How-to

7 Tips for Improving Results When Finishing Stainless Steel

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To achieve the most common stainless steel finishes, you often have to follow numerous steps in a specific order. Because of this process, and because stainless steel is more susceptible to heat and contamination, you may find that working with the material is more time-consuming and expensive than working with carbon steel.

It's important to understand how stainless steel responds to finishing and why it's so critical to use products specifically designed for this material. Doing so can save you time and money while allowing you to achieve the desired results.

CHALLENGES OF FINISHING STAINLESS STEEL

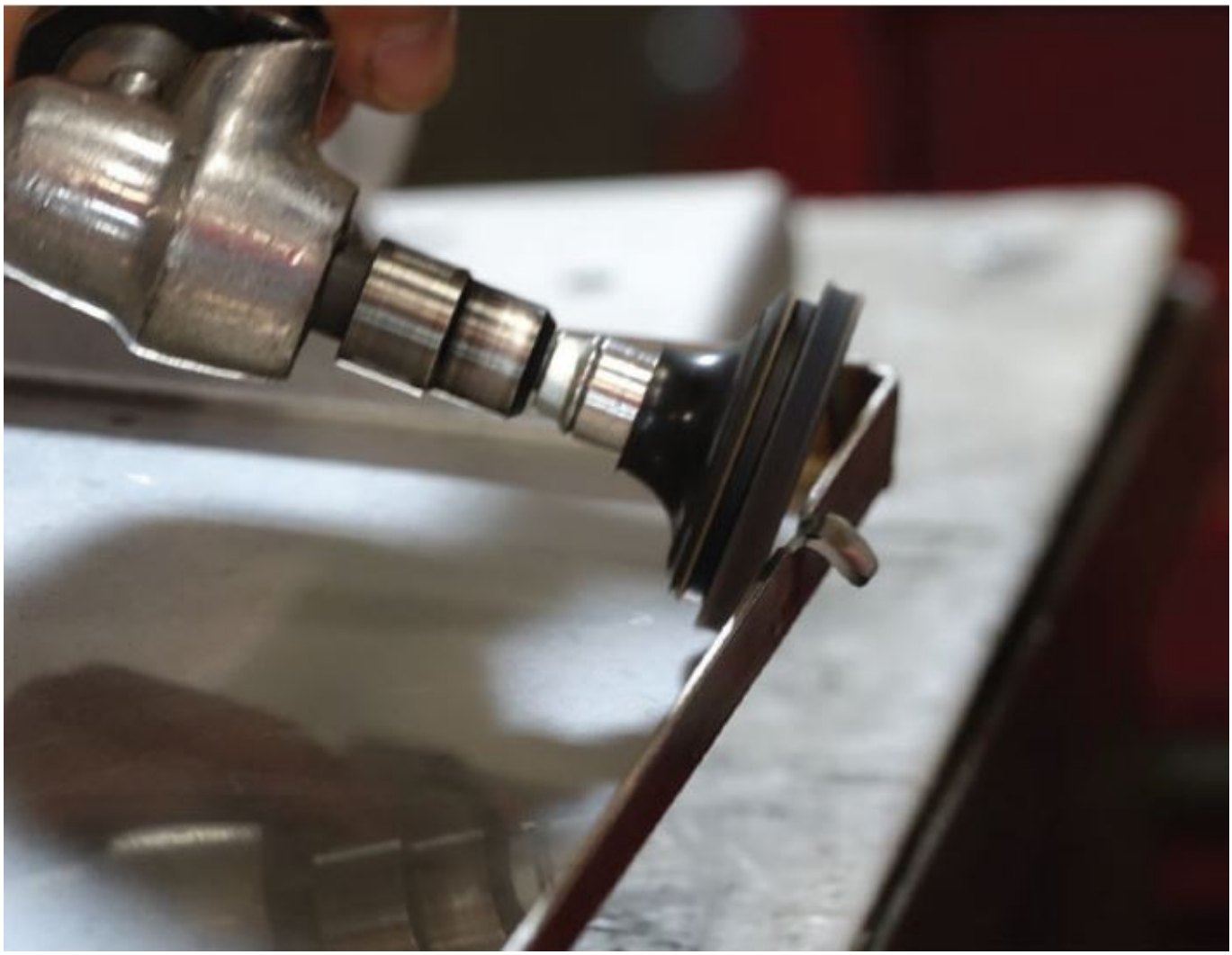
Stainless steel is used in many industries and applications where high purity or specific aesthetic requirements are important, including food service, medical, aerospace, energy, and architectural metal fabrication. While the material offers strength, long life, and corrosion resistance, it does present some challenges during welding and finishing. Here are some factors to consider:

▪ **Stainless Steel Is Susceptible to Contamination.** In fact, it can be more susceptible to contamination than carbon steel. In applications where high purity is critical and most welds are X-ray-inspected, such as medical equipment and power generation, it's important to maintain consistency throughout the weld and avoid inclusions to prevent contamination. This extends to the finishing process too. You don't want to introduce contaminants during the finishing process that could later corrode the weld or weaken the joint.

