Weld Purging World

2022 ISSUE 01: JANUARY

IN THIS ISSUE:

THE LATEST NEWS FROM OUR UK HQ

TECHNICAL ARTICLE: ENCLOSURES

WELD PURGING PRODUCTS INNOVATORS, MANUFACTURERS AND INTERNATIONALLY RENOWNED SPECIALISTS
WHAT’S IN THIS MONTH’S ISSUE

A Look Back ar 2021 3 - 4
Welding Chambers 5
Technical Paper: Enclosures 7 - 11

A WELCOME FROM THE EDITOR

Dear Reader,

Happy New Year and welcome to the first issue of Weld Purging World for 2022.

This month, we take a look back at our highlights of 2021 and look ahead at what 2022 has in store for us.

On page 7 you will find our Technical Article Enclosures, which discusses the impact of using a Flexible Welding Enclosure on corrosion resistance and helping to eliminate oxygen.

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
Marketing and Social Media Manager
michaelahess@huntingdonfusion.com
Happy New Year from all of us a Huntingdon Fusion Techniques HFT®.

It was another fantastic year for us. Here are some of our highlights:

The launch of our NEW Weld Trailing Shields:

Early in 2021, we launched our updated Weld Trailing Shields®, with manufacturing being brought in house. This was a huge step for us as a leading manufacturer of Weld Purging Products.

Along with the new sleek design, our Argweld Weld Trailing Shields® have a NEW Unique clip design, which means the welder can interchange different shield sizes without having to change the welding torch.

With our name and logo stamped onto every new Argweld Weld Trailing Shield®, you can be sure the Shield you are using is a Huntingdon Fusion Techniques HFT® design, we guarantee quality and 100% craftsmanship. They are built to last.

Each Argweld Weld Trailing Shield® produces perfect gas coverage, smooth gas movement and no leaking with every model carefully and individually tested to ensure quality performance every time. Made in the UK to European Standards and Quality Control Procedures.

20,000 PurgEye® 100’s sold:

Midway through 2021 we reached a huge milestone of selling over 20,000 PurgEye® 100’s since its launch in 2012. Selling 20,000 PurgEye® 100 Weld Purge Monitors® Worldwide in less than 10 years is such an incredible achievement for us.

The low cost, hand held, battery operated PurgEye® 100 is perfect for obtaining zero colour, oxide free welds in stainless steel, reading accurately from atmospheric oxygen level (20.94%), right down to 100 ppm (0.01%). No wonder the PurgEye® 100 is the World leading 100 ppm monitor.
Gigantic Pipestoppers®:

We had various special orders during 2021, which included a 136” diameter Weld Purging Dam for one of our European customers. We really do have a solution to every pipe stopping and blocking requirement. No matter how big or small.

Shops and Industry Events:

We were able to attend a few events during 2021, including the WNE in Paris. Unfortunately, we weren’t able to get to the larger shows such as Fabtech, but we still provided support to our Exclusive Distributor, COB Industries, during the show to ensure our products and technical expertise were still there! Well done Cletus for taking one for the team and managing all the set up and stand manning. Reports were that the Show was pretty well attended.

A look ahead to 2022:

There are lots of exciting things happening for us during 2022. One of the most prominent updates we have in the pipeline is a NEW look PurgEye® 100 with major changes being made including a high quality, lightweight metal housing.

As always, we will continue our appearances at Industry Shows where we can and of course look to keep you all updated with our latest technical expertise through our White Papers and articles.

We wish you all a happy and healthy 2022.

---

**CALENDAR: EVENTS IN THE INDUSTRY**

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>TechniShow</td>
<td>15 - 18 Mar 2022</td>
<td>Netherlands</td>
</tr>
<tr>
<td>Tube 2022</td>
<td>9 - 13 May 2022</td>
<td>Düsseldorf</td>
</tr>
<tr>
<td>Adipec</td>
<td>7 - 10 Nov 2022</td>
<td>Abu Dhabi</td>
</tr>
<tr>
<td>Fabtech</td>
<td>8 - 10 Nov 2022</td>
<td>Atlanta, USA</td>
</tr>
</tbody>
</table>
WELDING CHAMBERS FOR OXIDE-FREE WELDS

Our Flexible Welding Enclosures® are in use throughout the Aerospace Industry. These low cost welding chambers provide a complete inert gas coverage when welding components.

Pictured is a European customer involved in the aerospace industry, welding Titanium, Zirconium and Tantalum.

Argweld® Flexible Welding Enclosures® have been supplied to many notable names in the Aerospace, Sports Vehicle and Medical industries as a means of obtaining a Welding Enclosure quickly for fast turnaround of work, instead of the lengthy process of purchasing and using metal chambers.

