

# ALUMINIUM NEWS

THE VOICE OF THE UK ALUMINIUM INDUSTRY

ISSUE 12 MARCH 2022

# 1962

*Celebrating*

# ALFED 60<sup>TH</sup>

ALUMINIUM FEDERATION ANNIVERSARY

# 2022

• ALFED  
• HOUSE OF  
• LORDS LUNCH  
• TAKES PLACE  
• ON 21 JUNE

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• ALFED ANNUAL  
• DINNER AND  
• BUSINESS BRIEFING

• 10

• SIXTY YEARS  
• OF THE  
• ALUMINIUM  
• FEDERATION

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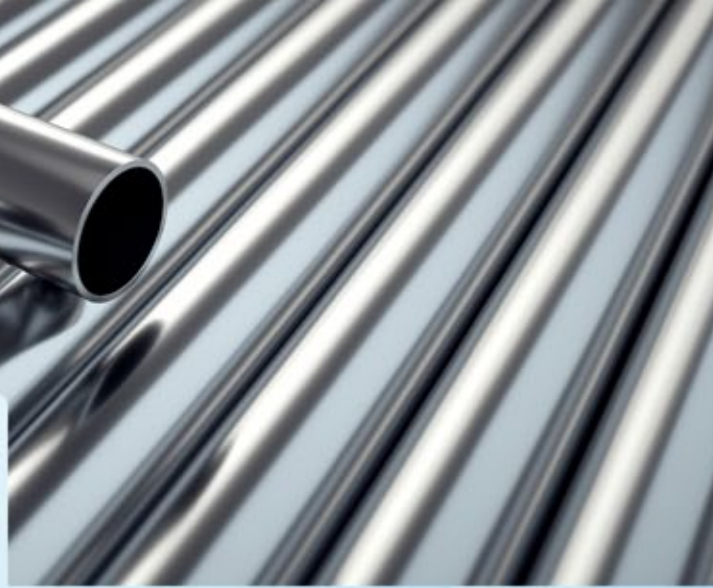
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• COATINGS TO  
• HELP MITIGATE  
• CHALLENGES OF  
• FORMING AHS  
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• HYDROGEN  
• FOR THE  
• ENERGY  
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**ALFED**  
ALUMINIUM FEDERATION



Since formation in 1981, we have developed into one of the UK's largest independent Aluminium and Stainless Steel stockholders.



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SHEETS | PLATES | EXTRUSIONS



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### MARCH

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- ALFED HS&E Conference, Wolverhampton

31  
APRIL

5-7

- Engineering Supply Chain Show, NEC Bham

11-12  
28

- World of Aluminium
- ALFED Finishing Sector Group

MAY

5

- ALFED Aluminium Distribution Sector Group

10-12  
18

- FIT Show, NEC Bham
- ALFED Aluminium & Architecture Innovation Group

JUNE

8-9

- Manufacturing Expo, NEC Bham

16

- ALFED Board Meeting

16

- ALFED Annual General Meeting

21

- House of Lords Lunch

22

- ALFED Extrusion Sector Group (provisional)

22

- ALFED Recycling Sector Group (provisional)

23

- ALFED HS&E Support Group (provisional)

JULY

6

- ALFED Meeting the Automotive Industry

14

- ALFED Aluminium Distribution Sector Group (provisional)

21

- ALFED Finishing Sector Group (provisional)

SEPTEMBER

1

- ALFED Recycling Sector Group (provisional)

6

- Aluminium Light - Module 1

8

- ALFED Board Meeting

13

- Aluminium Light - Module 2

14-15

- Metals Expo, NEC Bham

20

- Aluminium Light - Module 3

21

- ALFED Extrusion Sector Group (provisional)

21

- ALFED Recycling Sector Group (provisional)

27-29

- Aluminium Dusseldorf

OCTOBER

4

- Aluminium Light - Module 4

5

- ALFED Finishing Sector Group (provisional)

11

- Aluminium Light - Module 5

12-13

- Aluminium Casting

18

- Aluminium Light - Module 6

25

- Aluminium Light - Module 7

26-27

- Aluminium for Engineers (Day 1&2)

NOVEMBER

1

- Aluminium Light - Module 8

2-3

- Advanced Engineering, NEC Bham

## FOLLOW US

 [linkedin.com/alfed-aluminiumfederation](https://www.linkedin.com/alfed-aluminiumfederation)

 [twitter.com/alfedaluminium](https://twitter.com/alfedaluminium)

2-3

- Aluminium for Engineers (Day 3&4)

8

- Aluminium Light - Module 9

10

- ALFED Annual Dinner (& Business Briefing), De Vere Tortworth Court

15

- Aluminium Light - Module 10

22-23

- World of Aluminium

30

- ALFED Extrusion Sector Group (provisional)

30

- ALFED Recycling Sector Group (provisional)

DECEMBER

1

- ALFED HS&E Support Group (provisional)

7

- President's Dinner

8

- ALFED Board Meeting

### KEY

- ALFED Members meeting

- Training course/webinar

- Event - open to all

## FOR MORE INFORMATION PLEASE VISIT:

### EVENTS:

[www.alfed.org.uk/aluminium-federation-events/](http://www.alfed.org.uk/aluminium-federation-events/)

### TRAINING:

[www.alfed.org.uk/alfed-training/training-with-alfed/#ourcourses](http://www.alfed.org.uk/alfed-training/training-with-alfed/#ourcourses)

## ABOUT US



### CEO

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### Technical Manager -

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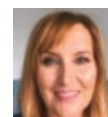
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[www.alfed.org.uk](http://www.alfed.org.uk)

## QUARTERLY MESSAGE FROM THE PRESIDENT



It gives me great pleasure to give my first report as president of ALFED and I would like to take this opportunity to wish all our members the very best for 2022. This year is the 60th Anniversary for ALFED and we look forward to some special events throughout the year where we can celebrate.

I would like to give special thanks to Clive Bush for the past two years where he has served as ALFED's President with great clarity and assurance during the most turbulent times that most of us can remember.

The famous opening lines from Charles Dickens "Tale of Two Cities" seems to capture the mood.

It was the best of times, it was the worst of times, it was the age of wisdom, it was the age of foolishness, it was the epoch of belief, it was the epoch of incredulity, it was the season of Light, it was the season of Darkness, it was the spring of hope, it was the winter of despair, we had everything before us, we had nothing before us .....

These words resonate as we look ahead to 2022. The situation in the Ukraine is one that will have dramatic consequences whatever the outcome. Inflation is at record highs and one that many people will not have seen previously. We are in the middle of "The Bubble of Everything"; with all asset classes showing real growth over the past couple of years; house prices, Bit Coin, Energy and commodities including aluminium are at near all-time highs. With interest rates at their lowest level for centuries and where governments have accumulated more debt than at any time in history, then investors have been forced to look for better returns and this has driven The Bubble of Everything. We are now seeing inflation soar and as a result interest rates are being pushed higher with the third rate increase already announced; with this change in emphasis, I believe that several asset classes will suffer an inevitable correction; it is not a case of if but when!

Supply chain issues have arisen as economies have emerged from the effects of the pandemic especially with electronic semiconductors which in turn has affected the auto industry. The one item that has affected everyone has been the situation with energy; sky high gas prices have a knock-on effect on all power costs. The European aluminium market is a major casualty of soaring energy prices; manufacturers with exposure to spot power prices have been cutting production quite dramatically in the 1st quarter. The London Metal Exchange (LME) aluminium prices have set three-month highs in the past few weeks because of the growing shortage, with premiums also reacting strongly to the supply issues. As a result

of these issues in the primary market the scrap substitutes are all heavily in demand and prices have continued to rise. The demand for aluminium is expected to improve as the year progresses as the supply chain issues subside and the pent-up demand from the automotive industry is realised.

It is quite staggering when you consider that 75% of all the aluminium ever produced is still in use in some form; and it takes 95% less energy to produce recycled aluminium as against primary aluminium. The UK is a global leader when it comes to aluminium recycling, and it is one of our goals to achieve a 90% increase in the domestic use of recycled aluminium. Having spent a lifetime in the recycling industry I would like to work with all at ALFED to drive the ambitions of closed-loop supply chains, whole life design innovation and being part of a national recycling strategy.

Considering all the issues that we face then it seems to be more important than ever that we are members of a successful and strong organisation that it is working for the benefit of all its members.

ALFED has positioned itself where it can now deliver on a wide range of subjects through its knowledge partnerships, training programs, networking events, political lobbying, communication policies and business briefings. Working together we can support and strengthen the UK aluminium industry for all sectors.

I would like to engage with all our members during my term and I would welcome the opportunity to discuss how you would like to see ALFED develop and what are the issues that you would like us to focus on. We recognise that we represent all aspects of the aluminium supply chain, and it is our aim to continue to develop our organisation for the benefit of all our members.

Thank you for placing the trust in me and I look forward to working with you all.

Mike Dines  
**ALFED President**

# MEMBERSHIP

## ALUMINIUM FEDERATION IS THE VOICE OF THE UK ALUMINIUM INDUSTRY

The Aluminium Federation represents businesses who process, trade and work with aluminium. We foster innovation, promote best practice, develop skills and champion member interests. From training and networking to research, advocacy, lobbying and outreach, we help our members solve problems, capitalise on opportunities and boost their competitiveness.

As a member, you become part of an influential community, getting your voice heard within the industry and at the highest levels of government. Working together, we are actively driving UK aluminium forward - and we look forward to working with you in this endeavour.

### COLLABORATION:

We bring together recycling and secondary producers, extruders, finishers and stockholders – helping everyone involved in UK aluminium make connections for mutually beneficial business and supply development.

### INNOVATION:

You benefit from a range of services that help you stay at the cutting edge. From research and development through to industry benchmarking and technical support, you get insight that assists you to develop your business.

### OPPORTUNITY:

We give you a unique opportunity to get your voice heard - within the industry and in government. Whether you're a global company or an SME, you can advocate and influence to improve market conditions for your products and services.

### MEMBER BENEFITS:

Benefit from a range of services that help you develop your business, workforce and supply chain:

- Advocacy & lobbying
- Market insight
- Training
- Technical support
- Consultancy from energy management support to bespoke training, coaching and e-learning
- Events
- Influence & Policymaking
- Shared Learnings & Networking
- Savings & Partnerships

### WHY JOIN THE ALUMINIUM FEDERATION

Whatever your company size or speciality within the industry, we help you access the technical expertise, market insight, business support and government influence you need to boost your competitiveness.

We offer different levels of membership based on your business size – so it's both affordable and valuable.

"As an ALFED member, you get your voice heard. We're a small metal finishing company, but I get my voice heard very loudly. When I was the ALFED President, this gave me influence at a high level with government – I was routinely on calls with ministers and civil servants. And I had my voice heard even before I was president. In 2004, the British standard changed to an EU-wide one that was much weaker. I campaigned to change it, and as an ALFED member, I had a say via the Finishing Group. I got my opinions over, and the standard is now changing. It was a real success for our business."

Giles Ashmead, Director, Powdertech

**CONTACT US  
TO DISCUSS HOW  
ALFED MEMBERSHIP  
CAN HELP YOUR  
BUSINESS**

**T: 0330 236 2800**

**[www.alfed.org.uk](http://www.alfed.org.uk)**

**ALFED**  
ALUMINIUM FEDERATION

**EVERYTHING WE DO FOCUSES ON HELPING UK ALUMINIUM BUSINESSES CAPITALISE ON OPPORTUNITIES**

# ALFED HOUSE OF LORDS LUNCH TAKES PLACE ON 21 JUNE



The ALFED Annual Parliamentary Lunch is being held on Tuesday 21 June 2022 in the Cholmondeley Room Terrace at the House of Lords.

The event is being hosted by Lord Rupert Redesdale.

The purpose of this very important event in ALFED's calendar is to raise and discuss issues relating to the UK's Aluminium Sector at the highest level within UK Government.

There will be three short presentations given during lunch. The speakers will be from political backgrounds and industry leaders discussing current and future affairs.

There will be opportunity after the presentations for a Question and Answer session.