▪ **Stainless Steel Is Soft.** Because it is softer than higher-carbon-content steel, it is easier to damage or gouge the workpiece. Take extra precautions to avoid removing too much material, which can later weaken the weld. Stainless steel also discolors with heat, so using too much pressure during grinding or finishing can turn the metal a purple or brown color, requiring a secondary process to remove discoloration, which costs you time and money.

▪ **Finishing Stainless Steel Is a Multistep Process.** To properly finish stainless steel, you must follow specific steps and work your way through the grit levels of the abrasive products you are using. No one product does it all when it comes to finishing stainless steel. It is common to start with a bonded abrasive for heavy stock removal, move to a flap disc to blend, then use a resin-fiber disc to blend the parent material to the weld before finally ending with a polishing or buffing disc. While it may be tempting to skip steps to save time, that can result in costly rework if the results aren't what you need.

▪ **Mistakes Resulting in Rework and Scrap Are Expensive.** Rework on stainless steel can cost double what it is for rework on carbon steel. To begin with, stainless steel is a more expensive material than carbon steel and typically requires more labor. Stainless steel is less forgiving, and you must follow the finishing process carefully to avoid damaging the material. Abrasives used with stainless steel may also be more expensive since the application requires contaminant-free products.



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FINISHING DO'S AND DON'TS

Because stainless steel can be a challenging and expensive material to work with, it's important to be properly trained before you begin grinding and finishing it. Here are some tips regarding proper technique, product selection, and usage that can help you.

1. Do Choose Products Based on Finish Requirements. Common finish types for stainless steel are nondirectional, No. 4 finish, or mirror polish. Your abrasive choice depends on the visual or roughness average (Ra) finish requirements. For rough grinding, a 36- or 40-grit flap disc works well. But if you need a mirror polish, you'll need to go even higher with the grit and add some buffing compounds or fiber wheels to polish the material to its required visual finish. A product specifically designed for stainless steel will work more efficiently on this material because it will cut faster, last longer, and reduce heat better than a product designed for carbon steel.

2. Don't Cross-Contaminate. Just because a product is labeled for use with carbon steel or stainless steel doesn't mean it is contaminant-free. A product that is contaminant-free contains less than 0.1% of iron, sulfur, and chlorine—elements that cause oxidation.

Bonded abrasive products labeled as Inox are contaminant-free. Whether or not you need a contaminant-free product depends on the final requirements of your application. It's also important to avoid using a product on stainless steel after it's been used on carbon steel. If you use a stainless steel brush on carbon steel and then on stainless steel, it will introduce contaminants from ferrous material.

One way to avoid cross-contamination when wheels and brushes look similar is to use color-coded abrasive products. These can help prevent you from mistakenly using a carbon steel brush on stainless steel or vice versa.

3. Do Start With the Desired Finish on the Parent Material. Starting with the base material prefinished to the desired specifications is a common practice to save time and money for many operations. For example, a sheet metal base piece may come to the welding operation with a No. 4 directional finish or mirror polish that was completed by a machine. This minimizes the amount of finishing that you must do by hand after the pieces are welded together.

(Top) With the right technique, the finish you achieve on stainless steel will be smooth and consistent, as shown before and after. (Bottom) Using color-coded abrasive products can help you avoid cross-contamination when wheels and brushes look similar.

4. Don't Apply Too Much Pressure. When you are using abrasive products, pressure equals heat, and heat can damage stainless steel more easily than carbon steel. You can control the heat when grinding or finishing by applying less pressure and letting the abrasive brush or disc do the work as it was designed.

5. Do Keep the Product Moving. Use a uniform and consistent pattern when grinding or finishing stainless steel. Dwelling in one area too long can build up heat, which can damage the base metal and result in added time and rework.

6. Don't Skip Safety. Using the necessary personal protective equipment (PPE) is important for any welding and metal finishing work, but especially for stainless steel. It's recommended to use a respirator when finishing any steel or stainless steel because of the dust generated from the abrasives as well as the base material. Stainless steel has the added danger of high amounts of nickel, which can become airborne along with other particulates when grinding, which can cause lung damage.

7. Do Document the Process. Detailing your step-by-step process for finishing stainless steel is important for producing consistent results each time. It helps to remove guesswork and reduces the chance for rework. This is especially important for applications that require a very specific finish that will be measured each time, such as a medical or food processing application. Your documentation should include the processes you used and the specific type and grit of abrasives for each step.

MAXIMIZING RESULTS WITH STAINLESS STEEL

The abrasives market has changed considerably over the past 15 years. New products designed specifically for stainless steel can help improve your productivity and finish quality when working with the material.

In addition to choosing a product designed for your application and the required finish, it's also important to follow the steps of the finishing process and understand how stainless steel reacts. This will help you reduce rework, save time and money, and get the best results with stainless steel.

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