

TECHNICAL DATA SHEET

Nonacid® 701

A non-cyanide electrolytic bath for the removal of rust and scale

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CONTENTS

1 Process Information	1
2 Equipment	2
3 Make-Up	2
4 Working Parameters	3
5 Maintenance	3
6 Operating Recommendations	4
7 Electroplating Operations in Open-Ended or Closed Barrels	4
8 General Safety Precautions	4
9 Material No. for Make-Up and Maintenance Products	4
10 Document History	5

1 Process Information

Nonacid® 701 is an electrolytic rust and scale removal bath which can be used to remove rust and light scale – as occurring, for example, from annealing, hardening, or welding processes – from cast iron and steel.

Nonacid® 701 offers the following advantages over conventional treatment with acid:

- Nonacid® 701 exerts no aggressive action whatsoever on the basis material. Since it does not act to change the substrate dimensions, Nonacid® 701 is even effectively suitable for treating work pieces which have been ground to fine tolerances. This is a valuable advantage over conventional acid dips, which cause widespread difficulties by their aggressive action on the basis material.
- Parts treated in Nonacid® 701 come from the bath with a bright metallic surface. In this condition, they possess an active surface which enables their direct electroplating in conventional electrolytic baths, without the need for any further pre-processing. As a result, Nonacid® 701 produces none of the stubborn residues such as those which are typically left by acid etch cleaning baths, and which must be removed by mechanical abrasion processes.
- Nonacid® 701 acts at the same time as an electrolytic degreasing bath. An additional degreasing step before electroplating is therefore not required. In order to prevent unnecessary pollution of the Nonacid® 701 bath, however, and to extend its effective lifetime, we highly recommend, as a very first step, treating the work pieces in one of our alkaline cleaners to clean extremely dirty or highly greasy surfaces.
- Nonacid® 701 is also outstandingly effective in removing rust and scale from mass-production bulk items intended for electroplating carried out in open-ended or closed barrels.
- Nonacid® 701 does not contain cyanide. This feature makes wastewater engineering simple and inexpensive.

2 Equipment

Tanks	Sheet steel with lining consisting of wire glass, hard rubber, or PVC; tanks consisting of PVC, polyethylene, PVC / polyester reinforced material. The tanks must be equipped with a narrow side compartment and with an electric pump. The motor-driven pump must pump the contamination from the bath – which separates out on the surface of the electrolyte – over into this narrow compartment. Baths with extremely large daily production throughput will develop a great amount of heat. In such cases, a cooling system must be provided.
Exhaust system	Required
Electrodes	Armco steel

3 Make-Up

Ansatz von 100 l	Liter	kg
Water, deionized	Approx. 95	
Nonacid® 701		10 - 20

- The bath can be made up directly in the same tanks which are intended for the rust- and scale-removal treatment process.
- Place approximately three-fourths of the required amount of water in the tank and add the Nonacid® 701 salt slowly and in small amounts at a time, while stirring vigorously.
This dissolving procedure will cause the solution to become very hot. If the user employs tanks with plastic lining, it is especially important that only small amounts of Nonacid® 701 are slowly added at a time to the water.
Otherwise, the generation of heat will be excessive and may cause the plastic lining of the tanks to soften and deform (an especially great problem with most plastics at temperatures above 60 °C).
- When the entire salt has been dissolved, top off the tank to the full required volume, and stir thoroughly.
- The bath is now ready for operations.

Depending on the requirements placed by its use, Nonacid® 701 can also be employed in concentrations which differ from the normal concentration given above.

For the removal of slight rust, for example, it is sufficient to use 10 kg of the salt for 100 l of bath liquid. If, on the other hand, parts covered with scale must be treated, concentrations toward the high end of the range given above (20 kg / 100 l) are effective for removing the scale within short exposure periods.

IMPORTANT NOTE: In all work with Nonacid® 701, make sure that all regulations on operations with alkaline solutions are carefully observed.

4 Working Parameters

Parameter	Value/Description
Bath density	Approx. 1.074 g/cm ³ at 20 °C for 10 kg 100 l
	Approx. 1.105 g/cm ³ at 20 °C for 15 kg 100 l
	Approx. 1.140 g/cm ³ at 20 °C for 20 kg 100 l
Bath temperature	Nonacid® 701 operates satisfactorily at room temperature. The scale and rust removal action is, however, greater at higher temperatures: we recommend 50 – 60 °C as an optimal range in such cases.
Current density	For rust removal 7 – 10 A/dm ²
	For scale removal 10 – 15 A/dm ²
	For electrolytical cleaning 2.5 – 7 A/dm ²
	In general, greater electric power consumption will be required for the removal of scale – also including scale which develops during spot-welding work – than for the removal of rust.
Bath voltage	The bath voltage will depend on the current density which is being used. The bath voltage will be 10 V on the average; at higher voltages, however, bath operations can be more effective. Voltages lower than 8 V are not sufficient since they do not enable the required current densities.
Time of processing	The time of processing will be 1 – 3 minutes, depending on the degree of fouling with grease, rust, or scale. For removal of stubborn scale, however, longer periods of time may also be necessary.