Fee to cover catering costs: £99 + vat. Numbers are limited and the demand is usually very high, and therefore places are restricted to one place per ALFED member company.

Please note this event is open to ALFED members only.

**Reserve your place now:**  
<https://bit.ly/3wuqpK9>

## Job Opportunity AT THE ALUMINIUM FEDERATION

### TRADE & ECONOMIC POLICY MANAGER

The Aluminium Federation is recruiting for a Trade & Economic Policy Manager.

#### JOB PURPOSE:

- Assuming primary responsibility for the development and advocacy of the UK aluminium sector policy.
- To monitor, analyse, research, report and lead on all trade and policy issues relevant to the UK aluminium sector.
- To support the development and delivery of the ALFED policy portfolio including government affairs, sustainability, circular economy, decarbonisation, competitiveness, and trade.
- To support and to represent all aspects of ALFED's political communication, government affairs engagement and events.
- To research and draft reports, consultation responses and position papers on current issues in support of ALFED's policy development.

More information or to apply: <https://bit.ly/3lf64i1>

**ALFED**  
ALUMINIUM FEDERATION

## UNIVERSAL COLLABORATION RESEARCH

Universal Collaboration Research presents a collaborative research and development platform. UCR engages with commercial partners that support a development programme, with assistance from educational institutions and innovation hubs. UCR's objective is to maximise the positive impact to reduce emissions, to reduce the climate impact across industry.

[www.ceramicallloys.com](http://www.ceramicallloys.com) or  
[www.ucrgroup.co/](http://www.ucrgroup.co/)



## DEANE ROOFING & CLADDING

Deane Roofing & Cladding offers roofing, cladding and envelope solutions, supplied and installed, for all clients and design teams regardless of their building types or complexity. Their strength comes from their knowledge and experience of best building practice and their technical expertise of the roofing and cladding systems both proprietary and bespoke that are available in the market.

[www.deaneroofing.com/](http://www.deaneroofing.com/)



## EMPIRE RESOURCES (UK)

Empire Resources is a distributor of value-added, semi-finished aluminium and steel products. Their customers include metals service centres as well as metal-working businesses and industrial manufacturers – all of whom rely on Empire Resources for the timely delivery of high quality products that meet their individual requirements. Their 300+ customers serve a diverse range of end-markets including transportation, construction, packaging, consumer goods and marine.

[www.empireresources.com/](http://www.empireresources.com/)



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## HAIR COLLECTIVE

Hair Collective is an importer of aluminium foils, which provide the ultimate control over colour application. Foil is mainly used when applying permanent oxidative colours on to hair.

Hair Collective is a premium collection of professional salon products, born from a collective desire to be more conscious about how they consume and source the products they work with. They stand first and foremost for sustainability. Their products use natural, recycled and compostable materials wherever possible.

[www.haircollective.co.uk/about/](http://www.haircollective.co.uk/about/)



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## WHY JOIN THE ALUMINIUM FEDERATION

Whatever your company size or speciality within the industry, we help you access the technical expertise, market insight, business support and government influence you need to boost your competitiveness.

We offer different levels of membership based on your business size – so it's both affordable and valuable.

Contact us to discuss how ALFED membership can help your business.

**T: 0330 236 2800**

**E: [info@alfed.org.uk](mailto:info@alfed.org.uk)**



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## METALOGIC

Metalogic is one of the world's leading suppliers of integrated IT Systems to the metals stockholding, service centre and processing industries.

Metalogic offers their customers multi branch, multi-product and multi process functionality and these are installed at every type of metals manufacturing and distribution business. The products are highly scalable and can be efficiently and cost effectively implemented and supported in businesses ranging from 5 to over 700+ users.

To complement their global market they handle all currencies, tax requirements and localisation on accounts by their partnership with Sage one of the world's leading accounts packages

[www.metalogicltd.com/](http://www.metalogicltd.com/)



## METSOURCE

Metsource focus and specialise in supplying high quality Primary and Secondary Aluminium Ingots. They also supply a portfolio of other Non-ferrous Ingot grades alongside Deox Ingot, Pebbles and Master Alloys. They are uniquely placed to supply your exact material requirements at market leading levels. Their philosophy is to secure and work long term with their customers and suppliers as a valued reliable partner.

Based in the UK they source and supply all grades of non-ferrous material around the globe. They are the perfect partner for sourcing and locating your exact requirements and finding a long term solution for strategic raw material supply. They specialise in Aluminium sources including 5000 series, 6000 series, 7000 series and factory feeds direct alongside aluminium ingot.

[www.metsource.co.uk/](http://www.metsource.co.uk/)



## CARLISLE FLUID TECHNOLOGIES UK

Carlisle Fluid Technologies UK is a global company which manufactures equipment for the supply and application of paints, coatings and sprayed materials. Incorporating the world leading brands of DeVilbiss, Ransburg MS, BGK and Binks, they supply high-tech market leading equipment for all major industry sectors.

[www.carlisleft.eu/en/home/industrial](http://www.carlisleft.eu/en/home/industrial)



## SURFACE FINISHING ENGINEERING

Surface Finishing Engineering have evolved into a world leader of surface treatment plant and equipment. They have developed close relationships with world leading organisations, manufacturers and repair shops. They believe that it's because of these relationships and their ability to undertake complex projects time after time that will provide longevity and future success for SFE for many years to come.

[www.sfeuk.com/](http://www.sfeuk.com/)



## THERMSERVE

Thermserve has a worldwide reputation as a dynamic, service-orientated company offering engineering solutions to the aluminium, steel and other metals industries.

Based in Telford, UK, Thermserve provides innovative solutions to both the cast-house and extrusion sectors.

All of Thermserve's products are engineered and manufactured in-house, ensuring total control of the entire process from sale to commissioning.

[www.thermserve.com/](http://www.thermserve.com/)



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**As a hands-on local UK supplier, Coidan Graphite are ready to help the aluminium sector bounce back.**

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**27th**  
**CRU World Aluminium Conference 2022**  
 18-19 May 2022 • London, UK

**Topics to be discussed include:**

- Threats and opportunities in global aluminium markets
- Trade and geo-political risks
- Recycling and Sustainability
- Global economic outlook
- The role of finance in decarbonization
- Carbon price and market outlook
- Prices and premiums outlook
- Bauxite and alumina

**35+** Countries  
**168** Companies  
**337** Delegates  
**Great** networking opportunities

**Secure your place to attend in-person (for the first time since 2019!) or virtually at:**  
[www.worldaluminiumconference.com](http://www.worldaluminiumconference.com)

## PROSTATE CANCER CHECKS NOW AVAILABLE TO ALFED MEMBERS

Prostate cancer is the most common form of cancer found in men in the UK, with over 47,500 men diagnosed each year. Most men (78%) who are diagnosed will survive their prostate cancer for ten years or longer.

GFCT is a testing charity offering clinics to ALFED members across the country to help reduce the number of cases of prostate cancer in the UK.

Their PSA test is a simple blood test, the results are analysed by the UK's leading independent laboratory, and the results reviewed by at least one leading Consultant Urologist. The results are available within 24/48 hours.

All men receive advice on recommended retesting intervals with their results and annual automated reminders.

GFCT has helped in the diagnosis of over 2,200 prostate cancers, including men as young as 40!

Please note self-testing kits are also available.

For further information contact Kathy Rombach at ALFED on 07899 924315 or email [krombach@alfed.org.uk](mailto:krombach@alfed.org.uk).



## TRIBOLOGY RESEARCH HUB



The Advanced Forming Research Centre (AFRC) is aiming to build a network of industrial partners to establish a Tribology Research Hub. The AFRC have undertaken several research projects to tackle the industry demands and challenges. Some of their success stories have increased tool life by +200% and saved £millions p.a. for industry.

Tribology is the study of friction, wear & lubrication to:

- Extend tool life
- Improve surface finish
- Improve part geometry
- Reduce energy requirements

The aim of the research hub will be to increase productivity through process specific understanding of lubricant and surface engineering performance.

For further information please contact:

- Christopher Fleming, Tribology Theme Lead: [christopher.fleming@strath.ac.uk](mailto:christopher.fleming@strath.ac.uk)
- Stephanie Craig, Forming Team Business Development Executive: [stephanie.craig.100@strath.ac.uk](mailto:stephanie.craig.100@strath.ac.uk)

# WORLD OF ALUMINIUM

This live, tutor-led interactive course will be delivered over two consecutive mornings via our online platform.

**11 & 12 APRIL**  
**9.30-13:00**  
**(2x mornings)**

## WHO SHOULD ATTEND:

The World of Aluminium is an intermediate level technical course specifically designed for production engineers, process and quality technicians, stockholders, customer facing sales/marketing persons and material/product purchasing individuals. This course is aimed at individuals who require a solid basic understanding to confidently engage with the aluminium industry and its products.

## COURSE CONTENT:

The course creates a solid basic understanding of aluminium, aluminium metallurgy, heat treatment and metal forming processes. It assumes no prior knowledge of metallurgy and is specifically tailored to the industry sector.

Technical elements are balanced with insights into the history of aluminium, its growth as the strategic metal of society, its sustainability properties and illustration of products, to create a holistic broad rounded knowledge.

## COST:

- ALFED members: £199+vat per person
- Non members: £299+vat per person

**For more information  
or to book a place please visit:  
<https://bit.ly/3BebLKH>**



Architectural and Metal Systems is expanding its services with a new anodising plant opening soon. The plant will have state-of-the-art facilities which will complement our existing powder coating facilities.

The introduction of the new anodising plant will expand the range of services and finishes that AMS has to offer and make us a one stop shop for aluminium products.

Contact [info@ams.ie](mailto:info@ams.ie) for more information or call us on +353 (0)21 4705 100

**SOLD OUT**

ALFED ANNUAL DINNER AND BUSINESS BRIEFING 2022

# ALFED 60<sup>TH</sup>

ALUMINIUM FEDERATION ANNIVERSARY

## JOIN US TO CELEBRATE THE ALUMINIUM FEDERATION DIAMOND ANNIVERSARY AT THE ALFED ANNUAL DINNER AND BUSINESS BRIEFING ON 10TH NOVEMBER 2022.

This annual event is a great opportunity to catch up with industry colleagues and friends. Last year's dinner was sold out; attended by over 250 aluminium industry professionals offering an excellent networking opportunity.

### Guest speaker: Kate Humble

Kate grew up next door to a farm in Berkshire where she acquired a love for nature. She has worked on a wide variety of TV programmes. In 1997 she joined the BBC, working first on the long running series 'Animal Hospital' and then joining the 'Holiday Programme', where she was asked to present her first report. She continued working both behind and in front of the camera until in 1999 she completed a lifelong dream and travelled through the Sahara Desert on foot and camel with salt traders. On her return, she continued presenting programmes for the BBC including 'The Essential Guide to Rocks', 'Tomorrow's World', 'Animal Park' and 'Rough Science'. Publishing countless nature and lifestyle books, Kate has established a popular following through her work in the wild over the years.



**Venue:** The dinner will be held at the at the superb De Vere Tortworth Court. Situated just north of Bristol and easily accessible from the motorway, Tortworth Court is a historic hotel in stunning surroundings – a place where a centuries-old story meets an exceptionally modern experience.

**Business Briefing:** A programme of industry speakers offering new insights on transformation, innovation and strategy in our current climate.

### Timings:

- 11.00** Arrival & Networking, Business Briefing & Lunch
- 18.30** Welcome Reception
- 19:00** Dinner

**Dress code:** Black tie

**Sponsorship opportunities:** This event provides a variety of sponsorship opportunities for you to raise your company's profile within the aluminium industry. Sponsorship packages range from £750 to £12,000 to suit your budget: ALFED Dinner and Business Briefing Sponsorship Opportunities – contact Kirsu Lintula at ALFED for any sponsorship enquiries: [klintula@alfed.org.uk](mailto:klintula@alfed.org.uk)

### Tickets:

- Business Briefing: Free to attend, this event is open to ALFED members and those who are also attending the dinner in the evening: Reserve your place: <https://bit.ly/37ytdOZ>
- Dinner and B&B (single occupancy): £375+vat per person: Reserve your place: <https://bit.ly/317JneU>

Please note: if you would like to reserve a double occupancy room (ie two persons) and two dinner tickets the total cost is £550+vat, this can be booked direct with the ALFED, please email [events@alfed.org.uk](mailto:events@alfed.org.uk).

