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A WELCOME FROM THE EDITOR

Dear Reader,

Welcome to the November issue of Weld Purging World 2021.

This month, we’ve had some updated Aerial Photography of our UK HQ, which you will find on page 3 along with further details on the World Nuclear Exhibition that we are attending at the end of the month.

On page 7 you will find our Technical Article Weld of Difference, which discusses the impact of poor welding practices on stainless steel corrosion resistance properties.

If you have any information that you would like to be featured in future issues of this publication, please contact me.

As always, we hope you enjoy the issue.

Best wishes,

Michaela
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WHAT’S NEW AT HQ!

This month we had some up to date Aerial Photography completed at our UK HQ by a local Photographer. It was a beautiful clear morning with the Welsh mountains visible on the horizon.

We are also excited to be attending the World Nuclear Exhibition in Paris on 30th November to 2nd December. More information and images to follow!
Titanium and stainless steel are both reactive alloys. When they are heated during the welding process, they will react with any air that is present, causing oxidation, which can lead to a loss of corrosion resistance properties. Shielding the metal with an inert gas is therefore crucial and one way to measure the oxygen content within the welding zone is by using a Weld Purge Monitor®.

Leading the way in Weld Purging Technology, Huntingdon Fusion Techniques HFT®’s PurgEye® Nano is ideal for welding titanium and high end stainless steel, where oxygen levels are required to be as low as 10 ppm.

Luke Keane, Technical Sales Manager for HFT® said: “By knowing the exact level of oxygen inside the pipe at all times, the welder knows when to start welding for high quality results. The PurgEye® Nano is our basic entry level 10 ppm Monitor, which means it is perfect for restricted budgets. It’s a simple plug and play monitor, ideal for welding titanium, stainless steel and other reactive metals such as zirconium.”

With leak-tight connectors for weld purge hoses, the lightweight PurgEye® Nano can be used with optional accessory hand pump and gas sampling probe. The PurgEye® Nano has been developed for weld purging where data logging, alarms and machine control are not necessarily required. The monitor has been developed with a unique long life sensor that has a warm up time under 60 seconds.
NEED SUPERIOR WELDS?

Reactive metals including stainless steels and titanium will react with air when they are heated during the welding process, which can cause oxidation and lead to a loss of corrosion resistance properties.

Huntingdon Fusion Techniques HFT® have recently launched their new and improved Argweld Weld Trailing Shields®, providing a high quality inert gas coverage during flat sheet, plate or pipe welding.

Chairman for HFT® Ron Sewell said: “Preventing the alloy from coming into immediate contact with air is easily done with our Argweld Weld Trailing Shields®. Manufactured right here in the UK, we constantly strive to improve our welding technology.”

“We have been manufacturing Argweld Weld Trailing Shields® for over 45 years now right, so we can guarantee quality and 100% craftsmanship.”

Designed to fit the industries most common welding torches, Argweld Weld Trailing Shields® have a new unique clip design, which means the welder can easily change different shield sizes without having to change the welding torch.

Weld faster and produce bright shiny welds with the addition of a low cost Argweld Weld Trailing Shield®. With their name and logo stamped onto every new Argweld Weld Trailing Shield®, you can be sure the Shield you are using is a HFT design.

Huntingdon Fusion Techniques HFT® are the official manufacturer of Argweld Weld Trailing Shields® with a legally registered trademark.
Make your Pipe Repairs Easy

Accu-Freeze™
Pipe Freezing System

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Applying poor welding practice to marine pipes can severely impact on their ability to withstand corrosion, even when ‘stainless alloys’ are involved, warns metallurgist and consultant Dr. Michael Fletcher.

Welds carried out on most metals without adequate inert gas coverage oxidise. The effect is even noticeable with many stainless steels. To some, it is an inconvenient feature that can be removed after welding, but this may be difficult and costly, especially if access is restricted.

Unfortunately, any oxidation can result directly in a reduction in corrosion resistance and, in some cases, loss of mechanical strength. This is significant in marine pipe applications where stainless steels along with titanium and nickel alloys are employed principally for their corrosion resistance and mechanical properties.

It will come as a surprise to many that oxygen contents as low as 50ppm (0.005%) in the welding gas can produce discolouration or ‘heat tint’.

