

PROMOTING COMPOSITES CAPABILITY IN ENGLAND:

AN INTRODUCTION TO THE ACTIVITIES OF ENGLAND'S REGIONAL DEVELOPMENT AGENCIES

Within the extensive portfolio of Regional Development Agency (RDA) support for Composites is a range of ongoing and legacy projects for developing: R&D; business innovation; infrastructure; education and training. These are taken forward in partnership with the business and research community, and with close collaboration with Government, the Devolved Administrations, the Technology Strategy Board, EPSRC and a range of other partners and stakeholders.

This document gives an overview of key strategic projects from across the regions that have been designed to ensure competitiveness in Composites, and through use of Composites. This is mainly delivered under the Government's Solutions For Business suite of business support products and is accessible via Business Link (www.businesslink.gov.uk). The support offered by generic Solutions For Business programmes such as The Manufacturing Advisory Service is not detailed in this report.

More information about the role and activities of the RDAs, including wider support for manufacturing is available by accessing the England's RDAs website: www.englishrdas.com.

Project Funding

Composites have attracted significant investment from a number of public and private sector sources over the past five years. RDA projects in the field to date are at least £15m, with a further £28m planned between April 2009 and March 2011 and another £8m already planned for the future (complemented by a further £90m from other public and private sources). A very large part of this is spent in creating facilities and funding for research and technology transfer, with further significant investment in skills and supply chain development.

Much support for Composites also links to the wider support for Advanced Manufacturing, and the total support and recognition of the strategic importance of this agenda is much greater than suggested above.

This annex focuses on the key projects specifically targeting the need to enhance Composites capabilities in the United Kingdom, reflecting both support for key national strategies, such as the National Aerospace Technology Strategy, and regional needs and priorities (reflecting the opportunities and challenges of the businesses and research organisations in the locality).

East Midlands

Manufacturing makes up a greater than average part of the East Midlands economy, with leading capabilities in transport technologies including aerospace (Rolls Royce), Rail (Bombardier) and Automotive (including Toyota). The Composites capability within the East Midlands is concentrated on the needs of transport and motor-sport related companies and this capability grew as a result of the drive by larger organisations such as Rolls-Royce Aerospace to develop a composite design and manufacturing competence to support their requirements for the manufacture of nacelles for civil aerospace engines. Companies such as the Advanced Composites Group were formed to serve this need.

ACG is a technology leader and has licensed teaching materials to the South West RDA-led Composites Gateway project, which seeks to address industry's needs for short technical courses in the South West and the Midlands. Advanced Composite Group (ACG) was a recipient of £1.9m of *emda* funding as part of the Next Generation Composite Wing programme.

As these organisations have grown, spin-off companies have been started and so the capability base has grown. This in turn has led to the development of a cluster of companies undertaking the majority of activities involved with the composite product lifecycle from 'Pre-pregging' through to moulding. The cluster has strong links with the region's Universities with examples of previous collaborations such as that between Ford Motor Company Ltd and the University of Nottingham investigating the automotive application of Composites. In addition to this, the cluster has strong associations with key organisations regionally, nationally and internationally utilising Composites in the aerospace, marine and motor-sport industries.

emda is a partner with Advantage West Midlands (AWM) as well as Rolls Royce and Loughborough and Nottingham Universities in the development of the Manufacturing Technology Centre. The MTC is described more fully under the section on the West Midlands (which is leading on this project for the RDAs).

Composites also comprises an ongoing strategic focus for funding under the region's £4.5m Regional Technology Framework – part of it's Regional Innovation Strategy. This funding is targeted at supporting demonstration and pathfinder projects which will help with the commercialisation of new technologies.

East of England

The main sectors where composites are important to the region include: Defence and aerospace; Rail; Automotive; Chemical and process plant; Construction; Marine; Energy. The East of England has a number of Formula 1 and other motor racing companies which have pioneered the use of Composites. The marine industry is also significant. In common with much of the UK marine industry, this is predominantly Glass Reinforced Plastic (GRP) and lower tech materials. The region has construction composite interests and is aware of skills issues across all sectors.

There are a number of key businesses in the UK composites industry, including:

- Hexcel - one of the world's leading composite material suppliers and undertakes R&D into textiles and resin systems, areas of particular importance

- Bespoke specialist Panels: A company developing and producing specialist composite panels for a variety of specialist applications in automotive, aerospace, nuclear and energy markets
- MERL: an independent UK company founded providing R&D, laboratory testing and consultancy services on polymer materials for engineering systems and structures
- GKN Composites provides leading wing edge heated composite panels for the Airbus programme

In addition to HEI expertise at the Universities of Cambridge, Cranfield, East Anglia and Hertfordshire, TWI (formerly The Welding Institute) is one of the largest Research and Technology Organisations (RTOs) with expertise in polymer science and other composite disciplines.

EEDA is supporting the Next Generation Composite Wing (NGCW) programme with three companies based in the East of England initially being supported by EEDA as part of the BIS / TSB / RDA / Airbus & Industry programme. This includes support to the Aircraft Research Association (ARA), Bedford, to develop the technology and application of composite components in wind tunnel environment.