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ALFED ANNUAL DINNER AND BUSINESS BRIEFING 2022



# SIXTY YEARS OF THE ALUMINIUM FEDERATION, 1962 – 2022

By Andrew Perchard, Niall MacKenzie and Duncan Connors

2022 sees the Aluminium Federation celebrate its diamond anniversary. On 14 May 1962, 18 aluminium companies and trade associations formed the Aluminium Federation (see the original Articles of Association image) out of two longstanding industry bodies, the Aluminium Development Association (ADA) and the Aluminium Industry Council (AIC), with the functions of those organizations absorbed under the aegis of the Federation from 1 February 1963. 2021-22 has been auspicious year for the aluminium industry's associations marked respectively by the 40th and 50th anniversaries of the European Aluminium and the International Aluminium Institute, alongside ALFED's celebrations.

The global industry has had a long history of alliances and collaborative experiments through a series of cartels up until WWII, which encouraged innovative partnerships and cooperation amongst the industry leaders on marketing, research and development, and transportation. This was followed after 1945 by a variety of European initiatives, including the Centre international pour le développement de l'aluminium (1950), the European Wrought Aluminium Association (1953), and the Organization of European Aluminium Smelters for the Secondary producers (1960).

By 1962, the UK aluminium industry was just over a century old; the first aluminium having been produced using the Deville process by C H Gerhardt in Battersea, London, and Bells Brothers in Washington, Newcastle upon Tyne, in 1859. The crucible of the modern British aluminium industry, however, was established on the banks of Loch Ness where the British Aluminium Company (BACo) had established its first smelter at Foyers in 1895.

From modest beginnings, through two world wars and the expansion of civilian uses of aluminium in its different forms after 1945, on the eve of the Federation's birth, the mature British aluminium industry had cause for confidence and excitement, not least given the explosion in consumer spending by the early 1960s. This had prompted Prime Minister Harold Macmillan to declare three years before, in a speech that has become synonymous with Britain's post-war boom: "most of our people have never had it so good. Go around the country, go to the industrial towns, go to the farms and you will see a state of prosperity." For the Industry, that optimism seemed born out in sectors such as transport, UK aluminium's largest single market (accounting for almost one third of consumption of the metal), with the growth of national airlines and passenger and transport planes, new rolling stock for the railways, the advent of shipping containerization (in 1956) and household car ownership (which almost quadrupled between 1950 and 1960). However, as for the industry at other times, there were anxieties and challenges. In the Winter of 1958-1959, relative US newcomer, the Reynolds Metals Company (which had only been formed chiefly as a foils producer in 1928 and expanded

massively as a vertically integrated domestic and global producer during and immediately after WWII) and the Birmingham-based Tube Investments Group launched a successful hostile takeover of the largest and oldest UK aluminium producer, BACo, shocking the global aluminium industry and splitting the UK

Cabinet and the City of London. UK aluminium producers faced increased market competition while British goods exports had fallen significantly. The UK

was shouldering a sizeable national debt significantly increased by loans from both WWI and WWII while its global political influence waned. In December 1962, US Secretary of State Dean Acheson declared at the US Military Academy at West Point: "Great Britain has lost an empire and not yet found a role." In 1957, with the signing of the Treaty of Rome, a European Economic Community was formed. Against this context at a meeting of the ADA, just before the formation of the Federation in 1962, leading Industry figures voiced their concerns about how the nascent EEC would affect the market for exports and whether they would be faced by significant export duties.

The Federation thus emerged in an atmosphere both of optimism and uncertainty but in the time-honoured fashion of the industry understanding the importance of cooperation. At first, following its predecessors, it focused on technical innovations and identifying new markets. In those early years, ALFED was led by Presidents Edward Player CBE (managing director of Birmid Industries Ltd) and Dr Stan Clotworthy CBE (managing director of Alcan Industries Ltd) and General Secretary H R Murray-Shaw, previously of the AIC, and for a very brief period General Sir (later Lord) Geoffrey Bourne, former commander in chief of British forces in the Middle East and then Director-General of the British Army.

As former ALFED Chief Executive Will Savage observed for Light Metal Age in 2015 and Aluminium News outlined in the December 2019 issue, the UK aluminium industry has undergone a dramatic change in its characteristics since those early days, moving from one dominated by then large global players, such as Alcan, BACo, and Alcoa (of these, 60 years later, only Alcoa survives) to one overwhelmingly led by SMEs. It is an industry



today, as the recent ALFED/ Fraser of Allander Institute report highlighted, that contributes £2.97bn in GVA and 37,000 jobs to the UK economy.

In this auspicious year, we are excited to be working with ALFED and the UK Industry, to produce a diamond anniversary history of the Federation. The ALFED Our History, Our Heritage project will culminate with an exhibition and commemorative booklet at the ALFED annual business briefing and dinner on 10th November, accompanied by a dedicated part of the website devoted to the Federation's history. The project team is led by Professor Andrew Perchard, Edinburgh Napier University, historian of the global aluminium industry, and author of *Aluminiumville: Government, Global Business and the Scottish Highlands* (2012). He will be joined by Professor Niall MacKenzie, University of Glasgow, who has also written on the aluminium industry, as well as the paper and Scotch whisky industries, and by Dr Duncan Connors, University of Otago, who is a historian of British shipbuilding, sustainability, and money. They will be working in close collaboration with the ALFED team. As is so often the case, the first drafts of histories are not written by historians. This is a timely place to thank former ALFED general secretary, Dr David Harris, for his brief overview of the Federation's history produced on its golden anniversary.

Speaking of the collaboration on behalf of the project, Professor Perchard said: "We are delighted to be working with ALFED on this exciting project to celebrate the Federation's diamond anniversary. As so many organisations are recognising, such heritage projects are important both as a celebration of their histories and for collecting that collective memory as a future asset for planning for the future."

An important element of the project is collecting memories and artefacts from members. We would welcome any memories, documents (correspondence, company magazines), as well as photographs, that you would be willing to share. To share these, please email [alfed@alfed.org.uk](mailto:alfed@alfed.org.uk) in the first instance.

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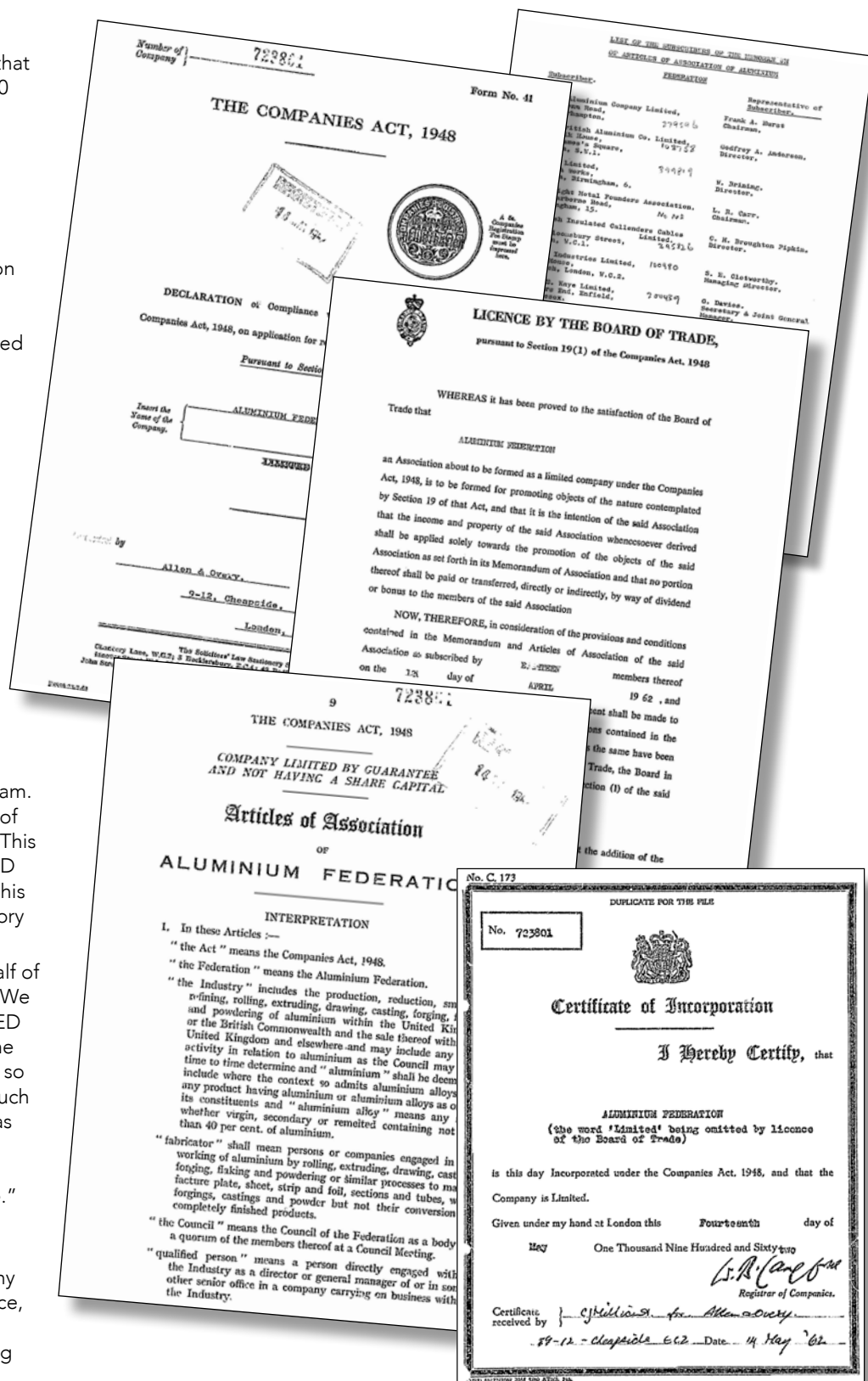
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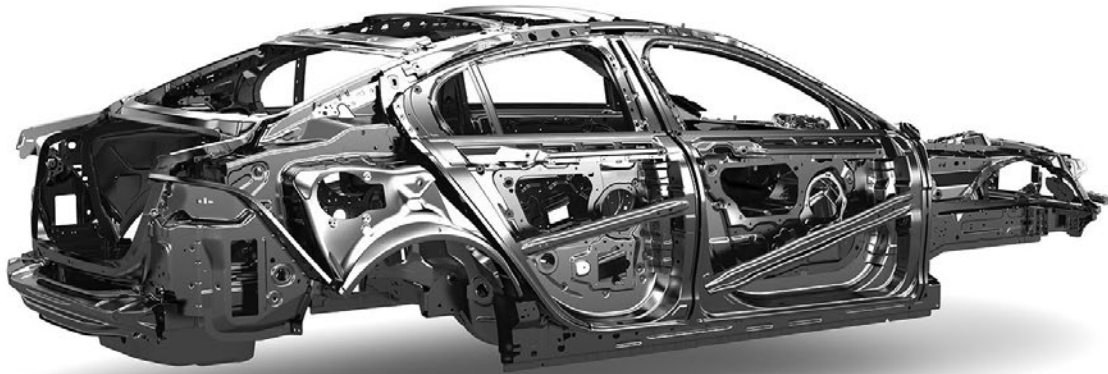


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## TOOL AND DIE COATINGS TO HELP MITIGATE CHALLENGES OF FORMING AHS ALUMINIUM ALLOYS

By Eur Ing John Yarnall CEng, MISE, FIMMM  
Surface Engineering Consultant

Diamond-like carbon coatings (DLC's) pair up well with CrN to provide optimum results when forming aluminium and its family of alloys. Several new coatings to help alleviate complications of forming high-strength aluminium, such as sticking, abrasion and adhesive wear. It is now well accepted that Physical vapour deposition (PVD, chemical vapour deposition (CVD) and thermal diffusion of vanadium carbide (VC) or boron nitride (BN) have a long history of successfully increasing tool life and productivity in stamping and forming applications. Whether on dies forming hot or rolled steel; early grades of high-strength, low alloys (HSLA) steel; or stainless steels, at least one of these coating technologies could be depended upon to deliver the desired performance.