Our Flexible Welding Enclosures® have been designed to provide an inert atmosphere for the welding of reactive metals such as titanium, zirconium, nickel alloys and stainless steels, where a rigid chamber may not be economically viable or where space may be at a premium.

The welding of titanium and nickel alloy aero engine parts demands greater attention to cleanliness and requires an inert gas shielding to prevent oxidation and metallurgical problems arising therefrom.

The Welding Chambers are manufactured from UV-resistant polyvinyl chloride (PVC) and are a highly effective device for welding with oxygen levels down to 10 ppm.

The encloses are manufactured with two sets of glove ports as standard and the upper half of the enclosure is optically clear, providing excellent welding vision. A fitted entry lock makes it possible to take small parts in or out of the enclosure without affecting purge quality. Special Enclosures can also be manufactured to suit various applications.

“We use our Argweld® Flexible Welding Enclosure® along with the PurgEye® Weld Purge Monitor® every day for our titanium welding. They are built to last!” Mark Cooper Fabrication Manager Shapes Aerospace International
Purge your Heat-Treated Pipework Confidently!

HOTPURGE® WELD PURGE SYSTEMS

Innovators, Manufacturers and Internationally Renowned Specialists

www.huntingdonfusion.com
The metallic alloys we use today have evolved through decades of research and many represent the pinnacle of achievement in terms of strength and corrosion resistance. Without these materials, the remarkable advances that have taken place in nuclear energy, medicine, pharmaceuticals, power generation and petrochemicals could not have been realised.

One of the most significant early breakthroughs occurred in 1912 in Sheffield when chromium/iron alloys were found to be corrosion resistant. Since then we have witnessed the introduction of low alloy creep-resistant steels, nickel-based alloys with elevated temperature properties and, more recently, the development of lightweight titanium alloys offering high strength-to-weight characteristics.

Optimum properties of all these materials is only achieved by precisely controlling the balance of elements. The ideal composition for every application has only been realised thanks to intensive research work by metallurgists but if elements are lost during subsequent manufacturing processes such as welding or other elevated temperature excursions, the corrosion and mechanical properties can be affected significantly.

Fusion welding of stainless steels provides a good example where loss of corrosion resistance can be significant. If welding is carried out in air and even where oxygen levels are as low as 50 ppm, the effective chromium content can be reduced and since this is the principle element added for corrosion resistance, it is a major consideration.
Another consequence of chromium loss during welding is the effect on mechanical properties. In the chromium/molybdenum/vanadium materials for example, developed for their high temperature creep resistance, enhanced hardenability, wear resistance, impact resistance and machinability, any reduction in chromium content can affect these properties. Furthermore, the sensitivity of these materials to contaminating products such as hydrogen in the shield gases needs to be considered. Care needs to be taken in selection of consumables and it is essential that any shield gases are of high purity.

The thermal cycles along with any local contamination involved in fusion welding titanium alloys can give rise to embrittlement of the alloy. Their reactive nature makes it essential to address the requirement for thorough pre-cleaning and particularly oxidation at the high temperatures involved in arc welding.

All in all, then, there is a strong material case for eliminating oxygen and other contaminants from the locality of the weld by purging with inert gas such as argon. A wide variety of purging solutions have been developed to combat the problem, including pipe welding systems and trailing shields but there is increasing demand for complex three dimensional components using alloys that are sensitive to oxidation and contamination. These are best fabricated in sealed enclosures where the entire welding operation is carried out in an inert atmosphere where contamination can be eliminated and oxygen levels reduced to well below 10 ppm.

Where quality and freedom from oxidation and contamination is crucial, total protection is afforded by using weld enclosures. Metal chambers and glove boxes have been in use for decades, and these are effective in providing a totally inert atmosphere during fusion welding.

![Fig 1. Multi-tube junctions are difficult to protect effectively without the use of an inert gas enclosure. For safety critical applications such as competitive pedal and motor cycling and in motor car racing where this type of joint is commonplace, total protection is essential.](image1.png)

![Fig 2. The accident involving Formula 1 racing driver Romain Grosjean at the Bahrain circuit in 2020 could have been fatal were it not for the head protection provided by the ‘Halo’ structure. This typifies an application where structural integrity is vital. Complete protection of the titanium alloy fusion zone during welding is essential and is provided by using an inert gas enclosure.](image2.png)
Although a traditional metal glove box can provide adequate protection it has a series of limitations. These have now been addressed successfully with currently available flexible alternatives.

- There is a major cost difference. Typically, metal enclosures cost ten times more than flexible alternatives, size for size. As the size increases, this ratio increases.