Current reversal

Although grease can be removed without reversing the current in Nonacid® 701 baths, it is necessary to provide anodic / cathodic current-reversal switching for the work in progress if rust and any types of scale residue are to be removed. The current switching periods here should be relatively short, since such an arrangement will enable faster cleaning of the material than with longer switching periods.

In general, operations in accordance with the following have proven effective:

- **Removal of scale:**
 - Alternate switching of cathodic / anodic polarity: 10 s cathodic and 5 s anodic
- **Removal of light rust (for example, rust film):**
 - Operations with cathodic polarity*
- **Removal of residue from etch processes:**
 - Operations with anodic polarity*

In special cases, it may be necessary to use different current-reversal switching times. These will have to be determined by trial and error.

Instead of performing all operations at one constant cathodic or anodic polarity mode, the same effect can be achieved here by switching in alternative cathodic / anodic modes, as for the **removal of scale**.

Racks

If the user intends to process the work primarily or exclusively in the anodic mode, it will be necessary to use suspension racks made of iron. Racks made of brass or copper will suffer from the action of the chemicals involved and are therefore not suitable: metal dissolved from brass or copper racks will be deposited onto the work when operations switch back to the cathodic mode.

If, however, the user cannot avoid the use of conventional racks (made, for example, of brass or copper), then they should be covered to as great an extent as possible with an insulating material in order to reduce the exposed surface to a minimum. The exposed contact ends must then be heavily nickel plated.

In order to prevent contamination of the Nonacid® 701 bath, use only racks which have been thoroughly cleaned of any metals which may have been earlier deposited onto them in other electrolytic baths. This is especially important for zinc or cadmium residue.

5 Maintenance

It will be necessary from time to time to monitor the density of the Nonacid® 701 solution. If the density falls below the prescribed level, then the bath must be replenished by addition of the original salt. Replenish by adding the salt directly to the electrolyte.

The great majority of the rust and scale removed from the work will settle as sludge to the bottom of the tank. We recommend removing this sludge at regular intervals: by mechanical lifting from the bottom, or by filtering of the bath liquid.

After the Nonacid® 701 bath has been in operation for some good time, its scale-removal effectiveness will decrease. When replenishment of Nonacid® 701 salt does not suffice to achieve satisfactory results, the solution is exhausted and must be replaced by making up a new bath.

6 Operating Recommendations

It can prove highly difficult to remove scale which results from annealing, welding, or spot-welding processes – especially when cleaning parts with heavily contoured or complex shape. Sufficiently great current density often cannot penetrate into the depths of such parts. In such cases, it is therefore necessary to loosen the scale by first sending the parts through a preliminary etch cleaning process in diluted hydrochloric acid (1 : 1). This preliminary step is especially important in work with automatic operations with programmed operational cycles.

For special effectiveness, however, we can highly recommend – instead of using hydrochloric acid - the use of our acidic rust- and scale-removal acid dip products. These products achieve the same desired effects as hydrochloric acid, but with considerably gentler action on the basis material. After this preliminary treatment, the user should proceed with Nonacid® 701 treatment as described above. The loosened scale will then be considerably easier to remove.

If Nonacid® 701 solutions become contaminated with foreign metals, this will show up in the form of discoloration on the surfaces of the work in process. This discoloration results from deposition of these metals once the polarity has been switched over to cathodic mode. These foreign-metal deposits will often impair the adhesion of the desired deposits applied in the following electrolytic plating steps. To prevent this problem, we recommend in such cases removing the work from the Nonacid® 701 bath only during the anodic phase.

If the work is being processed in automatic systems, the production control system must be regulated in such a way that the work will be removed from the bath after the anodic cycle. Only in this manner can satisfactory results be achieved.

In the event that the parts are covered with stubborn scale which cannot be removed satisfactorily during the cleaning process, the effects of the Nonacid® 701 bath can be enhanced by addition of 5 – 10 g/l of sodium cyanide. In such cases, however, it is necessary that a cyanide decontamination process be integrated into overall production, to ensure proper treatment of wastewater and concentrates.

7 Electroplating Operations in Open-Ended or Closed Barrels

The removal of rust and scale from mass-production bulk items intended to be electroplated in **open-ended or closed barrels** takes place in accordance with the same instructions as for plating in tanks. Armco steel serves as electrode material in such applications. The contact knobs and bolts in such systems must consist of steel. The treatment times here will be approximately the same as for operations in tanks, if the following current and voltage conditions are maintained:

Open-ended barrel operations:	Voltage: 8 – 10 V Current: 3.0 – 5.0 A/l
Closed-barrel operations:	Voltage: 10 – 15 V Current: 1.0 – 1.5 A/l

8 General Safety Precautions

Avoid direct contact with this material. Do not inhale associated mist or vapors. Wash contaminated clothing before reuse. Refer to Safety Data Sheet (SDS) for specific precautions before handling this material and for first aid recommendations. As applicable, keep exposure below the limits recommended by the appropriate regional regulatory agencies.

For further information regarding safe handling of the product please refer to the corresponding SDS. The SDS is provided as part of the ordering process. If you don't have a copy of the SDS for a product then it can be obtained, on request, from the appropriate regional Atotech office.

9 Material No. for Make-Up and Maintenance Products

PRODUCT	MATERIAL NO.
NONACID 701	80358

10 Document History

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