However, material trends and new design concepts in the automotive industry aimed at reducing vehicle weight, and improving safety are not only challenging the acceptance of many coatings for developing applications, they are opening the door to innovative approaches in both the field of PVD and 'smart tooling and lubrication' (STL) to push tool productivity to new levels. As a further driver, the next generation of HSLA steel, advanced high strength steel (AHSS), and the growing number of high strength aluminium grades now place even higher demand by automotive and aerospace OEM's on tools and protective anti-wear coatings. Like HSLA and AHSS, aluminium alloys represent another way for automotive OEM's to reduce vehicle weight for improved fuel economy while maintaining strength and safety of automotive structures. Moreover, direct environmental considerations in compliance with end-of vehicle regulations necessitate durability and recyclability towards a circular economy concept. Future COP 26 regulations will soon be drawn up to include further energy reductions by manufacturing supply chains where aluminium forming and its tools will play a crucial role in energy reduction.

### Challenges of aluminium forming-tool wear and sticking:

**Sticking:** There are two primary challenges with forming aluminium alloys. The first is sticking of the aluminium to the surface of the tool. Sticking of aluminium looks similar to galling of steel, but the mechanism that creates the sticking is different. When steel material picks up on or galls the surface of a tool, it is the result of dynamic friction between the two surfaces. The level of galling can be managed by minimizing the amount of dynamic friction present. Hard low friction thin film coatings provide a solution in combination with process lubrication to meet this challenge. The appropriate PVD/CVD layer chemistry and layer

morphology must be selected to achieve effective barrier between the tool and forming alloy surfaces. 'Smart tools' with surface engineered design to take account of real-time forming conditions can best meet this challenge. More about this later in this article.

Aluminium alloys have a high tendency to stick to the surface of tooling when it is being formed because of localized melting of the material caused by the heat generated during plastic deformation. To prevent the aluminium from sticking, an effective boundary lubricant that stays in place when the die/tool closes and pressure is exerted must be present. Alternatively, a tool coating that exhibits excellent static friction properties must be applied.

Traditional ceramic coatings like titanium nitride (TiN), titanium carbonitride (TiCN), titanium aluminium nitride (TiAlN), and chromium nitride (CrN) do not provide enough static friction resistance, so their use without an effective boundary lubricant will result in substantial aluminium sticking.

**Abrasion.** In addition to sticking, aluminium alloys -particularly so-called military-grade materials-bring challenges with abrasion. Abrasion likely results from two sources: the presence of aluminium oxide on the surface, and the silicon contained in the alloy to strengthen it. Silicon's abrasiveness is of particular concern in tool functions that are working through the cross section of the material.

With high volume industrial forming industry it has been found that further steps are necessary to address the sticking problem by using effective boundary lubrication on tool and die draw stations. In secondary stations such as trimming and piercing and supplemental forming operations such as tube forming, this boundary lubricant is no longer present; that is where the sticking and abrasion problems are the most prevalent. This is where low friction tool coating play a major role in preventing metal-to-metal

contact. See Fig 1 which shows some aluminium build-up (metal transfer from forming metal to tool surface together with abrasive surface wear through the coating).

Figures 1 & 1a



1. Punch working surfaces showing signs of land wear and metal aluminium pick-up Results of WC-C + DLC coating piercing 6000 series aluminium exhibited abrasion in the locations with the highest forming pressure.

2. 1a DLC as coated punches

## Carbon Coatings:

For aluminium applications in which sticking and abrasion occur, "diamond-like" carbon (DLC) coatings have been developed to provide protection that traditional ceramic PVD coatings cannot. DLC is the name given to a family of coatings produced either by PVD or plasma-assisted chemical vapour deposition (PACVD) processes that can exhibit a range of properties.

At the low end of the hardness scale (1,000 Vickers hardness (Hv) are coatings that contain large amounts of hydrogen and are more polymeric in nature. Conversely, at the upper end are coatings that contain no hydrogen and are more diamond-like. These coatings exhibit much higher hardness levels (greater than 6,000 HV).

However, these very hard coatings often lack the ductility required for forming tool applications.

The value of DLC coatings lies in their low coefficient of friction and their anti-sticking properties.

The most commonly used DLC coatings are multi-layered.

Some of them have a hydrogen-containing carbon coating on top of an initial layer. That base layer may comprise a pure metal, like chromium; a non-metal, like silicon; or carbide, such as tungsten or silicon carbide.

Multi-layered DLC coatings tend to fall in the middle of the hardness range (2,500 to 3,500 HV).

## Case histories illustration using

**combination layer system:** The initial application experimentation of DLC coatings in forming tool applications with these military-grade aluminium alloys centred on a multilayer product consisting of a tungsten carbide/carbon (WC-C) base layer with a hydrogenated carbon layer on top. Despite hardness levels of 2,400 HV and a coefficient of friction around 0.1 however, this coating failed to show the desired results in field trials where the boundary lubrication was either ineffective or non-existent. So under high volume high forming forces need additional substrate layer support as with Figure 2 depicts the results of a common multilayer DLC coating (a-C:H:W + a-C:H) that was deposited on a piercing punch used in 6000 series aluminium. The coating failed after a few thousand parts because of abrasive wear from the aluminium alloy in the locations with the highest forming pressure. Based upon results such as this, a change was designed in to the tool coating system to produce the required results. A change was made to the DLC layer design to improve performance. The WC-C under layer was replaced with CrN. Subsequent forming trials confirmed that to replace the WC-C under layer with CrN for aluminium applications and was based upon the long, successful track record that CrN + DLC (CrN + a-C:H) coatings have on tools forming automotive components like piston pins. The excellent performance that this combination exhibited, and confirmed in impact fatigue sliding tests, being factored into this decision because it demonstrated the coating's toughness under high impact and shear forces.

Like in the impact fatigue sliding tests, CrN provides a much better mechanical support under layer for the DLC coating under the forming pressures in actual applications than WC-C. Figure 2 depicts the comparison of the CrN + DLC coating with the WC-C + DLC coating in the same tube bending application. In this case, the coating can withstand the forming pressure and abrasive wear to produce the desired results. The trimming of 6000 series aluminium was an application in which a concentrated effort was made to evaluate the CrN + DLC coating because generally no lubrication was used. In one application, an uncoated tool began showing aluminium sticking just behind the cutting edges after 1,000 parts, which caused unacceptable score marks and burrs on the parts.

Figure 2



The CrN + DLC coating withstands forming pressures and abrasion better than the WC-C + DLC coating

Another application evaluated was piercing. The value of the CrN + DLC coating is that it can resist the aluminium build up that occurs during the punch extraction. Figure 3 shows the comparison of PVD TiN and CrN + DLC on two different punches run in the same die after 35,000 strokes. The TiN-coated punch exhibits aluminium sticking to the surface, while the CrN + DLC-coated punch shows none. Similar observations have been made when CrN + DLC was compared to PVD TiCN, another commonly used coating on pierce punches.

Figure 3

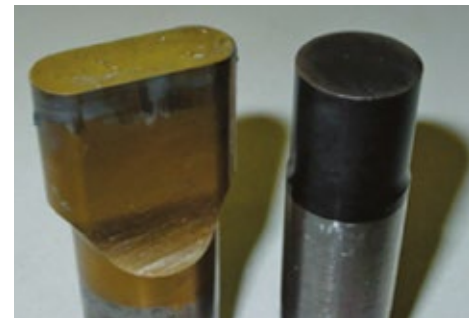


Figure 3 details how the combination of CrN + DLC outperformed PVD CrN coating in an aluminium forming application in its ability to resist the sticking and abrasion of the aluminium alloy.

Sheet metal forming dies exhibit a similar pattern of tooling performance and can be PVD/CVD coated using similar CrN+ DLC combinations, however, the forming dies size and weight can be a limitation on the capacity of PVD/CVD coating machines to handle. Multi-die section design can overcome this practical limitation of coating equipment by using multi-section segmented dies. This approach helps to provide 'smart tool' coated surfaces with reduced costs by coating only the parts of the overall tool surfaces that see most of the high stress metal forming contact zones. Simulation methods can help predict to size and surface stress conditions of tooling metal forming zones.

*Continued on page 18.....>*

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**New Generation tool coatings:** The following table provides an additional list of PVD/CVD tool coatings which are now commercially available for forming high strength aluminium alloys:

| Coating/<br>treatment | Thickness/depth<br>micrometres | Max Service<br>Temp.Deg. C | Hardness<br>VPN | Coating Tech      | Application          | Rating-<br>Forming Alloy        |
|-----------------------|--------------------------------|----------------------------|-----------------|-------------------|----------------------|---------------------------------|
| TiCN PVD              | 2-4                            | 300                        | 2,800           | PVD Arc           | Forming dies/punches | High hardness<br>ferrous alloys |
| TiN                   | 2-4                            | 450                        | 2,800           | PVD Arc           | Forming tools        | Medium duty                     |
| AlTiCrN               | 3-8                            | 850                        | 3,200           | PVDArc/HIPIMS     | Forming Tools        | Non-ferr. alloys                |
| AlCrN                 | 2-4                            | 1050                       | 3,000           | PVDArc HIPIMS     | Forming Tools        | Various Alloys ψ                |
| CrN                   | 4-6                            | 700                        | 2,300           | PVDArc HIPIMS     | Dies/punches         | Various Alloys ψ                |
| a-C:H:W (DLC)         | 4-6                            | 300                        | 2000+           | PVDubm PACVD      | Dies/Tools           | Non-ferr. alloys                |
| TiC                   | 6-10                           | 400                        | 3,200           | CVD. 1000 Deg.C   | Dies/tools           | Open tolerance φ                |
| TiN-TiC-TiN           | 6-10                           | 500                        | 2,500           | CVD. 1000 Deg.C   | Dies/Tools           | Open Tolerance φ                |
| TiC+MoS <sub>2</sub>  | 8-10                           | 500                        | 3,200+2000      | CVD low friction  | Dies/Tools           | Open Tolerance φ                |
| Boron Nitride         | 10-25                          | 500                        | 3,000           | PCVD              | Dies/Tools           | Open Tolerance φ                |
| Plasma Nitriding      | Case depth<br>~0.2mm           | 350                        | 1,200           | Ion Plasma        | Dies/Tools           | Hardened Tools #                |
| Duplex PVD+PN         | Various                        | 350                        | 1,200+2,500     | PVD + Ion nitride | Dies/Tools           | Hardened S.Tools #              |

## IR BOOSTER BEFORE GAS CATALYTIC OVEN ALLOWS INCREASE IN POWDER-COATING LINE SPEED

By installing an infra-red booster in the vestibule of an existing gas catalytic oven, Smart Architectural Aluminium of Yatton, near Bristol, have been able to increase the conveyor speed of their powder coating line by 20% and improve the quality of their high value aluminium extrusions.

Smart is the UK's largest producer and supplier of architectural aluminium extrusions, ranging from windows, entrance doors, sliding and slide folding doors to curtain walling, ground floor treatment and conservatory roofing systems. The company's success is very much based on its investment in innovative design and manufacture and its total commitment to quality. It makes use of the latest CAD technology and all of its products are finished to the highest standards.

At its Yatton factory, aluminium extrusions are powder coated in one of three powder-coating lines, two vertical and one horizontal. Here, the products are first powder coated and then conveyed through infra-red gas catalytic (GC) ovens to gel the powder, before passing through convection ovens for final curing. The gas catalytic panels for the horizontal line were fitted some ten years ago and had recently become less efficient because of contamination by free powder migrating from the oven vestibule. This was also causing quality concerns so Smart contacted Heraeus to arrange for new panels to be fitted.

