide. The new method, while offering passive and active safety, offers reduced costs at the same time.***

Picture gallery

Figure 1

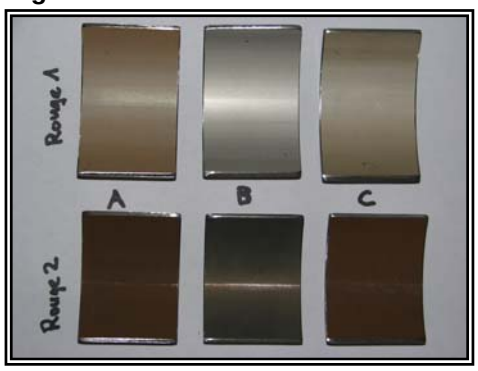


Legend Figure 1

The rouging of stainless steel surfaces in process damage the secure process conduct. It arises during the line operation and is particularly undesirable in ultra-pure water systems.

LABORATORY TEST ON 2 DIFFERENT TYPES OF ROUGING

Figure 2

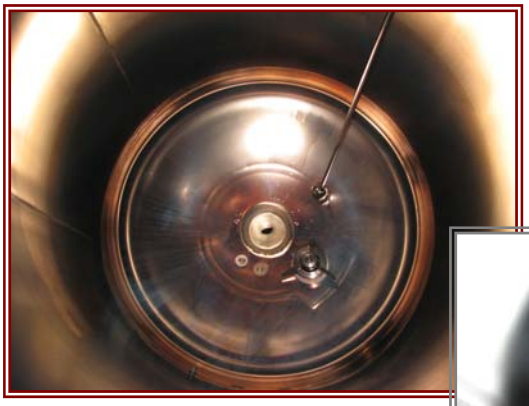


Legend Figure 2

Model A	untreated
Model B	1.25% Diruneutra, 1h at 80°C, pH 7
Model C	15% Phosphoric-/ citric acid solution, 4h at 80°C, pH<1

PRATICAL EXAMPLE

Figure 3a



Before treatment with Diruneutra…

Figure 3b

… after treatment with Diruneutra!

Contact

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