

A horizontal blue banner with a world map background, overlaid with a grid of latitude and longitude lines. The banner has a 3D effect with glowing blue lines.

# Materials Joining and Engineering Technologies

An Overview



## Materials joining and engineering

With a long history of invention, innovation and knowledge transfer, TWI delivers a continuous output of technical advances in materials engineering and joining technologies – critical to engineering design and industry practice across the globe.

### Without joining you can't really make anything

From aircraft to medical devices and from oil and gas pipelines to cars – all are made with parts which are joined to fulfil their function. TWI develops and improves the joining processes needed to make the products, vehicles and structures we see each day.

### If joints break, consequences may be dramatic

We are specialists in the design, evaluation, test and inspection of welded components and structures, ensuring their safe service and preventing failure.

### Technology developments need skilled personnel to apply them

With over 26,500 training and examination bookings worldwide per year, TWI certifies teams of suitably qualified employees that can convert their expertise into new products and processes, which, in turn, grow successful businesses.

### Adding value to business performance

The key benefit of working with us is access to the knowledge and knowhow of more than 500 engineers and scientists, as well as to state-of-the-art welding and fabrication equipment and large-scale testing facilities and laboratories. We have decades of experience ready-to-hand to carry out confidential work as an extension of your own resource, and the industry insight to bring organisations together in collaborative work to face industry challenges. We believe we can help with the important choices you make, and add real value to your development needs.



“A strong commitment to technical excellence and the drive for continuous improvement in what we do.”

## Meeting industry needs

We work with the most influential companies worldwide across all industry sectors, helping them to:

### innovate

- selecting alternative materials and joining processes
- using best practice consultancy
- inward technology transfer
- building prototype equipment
- adopting leading-edge technology and expertise

### reduce costs

- shortening downtime
- avoiding expensive failures
- saving time spent searching for information
- lessening the risk of damages from litigation
- evaluating new plant or technology
- reducing rework and scrap

### market effectively

- using TWI's information services
- generating performance/application data
- participating in Joint Industry Projects
- contributing to webinars and conferences
- using TWI media resources

### improve quality and reliability

- correctly applying Standards
- exploiting accumulated knowhow
- developing solutions to manufacturing problems
- staff training and examination
- company certification
- benchmarking performance against world-class standards
- process control and inspection





## Working with you

### Advice and Consultancy

TWI experts work with industry, applying knowhow to provide an extended capability from concept to completion.

You can count on us to advise you at every stage of a project. When there is a need to get the best out of a new joining technology or material – or if something has gone wrong – we work with you, taking a multidisciplinary approach across three main areas:

- joining technology
- materials and corrosion management
- integrity management

### Research and Development

Teams of specialists carry out confidential R&D for industry to improve efficiency, reliability and profitability.

An R&D project is frequently the best way forward when you want to develop new information or improved understanding. The benefits of short-term development work or a longer term R&D programme can include increased product and structural reliability, greater manufacturing efficiency and enhanced profitability.

We carry out four types of project:

- single sponsored – for a single company, often near market
- joint industry sponsored – for a number of companies with shared interest
- public funded – funded by companies, normally in conjunction with European and national governments
- core research – our internal research programme, designed to meet the needs of Industrial Members

## Information Services

World-renowned, comprehensive and confidential services to support your business.

- direct access to our experts – skilled staff tackle unlimited questions
- technical enquiries – rapid response from a centrally manned service
- information search and retrieval – from world leading stock of publications
- results from our core research programme – the foundation of TWI's high-quality resource
- online technical knowledge – up-to-date, immediate access to TWI's knowledge
- standards enquiries – information and application
- industry information – direct support for key industry sectors

## Training and Examination

Providing internationally recognised qualifications demanded by industry.

Via our global network of offices, training centres and agents, we provide training and examination services designed for all major industry sectors. Our world-class teams deliver an unrivalled quality of training and assessment leading to internationally recognised qualifications.

Courses include :

- non-destructive testing
- welding inspection
- plant inspection
- welding procedures
- practical welding
- health and safety
- underwater inspection

Accredited to CSWIP, BGAS-CSWIP, EWF/IIW, PCN, ASNT, SNT-TC-1A and NEBOSH certification schemes.

Standard courses are scheduled at all TWI venues and customised training can be arranged to suit particular needs. TWI offers complete flexibility enabling courses to be matched to your personal, industry or company requirements.

## Professional Membership and Registration

The route for internationally recognised professional membership and Engineering Council registration.

To demonstrate your knowledge, commitment and professionalism, The Welding Institute can help career development with:

- personal mentoring, career advice and support
- high-quality technical information
- individual advice and guidance from qualified practitioners
- career planning tools for recording IPD/CPD
- access to events and training

## Software Products and Development

Ensuring quality, safety and structural integrity in welding engineering.

TWI's welding software ensures compliance with today's comprehensive QA and production management requirements. TWI's integrity management software saves time and resources by enhancing decision making in the management of your assets to the latest standards and codes.

Your company can gain access to these services by becoming an Industrial Member. Training, examination, professional membership and software products are accessible outside the Industrial Membership framework.





## Extending your resources

Our expert skills base allows us to assemble the right team to provide you with a complete, integrated and impartial solution to your technical challenge. You can be confident that work carried out by TWI will be based on the latest technical information.

### Joining technology

Our welding and joining expertise is broad: from fusion welding processes such as arc, laser, electron beam and resistance welding, brazing and soldering to non-fusion techniques such as friction and ultrasonic welding, and diffusion, as well as adhesive bonding. TWI specialist knowledge covers welding and joining for a variety of materials including metals, plastics, composites and ceramics.

### Material and corrosion management

Materials are the building blocks of all functional structures. Choosing materials that are not only cost-effective but also offer predictable in-service performance is essential to ensure reliable operation and avoid the potentially catastrophic consequences of in-service failure. Our capabilities encompass material analysis and characterisation, testing for corrosive service, hydrogen embrittlement and weldability, performance evaluation and failure investigation.

### Integrity management

TWI has world-leading expertise in developing and implementing asset management strategies to optimise capital and operating expenditure, satisfy regulatory demands and avoid the failure of advanced structures. We cover failure investigation, root cause analysis, litigation, consultancy, specialised software products, mechanical and corrosion testing, and the development of integrity management solutions.

Innovative inspection solutions, interfaced with related technologies such as engineering critical assessment, risk-based inspection, reliability analysis and repair procedure development provide the optimal solution in any practical industrial situation. Our teams are skilled in applying a complete range of advanced non-destructive testing technologies, including long-range ultrasonics, phased array, digital radiography and condition monitoring, to enhance performance and asset value without damaging the test subject.

## About TWI

As the first ever organisation to be dedicated to welding and joining research, TWI has grown its business as a membership-based consultancy service over nearly 70 years, employing top engineers, materials scientists, chemists, and experts in physics to realise our position as a respected world authority.

We have five laboratory and training facilities in the UK and a further 20 worldwide. Supported by our successful international training and examinations network, we take technical and practical knowhow to regions looking for growth through skills development.

Our Cambridge headquarters is also the base for the National Structural Integrity Research Centre, a state-of-the-art postgraduate research hub bringing together academic study and industry-driven project work.

To find out more about how TWI can work for you please contact us:

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