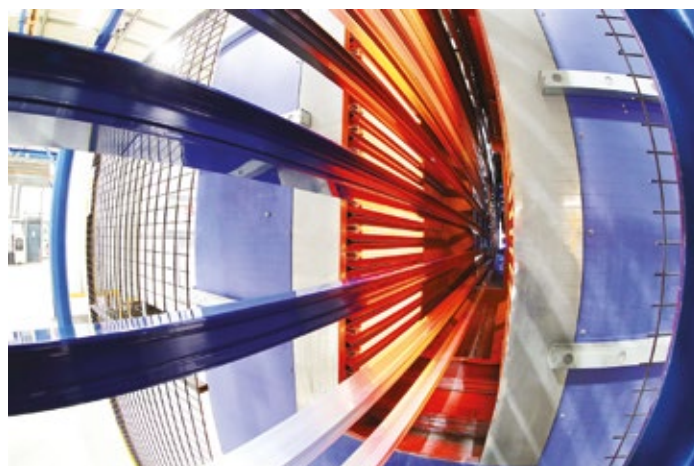
However, Heraeus suggested that, to increase the longevity of the new panels, an infra-red (IR) booster system could be fitted in the vestibule. This would heat the applied powder to a gel state, eliminating any powder contamination of the panels in the gas catalytic oven, where a complete gelling would be achieved before the coated parts passed to the convection oven for final cure.

Consequently, 48 2.2kW medium wave emitters, individually mounted in stainless steel reflectors within an aluminium

framework were easily secured to the existing steelwork within the gas catalytic oven vestibule.

Since installation, the system has been eminently successful. As Michael Coles, the production manager at Smart, comments, "The IR booster, which was retrofitted easily in existing space in the vestibule, has provided us with a simple but elegant solution to a possible contamination problem, increasing panel working life and improving product quality."

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# HYDROGEN FOR THE ENERGY TRANSITION

For more information, please contact Dr Martin Lawrence, CEng, MIMechE, Combustion Development Specialist at Air Products PLC.  
Mobile: +44 (0) 7887624893. Email: lawrenm1@airproducts.com. Or visit: <https://www.airproducts.com/applications/melting-non-ferrous>

Climate change is being accelerated by greenhouse gas emissions. The UK is looking to become leaders in the Energy Transition from fossil fuels to using sustainable energy sources. Following the Climate Change Act, published in 2008 and a series of Carbon Budgets, the UK government are setting into law the world's most ambitious climate change target to map out how to cut emissions to net-zero by 2050. There are a number of potential routes towards net-zero carbon emissions, including electrification, biofuels, gasification, carbon capture, and hydrogen.

Some industrial processes are suitable for electrification, whereby fossil fuel powered furnaces and boilers can be replaced with equipment powered by green electricity. However, hard-to-abate industries and processes may have to switch to low carbon fuels, such as hydrogen. Carbon capture may be an alternative solution to fuel switching if the carbon dioxide ( $\text{CO}_2$ ) can be stored or used effectively and economically. Hydrogen has been identified as one of the leading candidates for low carbon fuel switching to enable the transition towards net-zero carbon emissions in transport and heavy industry. This is due to its properties and its potential to become a clean alternative to fossil fuels, such as natural gas, oil, and coal. A transition from fossil fuels to low carbon hydrogen is likely to become the best route to net-zero for the aluminium industry, where electrification and carbon capture may not be possible or economical.

## Hydrogen production

Hydrogen is the most abundant element in the universe, and it is used for a number of industrial processes, including petroleum refining, fertiliser production, and metal treatment. However, on Earth, it only occurs naturally as part of compounds, such as water and organic molecules. Therefore, in order to produce pure hydrogen, the hydrogen must be extracted from these compounds and this needs to be done in an efficient and environmentally friendly way for the hydrogen to be considered low carbon. Most industrial hydrogen is considered grey hydrogen as it is produced from the steam reformation of methane and its production has similar  $\text{CO}_2$  emissions to the combustion of coal.

Zero and low-carbon hydrogen can be produced from electrolysis using renewable energy (green hydrogen) or by applying carbon capture to steam methane reforming plants to reduce the amount of  $\text{CO}_2$  emitted into the atmosphere (blue hydrogen). There are a number of certification and "guarantee of origin" schemes for low-carbon and/or renewable hydrogen. These include or

derive from CertifHy, TÜV SÜD, and the Renewable Transport Fuel Obligation and define varying thresholds for hydrogen to be considered low carbon and/or renewable. Carbon intensity thresholds are generally calculated as a percentage of  $\text{CO}_2$  emissions saving based on a fossil fuel equivalent benchmark, type and age of the hydrogen production facility, and use of hydrogen. The threshold is typically between 33 - 38  $\text{gCO}_2\text{e/MJ}_{\text{LHV}}$  of hydrogen produced by steam reformation of methane (blue hydrogen) and can be below 30  $\text{gCO}_2\text{e/MJ}_{\text{LHV}}$  for electrolysis (green hydrogen). It is expected that the thresholds will become more stringent as we approach key net-zero milestones. Figure 1 shows a comparison of different types of hydrogen, with respect to  $\text{CO}_2$  emissions and shows examples of best available technology (BAT) benchmarks, with low carbon thresholds from CertifHy and RTFC UK.

## Hydrogen supply chain

Hydrogen is an industrial gas that has been supplied to industries around the world for many years and as such there are several solutions when considering the supply of hydrogen. Air Products offers liquid hydrogen and compressed hydrogen gas in a variety of purities and various modes of supply around the world, with an extensive network of pipelines, hydrogen manufacturing plants and transfill facilities. Hydrogen can be generated at a large plant and supplied via pipeline locally to the end use point. Large plants can be designed to include a liquefier, which can produce liquid hydrogen for remote supply. This can be decanted into transportable tankers and delivered by truck or train and then used to fill cryogenic storage tanks, located on the site of the end user. It is also possible to provide high pressure gaseous hydrogen via tube trailer to a remote location in a similar manner. Figure 2 (overleaf) shows a photograph of a liquid hydrogen tanker for hydrogen deliveries. Gaseous or liquid bulk deliveries are great for supplying processes that are

not local to a large plant and can be suitable for varied hydrogen usage. Hydrogen can also be transported and stored safely as ammonia, which can be liquified under milder conditions and therefore it can be stored in inexpensive pressure vessels, rather than cryogenic containers. Furthermore, liquid ammonia contains about 1.7 times more hydrogen by weight than liquid hydrogen; liquid hydrogen contains 71  $\text{kg-H}_2/\text{m}^3$  and liquid ammonia contains 120  $\text{kg-H}_2/\text{m}^3$ . On-site generation is another option for remote processes that require a consistent supply of hydrogen, whereby

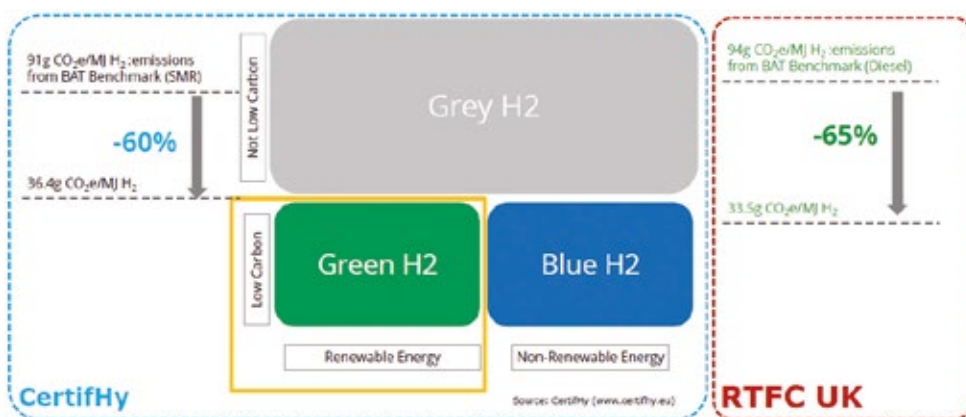


Figure 1. Different types of hydrogen and  $\text{CO}_2$  emissions thresholds from CertifHy and RTFC UK.

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Figure 2. Air Products liquid hydrogen tanker for hydrogen bulk deliveries.

a relatively small hydrogen plant can be installed on the site of the end user to produce hydrogen to be directly used in the process. The hydrogen generator can be either an electrolyser or a small methane reformer that can be designed to output the amount of hydrogen required for the process. On-site generators are better suited for continuous processes that require a steady amount of hydrogen during operation. For an on-site generator to be certified as low carbon hydrogen, the end user would be required to purchase either renewable energy or natural gas. End users in the aluminium industry that are not located in the vicinity of a large plant could consider bulk deliveries or on-site generation, depending on their particular circumstances.

## Creating a low-carbon hydrogen infrastructure

The scale of change required for switching from fossil fuels to low carbon alternatives is of the same order of magnitude as that of previous industrial revolutions. It follows that a hydrogen economy will drive innovation and ideals, leading to new legislation and working practices. The creation of a hydrogen infrastructure will allow the market to begin to form and grow. There are a number of potential hydrogen clusters currently in consideration for the UK, including HyNet and Humber Zero, which would produce low carbon hydrogen to be introduced into the UK natural gas grid for those areas. These projects will introduce low carbon hydrogen into the market. The supply of

renewable and low-carbon hydrogen at large scale is at an early stage of development; production and distribution – by pipeline and road - will require substantial investment by the private sector and take a number of years, with substantial support from the UK government. It is likely that UK hydrogen production will be complemented by imports from parts of the world well-served with renewable energy resources.

## Hydrogen for mobility

Air Products provides hydrogen fuelling solutions for a variety of markets and has more than 60 years' experience in hydrogen production, handling, and distribution. Air Products deployed their first hydrogen fuelling station in 1993 and have developed an extensive patent portfolio related to hydrogen supply and dispensing technology based on performing millions of safe fills. Significant advances have been, and continue to be, made in the use of hydrogen, both as a transportation fuel and a fuel for power generation. With more than 60 years of hydrogen experience, Air Products is at the forefront of hydrogen energy technology development. With a multi-billion dollar investment, Air Products have partnered with NEOM and ACWA Power to build the world's largest green hydrogen plant in Saudi Arabia, which will be on stream in a few years' time. The joint venture project will produce 650 tons per day of hydrogen from wind and solar energy, which will be transported in the form of 1.2 million tons per year of renewable ammonia. The renewable hydrogen will be used to power buses and trucks around the world, eliminating 3 million tons per year of CO<sub>2</sub> emissions, equivalent to the emissions from over 700,000 cars.

## Hydrogen for combustion

Hydrogen is being considered as a replacement for today's fossil fuels because it is abundant, efficient, and unlike other alternatives, it offers the potential to be renewable and it produces no CO<sub>2</sub> emissions when combusted. It can be utilised as the energy carrier for generating electrical power with hydrogen fuel cells and for hydrogen combustion.

Continued on page 21.....>



Figure 3. Air Products' long standing blue hydrogen facility in Port Arthur, Texas.

<..... Continued from page 20

A wide range of industrial applications currently use natural gas and can be considered for switching to using hydrogen to achieve their net-zero carbon emissions targets. The calorific value of hydrogen is about 12.7 MJ/m<sup>3</sup> and the average calorific value of natural gas in the UK is about 39 MJ/m<sup>3</sup>, which means that approximately three times the volumetric flow rate of hydrogen is required to produce the same energy as natural gas. This is important when considering retrofit applications to switch from natural gas to hydrogen, as the burners and pipework must be sized appropriately to allow the increased volumetric flow rate of fuel.

As the concentration of hydrogen in the fuel is increased, the composition of the furnace atmosphere changes; increasing the water content and the potential for free hydrogen molecules to escape the flame and come into contact with the charge material inside the furnace. Therefore, it is necessary to understand how these changes in furnace atmosphere could impact on the final product. For some secondary aluminium melting operations, hydrogen absorption can be a challenge, whereby hydrogen can be absorbed by the aluminium, creating porosity in the final product and potentially causing defects. Pilot studies and the implementation of hydrogen combustion systems onto early-adopter production furnaces are essential to provide an understanding of how to operate the process to minimise any potential risks. Furthermore, the effects on the furnace and downstream equipment, such as the baghouse, must also be understood.

