EAN-003
Understanding and Avoiding a “White Contamination” problem when using the TIG Brush

INTRODUCTION

There is usually one cause of the “White Layer” appearing on metal, especially stainless steel, when using the TIG Brush – and that is contamination.

Contamination can be from oils, glues, polishes, or fluids that have come into contact with the metal or the TIG Brush tip. The contamination can occur at any time prior to the TIG Brush being used for cleaning, even before the metal steel is delivered as a raw material. If a Phosphoric based cleaning fluid is used, and it has not been “Neutralized”, the cleaning fluid can also leave contamination on the surface of the stainless steel. This may result in a white “frosting” appearing several days or weeks later.

Often any contamination is initially clear, and cannot be seen easily. It is not until heat is added that the contamination turns to a white color. The heat can be added during the welding process (resulting in a white ring around the weld), or added by the use of the TIG Brush (resulting in a white layer).

The best way to avoid contamination from occurring is to use a Genuine Ensitech “Pre-cleaner” before welding or using the TIG Brush, and/or a “Neutralizer” after using the TIG Brush.

The Pre-Clean, Cleaning and Neutralizer fluids to use depend on the application, and on the metal being cleaned. Please refer to the Ensitech Fluid Guide in APPENDIX A to select the correct fluids.

We recommend that before welding or cleaning stainless steel, a “Pre-Clean” fluid is sprayed onto the surface of the stainless, then wiped off with a damp rag and finally rinsed in water. In most cases this will stop the white layer from appearing. To prevent “Frosting” from appearing, the relevant “Neutralizer” needs to be sprayed wherever the TIG Brush has been used, and then washed off with water.

SOURCES OF CONTAMINATION

There are four common sources of contamination: plastic covering; cutting fluid; contamination from other sources; Phosphoric based Cleaning Fluid being left on the metal surface. How to identify the source of contamination, and how to prevent it in each case, is discussed below.

1. Plastic Cover on Stainless Steel
   Identification
   After peeling away the Plastic Cover, a White Layer appears as I use the TIG Brush!

   Some examples are shown on the next page:-

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Pictures 1 & 2 – These photographs show a “White cloudy layer” on Mirror Finish Stainless Steel

It is clear from the photos that this customer is using Stainless steel which has a protective plastic sheet on it. (This is very common for supply of “Mirror Finish” or “High Polish” Stainless steel.) The plastic cover sheet is still visible in the bottom of picture 1. The plastic cover is "glued" to the surface with a mild adhesive. The adhesive allows the user to easily "peel" away the plastic cover when they want to.

**Causes of the Contamination**
The adhesive leaves a very small amount of material on the surface of the stainless steel. The layer of material left behind is VERY thin, and usually cannot be seen. However there is enough residue left behind to turn white at the high temperatures produced by welding (which will cause a white ring) or by the TIG Brush (which causes the white layer as seen in the pictures).
Preventing the Contamination

Apply a genuine Ensitech Pre-Cleaning fluid such as TB-02 after peeling back the plastic, before welding or cleaning with the TIG Brush. See the chart in Appendix A for choosing the appropriate fluids.

2. Cutting Fluid Identification

A “White Layer” appears around a weld, after cleaning away the brown “heat tint”.

![Picture 3. White “halo” around welds.](image)

Reason for Contamination

Many customers use a “cutting fluid” when cutting and preparing their work, prior to welding. Many “cutting fluids” contain a soluble oil. When the welding heats the contamination, it turns white but is hidden by the brown and blue “heat tint”. When the heat tint is removed by the TIG Brush, the white marking is revealed, often resulting in the TIG Brush being blamed. Unfortunately, the white marks can be quite difficult to remove once formed.

Prevention of Contamination

To prevent the white marks appearing, any organic compounds (such as cutting fluid) need to be completely removed prior to welding. We recommend using a genuine Ensitech “Pre-Clean” fluid such as TB-01 for this. See Appendix A to select the appropriate fluid.

3. Fluids or other chemicals mixed on the surface of the work.

Identification

A “White Layer” appears wherever I touch the TIG Brush!
Reason for contamination
A contaminant has mixed with the Cleaning Fluid being used. For example, while using TB-25 the brush has been dipped into TB-30ND and then used with TB-25 again. If this happens, a “white layer” similar to Pictures 1 and 2 may result.

Prevention of Contamination
Ensure the customer does NOT use one brush with several fluids. For example, use one brush for TB25, and a different brush for TB30ND. Always wash the brush out after using, to prevent problems later if used with another fluid. If a brush becomes contaminated with both fluids, it will need a lot of careful cleaning before it can be used on mirror finish work again! (We recommend that only one fluid type be used with each brush tip!)

4. “Frosting” or crystals appear on the work some time later.
Identification
A white powder (or “frosting”) appears on the work some time after the TIG Brush has been used. See Picture 4 for identifying this type of contamination.

