

## Descaling and Pickling

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#### Applicable to:

#### Corrosion-resistant Alloys

#### High-temperature Alloys

#### Wear & Corrosion-resistant Alloy

As a result of their inherent resistance to corrosion, the HAYNES® and HASTELLOY® alloys are generally inert to cold acid pickling solutions. Also, the oxide films that form on these alloys during heat treatment are more adherent than those that form on the stainless steels.

The most effective descaling methods for the HAYNES® and HASTELLOY® alloys are immersion in molten caustic baths, followed by acid pickling at elevated temperatures.

Three descaling methods have been used successfully with the HAYNES® and HASTELLOY® alloys, namely:

1. The VIRGO descaling salt bath process.
2. The sodium hydride reducing salt bath process.
3. The DGS oxidizing salt bath process.

The procedures associated with these methods are shown in the table below.

**Descaling and Pickling Procedures**

	<b>VIRGO Descaling Salt Bath</b>	<b>Sodium Hydride Reducing Salt Bath</b>	<b>DGS Oxidizing Salt Bath</b>
Descaling Bath	VIRGO Salt	Sodium Hydride	DGS Salt
Bath Temperature	970°F (521°C)	750°F-800°F (399°C-427°C)	850°F-950°F (454°C-510°C)
Descaling Time	1 to 3 minutes	15 minutes	2 to 10 minutes
Water Rinse Time	1 to 2 minutes	1 to 2 minutes	1 to 5 minutes
Pickling Step 1	15-17% Sulfuric Acid + 0.5-1% Hydrochloric Acid at 165°F (74°C) for 3 minutes*	4-6% Potassium Permanganate + 1-2% Sodium Hydroxide at 135°F-155°F (57°C-68°C) for 15 minutes*	15-25% Nitric Acid + 3-5% Hydrofluoric Acid at 130°F-150°F (54°C-66°C) for 10 to 20 minutes
Pickling Step 2	7-8% Nitric Acid + 3-4% Hydrofluoric Acid at 125°F-160°F (52°C-71°C) for 25 minutes	8-12% Nitric Acid + 2-3% Hydrofluoric Acid at 125°F-160°F (52°C-71°C) for 15 minutes	No Second Step
Final Water Rinse	3 minutes or Steam Spray	Dip	Dip and Steam Spray

\*Followed by a water rinse

Sand, shot, or vapor blasting are acceptable for removing scales, under certain conditions. The blasting

materials should be such that they provide a rapid cutting action, rather than smearing the surface. Also, sand should not be re-used, especially if contaminated with iron. After blasting, it is desirable to pickle the work-piece in acid, to remove any embedded iron or other impurities.

Extreme care should be taken when blasting thin-sectioned components with sand, because of the dangers of distortion and/or embedding sand or scale in the metal surface. Sand blasting also tends to work harden the surfaces, which may cause subsequent forming problems for certain alloys.