Air Products has more than 50 years' experience in combustion technology and industrial furnace applications and has world-class research and development facilities that have produced best in class technology for the secondary aluminium industry. Combining a history of proven technology with decades of operational know-how and experience across the range of metals production operations, allows Air Products to work with customers to effectively understand and overcome challenges, bringing improvements in efficiency, productivity, and yield. With a change in focus from the industry towards reducing CO<sub>2</sub> emissions, Air Products have developed burner technology capable of using hydrogen as a fuel, either blended with natural gas or as 100% hydrogen. An example of a hydrogen burner operating at varying amounts of hydrogen blended into natural gas can be seen in Figure 4. The technologies are currently being deployed on a number of trial projects to demonstrate how hydrogen can be used in heavy industry and the learnings from these studies can address the above potential issues and give end users confidence to switch to hydrogen.

Traditionally, oxygen enhanced combustion has been used throughout heavy industry to provide increased combustion

efficiency to reduce fuel usage and increase productivity. When comparing air-fuel combustion (20.9% oxygen) to oxy-fuel combustion (100% oxygen), the removal of nitrogen from the process allows the fuel and oxygen to react much faster, creating a significantly hotter flame, in the region of 1000°C. Furthermore, there is no energy wasted heating nitrogen, which would otherwise be exhausted, unnecessarily removing heat from the furnace. This results in a significant reduction in fuel consumption of up to 40%, when compared with air-fuel combustion, which can be directly translated as up to 40% CO<sub>2</sub> reduction. When considering the relatively high cost of hydrogen compared with natural gas, oxy-hydrogen combustion systems can be implemented during the energy transition to reduce the overall cost of switching to hydrogen by reducing the amount of fuel required.

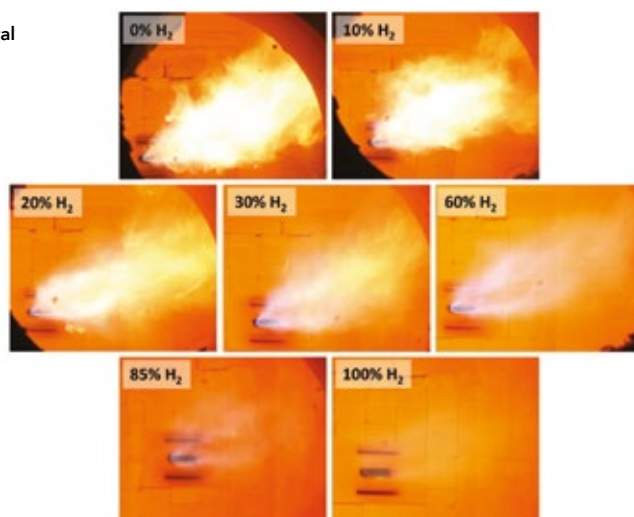
The increased combustion efficiency can also provide a significant increase in productivity when compared with air-fuel combustion systems. The significant increase in flame temperature of oxy-fuel flames can increase the melt rate by up to 100%. This is particularly interesting when considering using an on-site electrolyser to generate hydrogen, as the oxygen 'waste' stream can be used in the combustion process. electricity produced by renewable energy sources is used to power the electrolyser, then low-carbon oxy-hydrogen combustion can be used to eliminate CO<sub>2</sub> emissions, whilst also providing significant fuel savings and increased productivity.

## Conclusion

Hydrogen will play a pivotal role in generating a cleaner future for heavy industrial processes, such as the secondary aluminium industry. Hydrogen has been used as an industrial gas for decades and Air Products has more than 60 years' experience in producing, distributing, and handling hydrogen. There are also commercially available technologies to facilitate the use of hydrogen for the heating and energy applications to support the transition to a low-carbon economy.

Research and development work is ongoing, and further work needs to be done to prepare industry for using hydrogen, in terms of how it may affect processes, equipment, and final product quality. Governments around the world are already releasing funding calls for industry preparation projects and this will likely continue as we progress towards 2050. Low carbon hydrogen infrastructure needs to be put in place for hydrogen for the energy transition and this has already begun with a number of ground-breaking projects. By working together, we can decarbonise the hard-to-abate sectors.

**Figure 4. Hydrogen blended with oxy-natural gas flames from 0% H<sub>2</sub> (100% natural gas) to 100% H<sub>2</sub> (0% natural gas).**

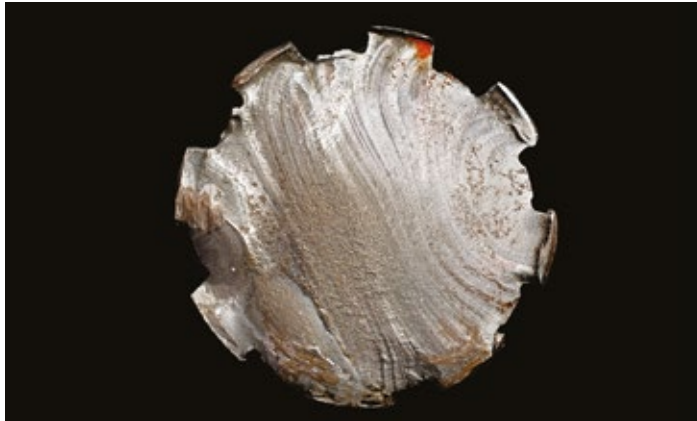


# METAL (ALUMINIUM) FATIGUE OR WHY DID THAT BREAK?

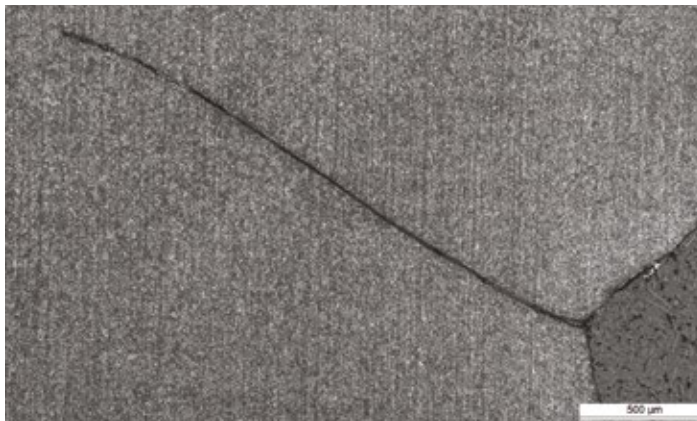
By Jan Lukaszewski, Technical Manager, Aluminium Federation

**Metal fatigue accounts for 90% of all service failures due to mechanical causes and yet is largely, ignored or misunderstood.**

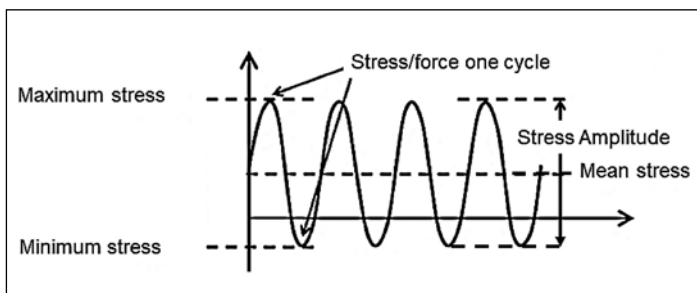
Metal fatigue is the initiation and propagation of cracks in a metal due to cyclic loading, so occurs in rotating shafts, bending beams, wheels, springs, wings, bicycles, bridges and even the seat on which you are sitting! Fatigue can occur in anything subjected to a repeating fluctuating load.



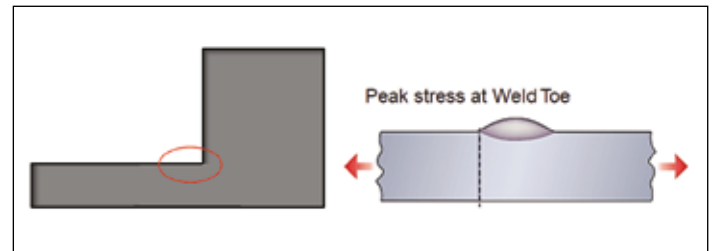
Once a fatigue crack has been initiated, it grows a small amount with each loading cycle until it reaches a critical size, when the stress intensity of the crack exceeds the fracture toughness of the metal, resulting in rapid final propagation leading to failure of the structure.



There are three basic factors necessary to initiate and propagate fatigue: a tensile load/stress of sufficiently high value, large enough variation or fluctuation in the applied load/stress and a sufficiently large enough number of cycles of the applied stress. The fatigue cyclic loading stress invariably is significantly less than the metal yield stress, or allowable static design stress, well before the onset of any permanent plastic deformation.



Virtually all fatigue failures occur on the external surface, that is normally being loaded in tension, from a stress concentration point or stress raiser, such as sharp corners, grooves, fillets, holes, threads, keyways, splines, or welds.

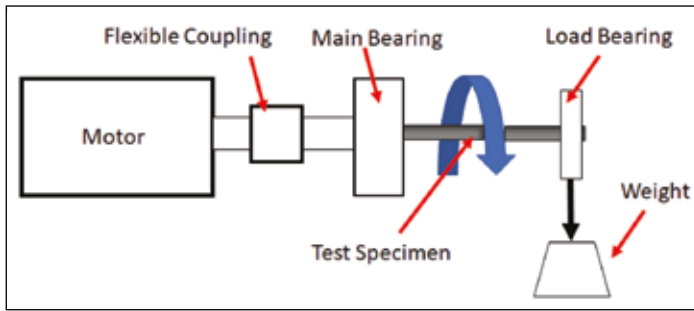


In 1954 the Comet aircraft crashes resulted from fatigue, reputedly initiated from the sharp corners of the square windows. Since then, all aircraft windows are designed corner free round or oval. However, this account is simple and apocryphal as all the observed fatigue cracks in the pressure cabin emanated from bolt or rivet holes near the cut-out areas. It was probably not the shape of the cut-outs that was so damaging to the fatigue life of the cabin, rather the method of fixing the windows and doubler plates onto the pressure cabin. Had the windows not been square then the standard gluing method might have been applied to these areas, and the failure avoided.

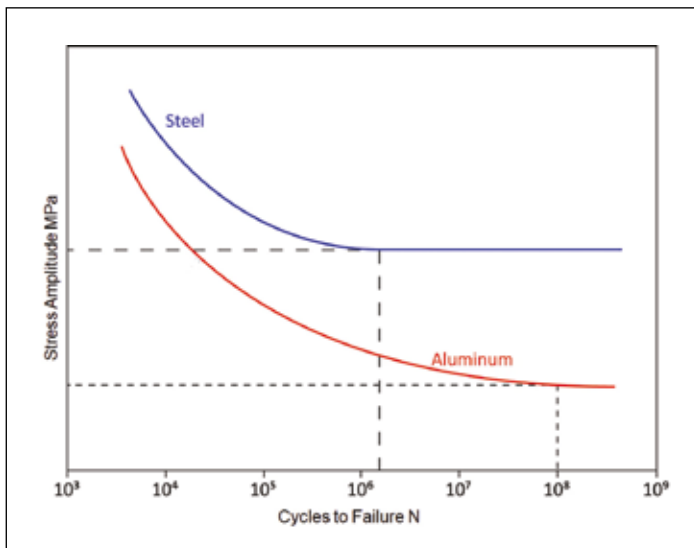


Fatigue strength is determined by applying various levels of cyclic stress to individual test specimens and measuring the number of cycles to failure. The test results are plotted as a graph of stress against the number of cycles to failure, the S-N curve. The S-N test curve is usually a stress - cycles, linear- log plot, with the actual S-N line representing the mean of the data from several tests.

The fatigue test and its resultant data S-N curve were developed by the German scientist August Wöhler during his investigation of an 1842 train axle failure in Versailles, France, the first documented fatigue failure. The Wöhler rotating bend fatigue tester uses a rotating cantilever specimen, with one end of the specimen held in a motor chuck and the other free floating, to which a load is applied; causing the specimen to bend. Each full bend rotation representing one cycle.