Reason for contamination
An acidic Cleaning Fluid has been used (such as TB-25), and the Cleaning Fluid has not been properly cleaned off. While the work initially looks clean, over time remaining Phosphoric Acid can combine with contaminants in the air, and phosphate salt crystals can form. These crystals are white, make the metal surface look powdery, and are very difficult to remove. Frosting can also occur after using Pickling Paste.
Prevention of Contamination
To prevent the crystals from forming, all traces of any acidic fluids must be removed from the work after the TIG Brush has been used. Simply rinsing with water does not achieve this – the water just dilutes the acid. Even wiping the work thoroughly with a wet cloth often does not work, because the water quickly becomes acidic, and re-contamination of the metal surface occurs. The most thorough and quickest way to remove any acidic Cleaning Fluid is to neutralize the surface with an alkali. Ensitech has formulated a range of Neutralizing Fluids matched to each Cleaning Fluid – see Appendix A for more details. Spraying the work with the appropriate neutralizer and wiping dry with a cloth will prevent Frosting from occurring. Another potential improvement is to use a milder Cleaning Fluid, such as TB-21 or TB-30ND. See Appendix A for more information.

Removal of Contamination
Removing the salt crystals once they have formed can be quite difficult. A fast way of removing this type of contamination is to re-clean the affected areas with the TIG Brush, then neutralize the work with the correct Neutralizing Fluid, as described above.

QUESTIONS AND ANSWERS

Why do customers NOT see white contamination when cleaning with other cleaners like “Pickling Paste” or abrasives?

Answer
Pickling Paste etches away the surface of the metal, and Abrasives wear away the surface of the metal. This means that any White Contamination resulting from the heat of welding is often removed along with the surface of the work. The TIG Brush has been especially designed to NOT damage the surface finish of the work by removing metal, and one consequence of this is that any existing white contamination on the metal surface is left unaffected. Removing all contaminants before applying heat to the metal (by welding or with the TIG Brush) is the best way to stop the White Staining from happening.

Why do the customers not see this problem with competition machines?

Answer
The reason that “sock” based machines do not seem to cause a “White Layer” to form on Plastic Covered surfaces, is that sock covered electrodes do not get hot enough! We have been told that some customers do see this problem with “sock” machines, but not as often as with the TIG Brush.

The longer the TIG Brush is used on the surface, the hotter the surface becomes, and the worse white staining can become! This is also true of “sock” based machines, but the heating takes much longer.

How will the customer know when to use a Pre-Cleaning Fluid, such as TB-01 or TB-02?

Answer
There are TWO common places where the White Contamination occurs
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Location 1 - A white “cloudy” layer appears generally on the surface of the metal, wherever the TIG Brush is used.

Solution 1 - Clean the surface with a Pre-Clean Fluid (such as TB01) before continuing to clean.
Solution 2 - Switch the TIG Brush to “Restore” (see HINT below).

Location 2 - A white mark (“Halo”) appears immediately around the weld, after cleaning the “heat-tint” away.

Solution - The Halo has already been caused by the heat from welding. In the future a genuine Pre-Clean fluid such as TB-01 should be used prior to welding – See Appendix A for more information. Try using the TIG Brush only on “Restore” (see HINT below) and this may remove the white mark along with the weld heat-tint.

HINT

If the “White Layer” starts appearing at any time while using the TIG Brush, try the following:-

1. Clean the work with an Ensitech “Pre-Clean” Fluid before continuing. This should remove any organic contaminants that are still on the surface of the metal. Use the table in Appendix A to select the correct “Pre-Clean” fluid.

2. Switch the TIG Brush to Restore . The Restore setting will leave the surface polished, but will also remove the white layer as it polishes.

CONCLUSION

Many customers have reported that by using genuine fluids such as TB-01 prior to welding, and TB-40 after using the TIG Brush, they are seeing significant improvements in the quality of the finish of their work.

By using an Ensitech Neutralizer matched to the Cleaning Fluid, customers who have occasionally experienced “Frosting” issues have also been able to find a good solution.

By using genuine Ensitech fluids, and following the guidelines presented in this application note, customers should experience consistent and long-lasting results from using the TIG Brush on all types of work, and all types of metals.

Appendix A contains a table which helps the user select which steps need to be taken, and which fluids to be used. For example, if cleaning stainless steel that has been covered with sticky plastic, prepare the metal with TB-02 prior to welding, clean with the TIG Brush using TB-25, and finish off by neutralizing with TB-40.
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To protect the surface of the work after cleaning, TB-50 forms a protective layer that prevents fingerprints from showing, and which allows future cleaning to be done with the wipe of a cloth.

Stainless steel can also be marked (etched) with a logo etc by using TB-90 and an Ensitech Marking Kit.

We hope that this document helps explain the reasons for White Layer contamination occurring, and presents some simple and effective solutions. If you have any further questions or comments, please contact Ensitech directly (see our details in the footer) or navigate to the TIG Brush website www.tigbrush.com.

APPENDIX A

<table>
<thead>
<tr>
<th>ENSITECH FLUID GUIDE</th>
<th>GENERAL PURPOSE (GOOD WELDS)</th>
<th>HEAVY DUTY, STICKY PLASTIC COVERING</th>
<th>MAXIMUM SPEED</th>
<th>MAXIMUM SAFETY</th>
<th>PREMIUM FINISH (MIRROR)</th>
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<tbody>
<tr>
<td>STAINLESS STEEL</td>
<td>PREPARE</td>
<td>TB-01</td>
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<td>MARK</td>
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<td>TB-90</td>
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*TB-41 Neutraliser should be used when the Cleaning Fluid is TB-30ND

For more information, ask Ensitech to send you a “Fluid Brochure”, or navigate to the TIG Brush website www.tigbrush.com