The mechanism of corrosion

Stainless steels owe their resistance to corrosion to the formation of a very thin (a few microns) transparent surface layer of chromium oxide. This provides a passive film that acts as a barrier to penetration by an invasive environment. When heated to a high temperature in the presence of oxygen, this film increases in thickness until it becomes visible – the colour becomes darker with increasing film thickness.

At a critical film thickness the film becomes unstable and begins to break down. The fractured zones created offer sites for localised corrosion.

Four principle mechanisms are involved:

1. Crevice corrosion

Localised corrosion of a metal surface attributable to proximity of another metal such as a weld. It is a locally accelerated type of corrosion and is one of the major corrosion hazards in stainless steels (see Figure 1).

2. Pitting corrosion

This produces attacks in the form of spots or pits and takes place at points where the passive layer might be weakened: it occurs in stainless steels where oxidation has reduced the passivity. Once the attack has started, the material can be completely penetrated within a short time (see Figure 2).
3. Stress corrosion cracking

Characterised by cracks propagating either through or along grain boundaries. It results from the combined action of tensile stresses in the material and the presence of a corrosive medium. It can be induced in some stainless steels by adverse heat treatments such as those occurring in weld heat-affected zones.

4. Micro-biologically induced corrosion (MIC)

Corrosion promoted or caused by micro-organisms, typically in industries related to food, beverage and chemical processing. It is usually referred to by the acronym ‘MIC’ and is common in welded sections.

To avoid these forms of corrosion it is essential that heat tints are properly removed before the piping is exposed to aggressive or aqueous environments. The alternative is to prevent heat tinting during the welding process by using an inert environment to protect the surface.

Light discolouration can be removed by bright annealing or acid pickling but heavier deposits may require machining such as grinding and polishing. Removal clearly requires access to the area in question, not only for treatment but also for debris removal. Even when access is available none of these treatments are easy and most can be very expensive.

Weld purging

The alternative to potentially time-consuming, difficult and expensive cleaning of heat tint is to avoid it during the welding process. This can be undertaken by protecting the joint from oxidation by using an inert gas such as argon. The upper side of the joint is protected by the inert gas used in the torch. The underside, known as the underbead, needs separate treatment. This technique is referred to as weld purging.

Seals are inserted on either side of the weld root and inert gas is admitted to displace air in the space between them. Many options for sealing are available but the only totally reliable and sufficiently versatile systems are those based on inflatable seals.

Considerable design effort has been applied by the designers and manufacturers to these solutions over the past decade or so. Currently available systems address the problems of controlled inert gas pressure and flow, the need for easy and rapid deployment and removal to limit overall welding time, thermal resistance and leak-tight access for oxygen monitoring equipment. They also provide a large pipe contact area and therefore excellent and reliable sealing.

Coupled with these advantages comes flexibility to allow access and removal through pipe bends, abrasion resistance and the use of materials that meet food, semiconductor and nuclear compliance standards.

The Argweld systems are examples of fully integrated inflatable purge equipment and can accommodate tube and pipe diameters from 25-2,400mm.
Oxygen level measurements

Clearly a knowledge of the oxygen level in the purge gas is essential, recognising that a level below 50ppm may be necessary. This can be accommodated with an oxygen monitor and sensitive versions of these, referred to as purge monitors, have been developed specifically for the welding industry. Commercially available weld purge monitors can combine monitoring down to 10ppm with software for data recording, analysis and quality control.

Conclusion

During the last few years many industries, including the marine sector, have revised their weld acceptance standards upwards in striving to manufacture products with better mechanical properties and much improved corrosion resistance. The welding accessory manufacturers have responded by developing equipment capable of meeting these standards but increased use of this equipment is vital in the pursuit of quality. Industry sectors with demanding standards for weld quality need to be aware of the corrosion hazards arising from poor welding practice. Simply assuming that so-called ‘stainless alloys’ are totally resistant to corrosion can be risky. SBI

References

1. Microbiologically influenced corrosion of stainless steel”, Jörg-Thomas Titz, 2nd symposium on orbital welding in high purity industries, La Baule, France
STYLISH 1 PPM
WELD PURGE MONITOR®

PURGEYE® 600 TOUCH
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