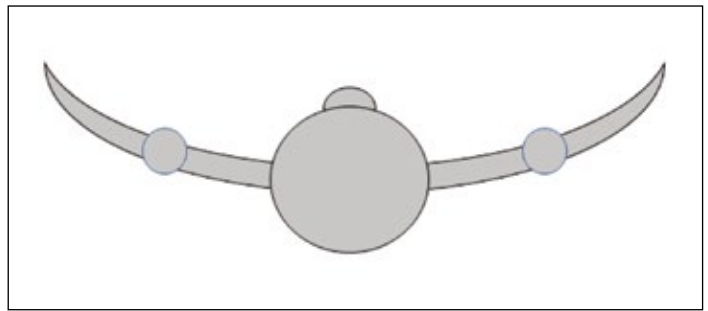
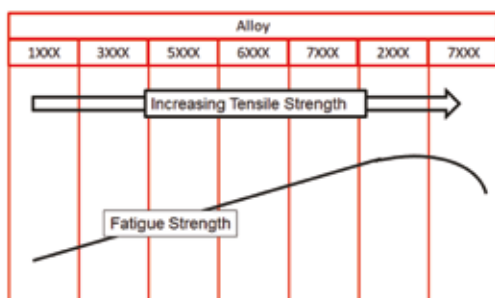


Some metals, steel and titanium have a fatigue limit, termed the "endurance limit" which represents a stress amplitude below which the material will not fail. Beneath the endurance limit the metal can be infinitely cycled without the risk of fatigue failure. Aluminium does not exhibit well-defined endurance limits; instead, it displays a continuously decreasing S-N response. Therefore, the endurance limit for aluminium is defined as that stress that causes failure at  $1 \times 10^8$  or  $5 \times 10^8$  cycles.



The Wöhler test uses identical polished test specimens, so provides pure fatigue endurance information for alloys and tempers under comparative conditions, ignoring all other factors. Actual Comet aircraft were subjected to full flight fatigue testing, to the point of failure, using hydraulic actuators, so were the first fully evaluated and metallurgically investigated aircraft failure.

For aluminium alloys up to a tensile strength of 300MPa, the endurance limit is approximately 40% of tensile strength. Therefore, there is a broad relationship between the increasing strength of alloys and fatigue endurance. The high strength alloys exhibit lower fracture toughness, so fatigue cracks propagate rapidly to failure from shorter fatigue cracks, hence their fatigue life is reduced. This is why the higher toughness AA2xxx alloys are preferred for many aerospace structures as cracks can be detected and regularly monitored well before they get to a critical size.



Understanding the strength and fatigue performance relationship of alloys/tempers is therefore critical to their correct application in design. Aircraft wings flex during flight, so high strength alloys that resist bowing, are employed in the top surfaces, surfaces subjected to compression, whilst high fatigue endurance alloys are applied to those lower, subjected to fluctuating tension.

Additional factors affect fatigue performance including:

- Stress concentration
- Stress raisers
- Tooling marks
- Type of cyclic loading
- Corrosion
- Temperature
- Metallurgical structure, including grain size and inclusions
- Temper
- Coatings
- Residual stress

Therefore, actual component parts can have significantly lower fatigue endurance than the laboratory specimens, used to determine alloy/temper endurance strength ( $S_e$ ). During the design of structures, to correct for the impact of processing, manufacturing, environmental and all other elements on fatigue life, factors have to be applied to endurance strength ( $S_e$ ).

Component Endurance  $S_e = (C_{\text{surface}}) \times (C_{\text{size}}) \times (C_{\text{load}}) \times (C_{\text{temperature}}) \times (C_{\text{reliability}}) \times (S_e)$

Multi component, integrated structures, automobiles, aeroplanes, bridges and even the humble beverage can, a pressurised container subjected to slow cycle fatigue, must perform repeatedly without failure in service. The improvements in design life calculation methods, the use of finite element analyses software packages have enabled engineers to approach the design of fatigue limited structures with confidence.

However, for safety critical structures/products, such a degree of confidence can only be proven through actual high speed fatigue testing in purpose-built rigs, replicating actual service loading and environments. In reality almost all fatigue failures of aluminium alloys in service arise from joints either associated with mechanical fasteners or from welds.

ALFED technical training courses include lectures on understanding fatigue and design for fatigue. Through its technical support service ALFED is working with several members on a number of fatigue related projects.





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# THE VOICE OF THE UK ALUMINIUM INDUSTRY



NEWS  
**ALUMINIUM**

**ALFED** quarterly magazine offers you a great opportunity to promote your products and services to key decision makers and influencers within the aluminium industry in the UK.

### SCHEDULE:

Issue 13 will be available on 30th May

For more information please contact:

Kirsi Lintula, Editor

e: [klintula@alfed.org.uk](mailto:klintula@alfed.org.uk)

m: 07768 566 437





## 2022: YEAR OF MASSIVE PAY-RISES?

One of the biggest fallouts of the “Great Resignation” is a huge hike in starting payment rates for staff.

This year, legal firms could be placing graduate lawyers on starting salaries as high as £150,000. The increases seen range from 15-50%, leading to a fiercely competitive market.

It's not just starting salaries either. In an effort to improve retention, many businesses are resorting to significant pay-rises to convince staff to stay. Pret a Manger has announced more than £9 million invested in pay rises.

What are the implications of this change? And how can you meet market demand when you don't have the money to do so?

We analyse our pay data, collected from Croner Reward clients, to give you expert insight and predictions...

### What we know about expected pay rises

The market data we are seeing at Croner reflects the predictions made above. In most areas, salaries are increasing. However, certain industries are experiencing bigger pay rises than others - we'll break this down later.

The main causes of the “Great Resignation”? People re-evaluating their lives and changing careers post-lockdown. We have also seen skill shortages in many areas, including digital roles which has seen a massive increase during the pandemic. This has left many businesses playing catch up with recruitment and considering pay rises to counteract the phenomenon.

Skill gaps have now been historically challenging certain industries, and this became a much bigger problem throughout the pandemic.

### STAFF SHORTAGES AND PAY RISES - MOST AFFECTED INDUSTRIES

#### Construction

Our pay data in this sector shows a 7% increase in wages last year. Also, the industry has seen 45,000+ vacancies during this period.

This is a sector that has seen a skill shortage in recent years, which has only gotten worse during the pandemic. It has resulted in a highly competitive market and rising salaries.

#### What can we expect?

Overall, the key is to be sensible. By using robust, reliable benchmarking data and using a concrete job evaluation

process, you can ensure pay is level. This will help you attract the right kind of talent and retain them. It will also help you maintain cost control.

Each individual candidate is different. Ask yourself - is this person worth the top end salary range? If they are, pay it. However, you might often find that an entry-level candidate is requesting a salary that they don't have the experience or skill set to meet. By understanding where jobs sit within your organisation you can make sure you don't under or over pay.

For example, an HR Officer in a similar company may have entirely different duties and responsibilities. This would warrant a difference in pay.

Also, don't be afraid to negotiate salaries and pay rises. Just because a candidate is asking for 15% more than you've offered, doesn't mean you have to pay it. Meet them halfway or explore other benefits that will help retain staff. Some may value flexible working over a salary increase, for instance.

### Ensure your pay rates are accurate

With Croner, you can guarantee that you are paying your staff correctly. Our Reward experts collect and analyse pay data from across the country to ensure you are competitive. You will also have access to expert advice 24/7.



As part of your ALFED membership you have free access to **Croner Business Support Helpline**, which covers Employment Law, HR and H&S helpline.

**Contact the ALFED Team for more information:**  
0330 236 2800 or email: [alfed@alfed.org.uk](mailto:alfed@alfed.org.uk)

# ADVANCED ENGINEERING

2 & 3 November 2022 | NEC Birmingham

**The UK's LEADING annual gathering** of OEMs and engineering and manufacturing supply chain professionals



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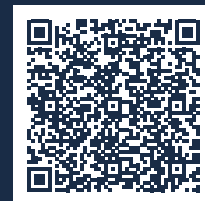
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& QUALITY CONTROL**



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We've met many great people who we will be looking to work with in the future, and overall it has been a very successful couple of days.

Matt Travis, Engineering Manager, JCB

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TRAINING ACADEMY

## TRAINING, EDUCATION & APPRENTICESHIPS UPDATE



### MANUFACTURERS CALL FOR UNIQUE TARGETED SECTOR APPROACH ON APPRENTICESHIP FUNDING TO CREATE MORE HIGH VALUE, HIGH GROWTH JOBS

Nearly £2bn in unspent levy funds last year as skills shortages climb

Britain's manufacturers are calling on Government to adopt a special approach to how the manufacturing sector can spend their companies' left-over levy funds, currently expiring and going to waste. They are asking to be able to spend those funds - which amounted to nearly £2billion last year - to pay the wages of new apprentices, a move which would allow a significant boost to new young recruits into the sector.

- Special approach to levy for manufacturing sector needed to allow levy funds to be spent on wages for new apprentices
- Allow manufacturers to spend levy funds on capital expenditure to support the delivering of high-quality opportunities
- High proportion of manufacturing companies based in the Red Wall areas of Britain – where manufacturing can create more high-value job opportunities to help the UK level up

Manufacturing has already been officially recognised as a growth sector by Government, and the sector is ideally placed to help deliver the Prime Minister's promise of more good jobs in those left-behind areas of the country where he has pledged to focus his levelling up agenda.

With a high proportion of manufacturing companies based in the so-called Red Wall areas of Britain, manufacturing can

### ALFED AND AluVET EDUCATION PROJECT

Aluminium focused vocational education and training

Greece, Turkey and the UK are collaborating to develop a European standard training programme in the aluminium sectors across Europe.



The project covers creation of a vocational training to increase technical, digital and soft skills that are linked with the national and European level for Vocational Education and Training (VET). VET qualifications have been developed with the specific goal of preparing students with skills for work.

As part of the project, each country conducted a survey with participating companies from the aluminium industry. The purpose was to collect and analyse data that will help in the design of educational modules based on industrial needs. The module details will be published once the data has been analysed and reported to the consortium.

For further information about the AluVET project, technical training or to participate in the next study 'Soft and Digital Skills' please contact Kathy Rombach at ALFED [kromback@alfed.org.uk](mailto:kromback@alfed.org.uk).

create more high wage, high-value job opportunities to help the UK level up. The sector already delivers wages higher than the rest of the economy with 2.7 million jobs countrywide. This sits alongside a £191 billion contribution to national output with massive growth potential and agility in the sector to expand.

Currently employers who pay the apprenticeship levy and have unused apprenticeship funds can transfer these funds to other employers. Transferred funds can be used to pay for the training and assessment cost of the apprenticeships and we can work with you to help the recipients of the funding to allocate this to train their staff.

This is good for both senders and recipients of the levy, helping address the critical skills shortage.

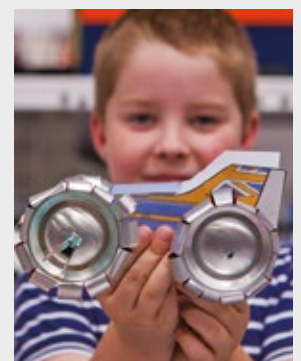
When it comes to levy funds the adage is to use it or lose it!

Contact Kathy Rombach at ALFED - [kromback@alfed.org.uk](mailto:kromback@alfed.org.uk) to discuss this further and don't forget that unused levy will expire and cannot be used or allocated by the employers.

### BLOODHOUND EDUCATION

Through its partnership with the Bloodhound Education charity the Aluminium Federation has sponsored the development of two unique projects designed to get children excited about aluminium, raise awareness of its properties, benefits and key role in contributing to sustainable living.

"ALFED funding of these resources during Covid has been invaluable the charity being able to support teachers and families with blended learning solutions in the classroom and at home," says Kirsty Allpress, charity CEO.



Over the last year the project reach was over 20,000 based on web downloads plus being made available to a further 26,000 via education newsletters and the charity social media channels.