- The difference in weight means shipment and movement is much easier – typically a metal enclosure weighs significantly more than of a flexible alternative.

- Flexible enclosures can be deflated and stored when not required. Without inflation a 1.25 metre diameter model occupies a mere 0.2 cubic metres and weighs only 8 kg.

- Manufacturing times for metal glove boxes can be very lengthy, extending into weeks. Some flexible enclosures are available from stock: bespoke versions can be produced in less than 8 weeks.

- There are no sharp corners in flexible enclosures and consequently no likelihood of trapping air pockets.

There have been considerable advances in enclosure development since the concept was introduced over two decades ago. For example, Huntingdon Fusion Techniques in the UK has spearheaded a drive to design systems specifically for the welding industry. The company has been at the forefront in developing these enclosures and has exploited the opportunities offered by advanced engineering polymers.
These innovative products offer significant attractions over metal glove box alternatives: a significant reduction in cost, very small floor footprint and availability of a very wide range of sizes. The HFT® product has rapidly become the preferred alternative enclosure globally. The flexible option has played a significant part in 3-D production and additive manufacture using arc welding is now being undertaken with CNC or robot systems, together with welding plant, all accommodated inside enclosures, some the size of small rooms.

A commercial spin-off from Cranfield University in the UK uses flexible enclosures to produce aerospace parts with the Wire Arc Additive Manufacturing (WAAM) process.

**Technical Specification of Flexible Enclosures**

A combination of translucent pvc material and optically clear sheet is used depending on the viewing requirements of the customer. Ultra-violet stabilized engineering polymers are used throughout during manufacture. Material thickness is nominally 0.5 mm (480 microns).

Principal large access zips are fitted and additional entry points can be provided for operators’ gloves. A service panel incorporates access ports for welding torches and for electrical leads. A purge gas entry port and an exhaust valve to vent displaced gas to atmosphere are incorporated into each enclosure.

**Large Viewing Area**

Large sections can be manufactured using optically transparent engineering polymers. This offers the opportunity for use by several operators at the same time – ideal for training purposes.

**Multiple Access Points**

Systems can be manufactured with numerous glove ports and gas/electrical entries. Large leak-tight zips afford easy access for components.

---

**Fig. 5. Multi-access enclosure manufactured to allow for several smaller fabrications to be welded in the same gas cycle. Alternatively, it can also be used for a single large item requiring access to several joints. Simultaneous multiple training can be undertaken.**

**Monitoring the purge gas oxygen content**

The fact that even very small amounts of oxygen in the purge gas can cause discolouration around the weld underbead makes it desirable that sensitive instruments be employed to measure residual oxygen.
Two essential characteristics of a suitable instrument are that it must have an adequate measuring range and it must sample the gas for oxygen content inside the purge volume.

Although many commercial monitoring systems are available these are generally not sensitive enough to meet the requirements for quality welding of alloys such as some stainless steels and most titanium alloys where the presence of oxygen levels as low as 20 ppm are essential if loss of corrosion resistance and reduction in mechanical properties are to be avoided.

Typical of advanced monitoring systems is the PurgEye® family of instruments from Huntingdon Fusion Techniques Ltd in the UK of which the recently introduced Argweld® PurgEye® 500 Desk is totally compatible with the requirements to continuously monitor oxygen levels in flexible enclosures.

Fig. 6. The protective gas needs to be continuously monitored to ensure that a low oxygen content is maintained. An advanced instrument such as the PurgEye 500® meets these requirements with a measuring range accurate to 10 ppm.

The instrument is fitted with an integral pump to deliver a regular flow of exhausting weld purge gas to the oxygen sensor to ensure consistent measurements and readings. Advanced software is used for control and communication purposes.

- PurgeLog™ is employed for computer interfacing, data acquisition, storage and printing of results and graphs for quality control purposes.

- PurgeNet™ is used for communicating the current oxygen reading to another piece of equipment such as a Dew Point Monitor with additional inter-pass temperature monitoring.

- PurgeAlarm™ is an IP66 Rated visual alarm that displays a red indicator when the oxygen level is reading a greater value than the alarm threshold set by the user. An optional green indicator can be fitted above the standard red indicator and will illuminate only if the alarm is active and reading a value lower than the alarm threshold set by the user. A sounder is available as a further option to provide an audible alarm instead of a light.

References

2. TWI Job Knowledge. Welding of ferritic creep-resistant steels
6. WAAM3D Ltd, Milton Keynes, UK
ACCURATE STAINLESS STEEL and TITANIUM WELD PURGING

PURGEYE® 200 WELD PURGE MONITOR®

Innovators, Manufacturers and Internationally Renowned Specialists

www.huntingdonfusion.com