

Electrochemical cleaning: The total solutions offering

Sean Blake of welding innovations and consultancy, ArcStrike, outlines the benefits of electrochemical cleaning of stainless-steel weld seams and weldments, and the advantages of relying on the leading global specialist in the technology, Nitty Gritty, for applications' support and to ensure safe, reliable and environmentally friendly results.

Nitty Gritty's range of chemical cleaning solutions is designed for use on stainless steel welds and surfaces, as a replacement for legacy paste-based pickling and passivating processes, explains Sean Blake of ArcStrike, a local stainless-steel specialist and the distributor of Nitty Gritty chemical cleaning machines and consumables.

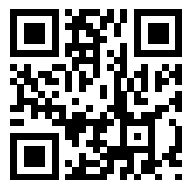
Pickling is done to remove impurities from the surface of stainless steel, such as rust, scale, heavy oxidation, and the heat tint from welding. Pickling produces a chromium-rich layer, which then promotes passivation, the process in which surface chromium reacts with oxygen to form a protective layer on the surface of the material. This perfectly sealed and self-healing passivated surface layer gives stainless steel its corrosion resistance.

Dangerous legacy methods

The legacy process for pickling and passivating stainless steel has always been to use a thick pickling paste, which is spread onto the area being treated by hand with a brush. This paste is usually a mixture of hydrofluoric acid (HF) and nitric acid (HNO₃), which are both aggressive, cor-

rosive and dangerous chemicals. "The HF reacts with the surface of the stainless to remove the top layer of iron and oxides, while the HNO₃ reacts later, reacting with chromium to build the passive layer," Blake tells AF.

The Nitty Gritty Clinox Pro, which includes electrolyte pumping and fume abatement, is the company's top-selling electrochemical cleaning, polishing and marking machine for stainless steel.



Pickling paste is dangerous! Hydrofluoric acid, which causes severe burns if touched and is toxic if inhaled, is subject to work exposure limits of around 3.0 ppm for 15 minutes, while nitric acid is also highly corrosive, causing lesions on the skin, eyes and mucous membranes on contact. Nitric acid emissions are also generated during the process, which contribute to acid rain and smog and are harmful to the ozone layer. A work exposure limit of 4.0 ppm for 15 minutes applies.

Rinsing and disposal are other disadvantages. Large amounts of rinse water are required to remove the used paste. This water becomes acidic and contains residues of heavy metals, so containment, treatment and safe disposal are essential, adding to the costs.

Electrochemical cleaning, the safer alternative

"Nitty Gritty has been developing this process for over 30 years, exclusively focused on the surface quality of stainless steel welds and weldments," says Blake.

Electrochemical cleaning machines use an inverter to generate a current flow for pickling and polishing processes. This alternative solution enables more dilute acids to be used, making the process a safe, eco-friendly, productive and economical way to restore weld joints and surfaces of stainless steel weldments.

"Nitty Gritty electrochemical machines have three functions. As well as pickling and polishing, cleaning machines have permanent marking functionality with an optional marking kit," he adds.

The Nitty Gritty's Bomar electrolytes used in the process are mild and less toxic, with some classed as non-dangerous chemicals. For pickling, there are three options: Neutral Bomar (blue), which is a mix ideal for food and beverage and pharmaceutical products; TIG Bomar (green), a much lower pH but still classed as non-dangerous; and Brill Bomar (red) is the most aggressive and



Nitty Gritty surface-cleaning and polishing machines with wide brushes are ideal for cleaning the sides of stainless-steel railway vehicles.

can be used for electro-polishing as well. These are applied using one of many 'torch' designs with various brush size options, and an advanced transmission delivery system that ensures optimal electrolyte flow onto the workpiece.

"After electrochemical cleaning, a spray-on, wipe-off finishing solution called INOX Fit is used, which also degreases and neutralises the surface. No further cleaning, rinsing, or post-processing is required," Blake points out. "While there is a small amount of waste effluent that should be disposed of responsibly as it contains heavy metals, since there is minimal rinse water and no need to dilute and neutralise, the volume tends to be a fraction compared to the legacy method," he adds.

The total solution advantage

Nitty-Gritty, thanks to its R&D efforts over 30 years, has a complete range that can deal with any type of weld and on any thickness. "Nitty-Gritty machines are suitable for easy jobs and complex stainless-steel tanks, and the company is continuously developing new products and solutions to advance the process," says Blake.

A wide range of different machines and accessories is now available: from small machines with brushes to get access into small areas, such as single spot welds, to surface-cleaning and polishing machines with wide brushes, such as the sides of stainless railway vehicles.

"Compared to using pickling paste, which will invariably result in visible etch marks on the finished surface, Nitty Gritty electrochemical cleaning solutions deliver excellent visual quality to stainless steel products," Sean Blake concludes.

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