The fun, practical activities give primary and secondary students the opportunity to expand their knowledge, put learning into practice, build skills confidence and make the link between the classroom and careers in engineering.

'You can change the world' is the latest project sponsored by ALFED and is a sustainable tools project linked to the United Nations sustainable development goals, which investigates manufacturing, recycling and waste management solutions. Students are given a mission to design and develop a tool sustainably which could solve a problem in their local community or globally.

A fantastic project covering many aspects of the curriculum and easily adaptable for a series of lessons or a home school activity. Bloodhound Education needs your support to continue to make these aluminium projects widely available, particularly to the growing number of home educators, under-represented, special educational needs and disadvantaged groups who cannot access these activities through school.

For more information about sponsorship opportunities or to donate please contact Kathy Rombach [kromback@alfed.org.uk](mailto:kromback@alfed.org.uk) or Kirsty Allpress [kirsty.allpress@bloodhoundeducation.com](mailto:kirsty.allpress@bloodhoundeducation.com).



TRAINING ACADEMY



## TRAINING COURSES AND WORKSHOPS

# WORLD OF ALUMINIUM

This live, tutor-led interactive course will be delivered over two consecutive mornings via our online platform.

**11 & 12 APRIL**  
**9.30-13:00**  
**(2x mornings)**

### WHO SHOULD ATTEND:

The World of Aluminium is an intermediate level technical course specifically designed for production engineers, process and quality technicians, stockholders, customer facing sales/marketing persons and material/product purchasing individuals. This course is aimed at individuals who require a solid basic understanding to confidently engage with the aluminium industry and its products.

### COURSE CONTENT:

The course creates a solid basic understanding of aluminium, aluminium metallurgy, heat treatment and metal forming processes. It assumes no prior knowledge of metallurgy and is specifically tailored to the industry sector.

Technical elements are balanced with insights into the history of aluminium, its growth as the strategic metal of society, its sustainability properties and illustration of products, to create a holistic broad rounded knowledge.

### COST:

- ALFED members: £199+vat per person
- Non members: £299+vat per person

**For more information  
or to book a place please visit:  
<https://bit.ly/3BebLKh>**

# TIME TO

Live interactive session delivered via online platform

## EFFECTIVE SALES WORKSHOP

**13, 14, 20 & 21 APRIL 2022**  
**9.30 – 13.00 (4 x mornings)**

The ALFED Training Academy 'Effective Sales Workshop' takes selling to the next level. It is designed to make sales work the way people buy, not the way you sell.

### WHO IS IT FOR:

This course is for you if you want to become the best salesperson/business development professional in your market or the go-to expert for all clients who are serious about finding the right solution for their challenges.

### WHAT WILL I LEARN:

- Filtering your target market
- Competitive talking points
- Building your prospecting script
- The perfect sales meeting checklist
- Getting a deal unstuck
- Mapping stakeholders
- Plan the work, work the plan: weekly cadence
- Art of the sales conversation
- Objections matrix
- Team selling for impact
- Creating personas and qualifying fast

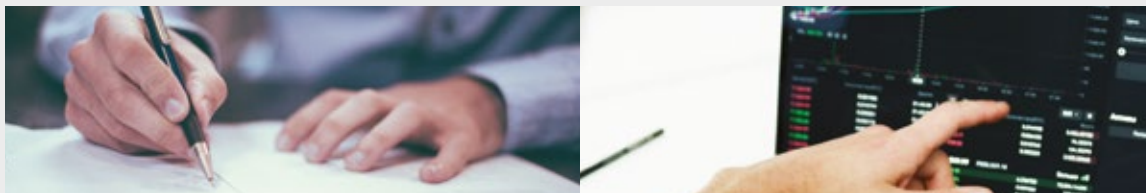
**ALFED members:  
£495+vat/person**

**Non members:  
£595+vat/person**

**For more information  
or to book a place please visit:  
<https://bit.ly/3wxkJ5p>**

- Proactive pursuit: turning cold calls into warm leads
- Asking the right questions
- Closing well
- Giving (and receiving) feedback

This comprehensive program will teach you and your team how to lead conversations masterfully from the first touch point to an ongoing relationship. Our course will help you overcome a host of selling related challenges and unlocks all of the potential your market contains.



## TRAINING COURSES AND WORKSHOPS



TRAINING ACADEMY

### EMOTIONAL INTELLIGENCE WORKSHOP

A live interactive session delivered via online platform

**11 – 12 May 2022 9.30 – 13.00** (2 x mornings)

**Empathy** is one of the most important skills in management today. Relating to others is vital in the workplace. Whether you are the office junior, the CEO or anything in between this course will increase your emotional intelligence, helping you to identify and manage your own emotions, the emotions of others to show you the way to greater success.

#### WHAT WILL YOU LEARN:

- Self-awareness in a leadership role and organisational behaviour
- Planning management and leadership effectiveness
- Team personalities, traits, types and challenges
- Explore and develop your own leadership style
- Effective behaviour at work
- Facing challenges
- Goal setting
- Being able to accept criticism and responsibility
- Being able to share your feelings with others
- Being able to solve problems in ways that work for everyone



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ALFED members: £199+vat/person Non members: £299+vat/person

**MARKETING....** a course designed for marketing executives, marketing co-ordinators, team leaders or any individuals who want to build their career in the field of marketing.

**8 – 9 June 2022 9.30 – 13.00** (2x mornings)

**For more information or to book a place please visit: <https://bit.ly/3wxkj5p>**

The ALFED Training Academy marketing course covers different marketing techniques to succeed in a competitive market:

- Marketing fundamentals
- Marketing mix
- Marketing techniques
- Different marketing approaches
- Customer communication techniques

- Discover the opportunities of digital marketing.
- How to be flexible and agile in the new world of marketing.
- Understand the six processes which will drive marketing in the future.
- What continues to work and what no longer will work in the future of marketing.

#### What will you learn:

- How to create a roadmap that works for your business.

#### Cost:

- ALFED members: £199+vat per person
- Non members: £299+vat per person

**Live interactive session delivered via online platform**



### HEALTH AND SAFETY COURSES

The ALFED online health and safety courses are all CPD accredited and certified by various accrediting agencies, including iirsm, The CPD Certification Service and ILM.

All of these courses are fully online and the course material will be available to the candidate for one year after the completion of the certification period.

- Asbestos Awareness (RoSPA & IATP Approved)
- Manual Handling (CPD Approved)
- Basic Fire Safety Awareness (RoSPA, IFE & CPD Approved)
- Fire Marshal (RoSPA & CPD Approved)
- Fire Extinguisher Safety (RoSPA & CPD Approved)
- Abrasive Wheels (IIRSM Approved)
- Working at Height (RoSPA Approved)
- Control of Substances Hazardous to Health (COSHH) (IIRSM Approved)
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- Emergency First Aid at Work - Refresher
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- Working in Confined Space (IIRSM Approved)
- Introduction to Risk Assessment (IIRSM Approved)
- Electrical Safety (IIRSM Approved)
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- Personal Safety for Lone Workers
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There has never been a more important time for our sector to pull together, to create a shared agenda, help promote and encourage manufacturing and engineering innovation and see our sectors grow. Manufacturing and Engineering Week will do exactly that and I am delighted that MAKE UK are a partner for this groundbreaking event."

— Stephen Phipson, CBE, Chief Executive, MAKE UK

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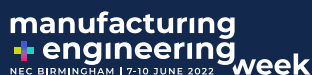
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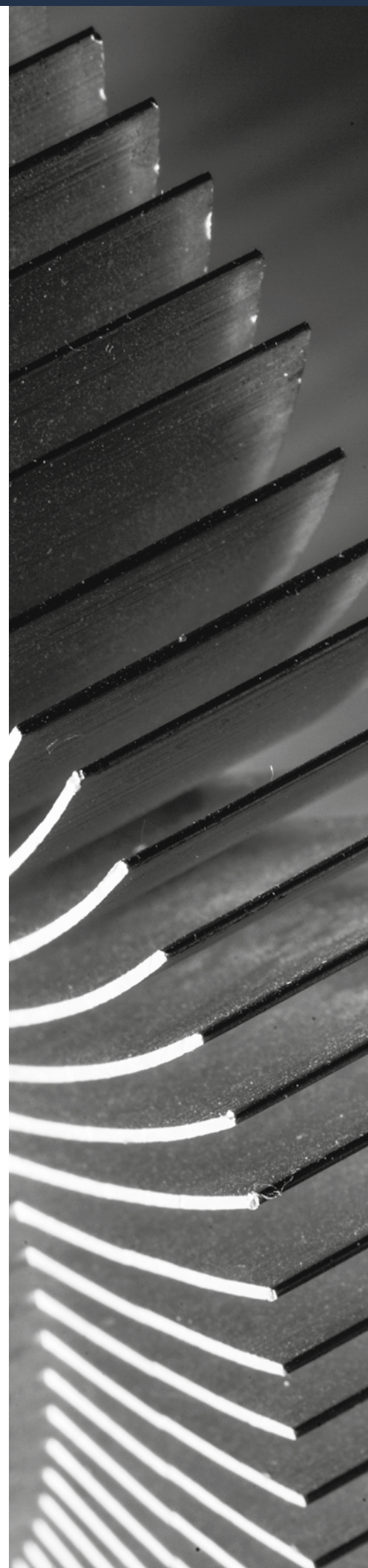
Staffordshire 01827 726 493  
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### AXALTA POWDER COATING SYSTEMS UK

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## POWDERTECH SURFACE SCIENCE

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<https://www.smithmetal.com/>

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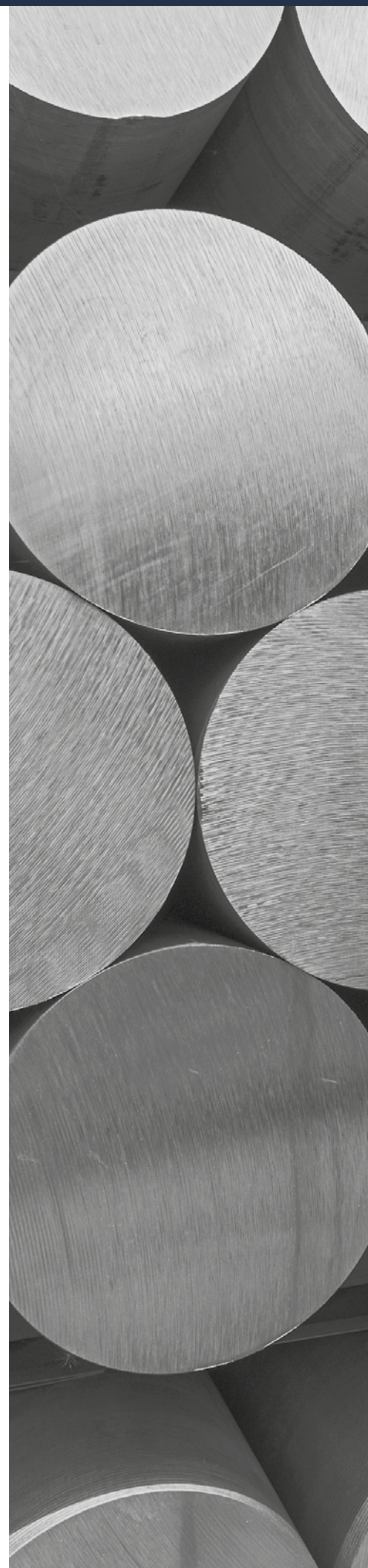
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<https://www.brunel.ac.uk/research/Centres/BCAST>

#### BRITISH SAFETY INDUSTRY FEDERATION

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<https://www.bsif.co.uk/>

#### BURCHILL GC

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#### COVENTRY UNIVERSITY

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### I

#### INSTITUTE OF MATERIALS FINISHING

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### M

#### MAKE UK - THE MANUFACTURERS' ORGANISATION

Greater London 0207 222 7777  
<https://www.makeuk.org/>

### S

#### SWANSEA UNIVERSITY

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### T

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#### THE UNIVERSITY OF SHEFFIELD

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