The East of England is also host the National Composites Network (NCN) at Granta Park co located with TWI, Cambridge.

London

London has significant and internationally acknowledged research expertise in Composites and Advanced Material technologies, with some 212 departments in 20 universities undertaking research activity in these fields. Leading HEIs include University College London, Kings College London and Imperial College London.

Key industry sectors, and London based companies with an expressed interest in this area include: Design (Nissan), Medical Devices (Eisai) and Manufacturing (Ceres Power). The increasingly important field of sustainable Composites is specifically relevant to the construction and transport sectors (Arup, Atkin's, TfL).

While there isn't any current sectoral prioritisation for any LDA business support products, major initiatives in this area that have been supported in the past include £2m over 2004/05 to 2008/9 in support of Nanoforce Technology Ltd (www.nanoforce.co.uk). Initially spun out from Queen Mary University of London, Nanoforce is a world leading advanced materials processing company which works with businesses to bridge the gap between R&D and industrial commercialisation.

The LDA has also supported the London Technology Network to broker university to business, and business to business, collaborations within the area of advanced materials.

North East

The North East economy has been dominated by the process industries but there are a number of initiatives in the emerging industries which have composite applications.

There are a number of One NorthEast investments around the New and Renewable Energy Centre (NaREC) which seeks to accelerate the deployment of wind, wave, tidal and other renewable technologies. Facilities include the ability to test large wind turbine blades and this has attracted a significant investment from Clipper Windpower Plc who aim to develop the world's largest off-shore wind-turbine.

BIS has recent awarded One NorthEast a £10m grant to develop a Marine Testing Facility. This will build on and utilise existing infrastructure at NaREC to provide testing infrastructure for marine drive systems and other critical wave and tidal energy device components. Such an investment for a 3 MW testing system will allow reliability and "destruction testing" of tidal energy turbine assemblies and the energy conversion units of wave energy devices. A facility of this nature and the nature of the systems being tested have the potential to utilise composite materials that not only resist corrosion, but have high performance characteristics.

The region has a strong defence industry (which has need for composite armour) and a cluster of automotive businesses including Caterpillar, Komatsu, Nissan and suppliers such as Magna Kansei.

Durham University has an Interdisciplinary Research Centre in Polymer Science and Technology and there other composite-related activities at a range of other universities including Newcastle, Sunderland and Northumbria.

North West

BAE Systems has a strong presence in the North West where, as part of the Typhoon and Joint Strike Fighter consortium, it develops and manufactures aircraft with high composites content. There are other companies in the supply chain which have developed advanced weaving, tooling and composite processing technologies, many of them proprietary.

The NWDA has invested in the Next Generation Composite Wing programme to support a group of companies which are looking at high productivity issues associated with wing manufacture. It should be noted that Airbus' wing assembly plant is in Wales but is a key part of the aerospace economy of the region.

Bentley is developing a number of novel processes which can enhance the appearance and mechanical properties of Composites and the speed at which they are produced.

The North West Composites Centre links the universities of Manchester, Bolton, Lancaster and Liverpool to provide Composites research and facilities including access to 60 academics.

Other major ongoing and planned NWDA-supported Composites projects include:

- NW Composites Centre (ongoing). Established in 2006 with £2.1m NWDA funding, to research new low-cost, low-energy routes for Composites

manufacture, the centre is currently undergoing an £8.2m expansion (NWDA £4.7m) to provide a Composites certification and evaluation facility which provides mechanical and NDT test equipment and manpower for companies to qualify flight-critical parts.

- The Aerospace Supply Chain Excellence 2 programme (ongoing), is a four year project that will start at the end of 2009 and is delivered by the NWDA-funded Northwest Aerospace Alliance. It builds upon the success of the previous Aerospace Supply Chain Excellence programme. Funded with £3.5m from NWDA and £3.4m from ERDF. This is an £11m project that will deliver five interlocking and interdependent strands of activity:
 - Commodity Groups: specialist, themed collaborative networks which will benchmark performance against global standards of world-class, establish developmental Learning Curves and pursue joint action plans.
 - Innovation: overseeing collaborative, open innovation projects configured around the operational and efficiency needs of aerospace SMEs, leveraging in essential additional funds and assisting commodity groups to progress through Learning Curves.
 - Skills Academy: driving intelligence on skills needs in the industry based on a Skills Capacity Model to forecast requirements and promote aerospace careers.
 - Shared Services: enabling aerospace SMEs to secure efficiencies and focus on core competitive strengths through aggregated procurement of non-core activities.
 - Extended Enterprise: establishing collaborative tendering arrangements which extend capacity, drive innovation, secure efficiencies and share risks.

South East

The South East economy has strengths in aerospace, marine, renewables and materials technologies. Largely reflecting the region's strengths in aerospace Composites technology, SEEDA has invested in four of the largest National Aerospace Technology projects through industry partners such as QinetiQ, GKN, GE Aerostructures and Eaton. For example, QinetiQ have developed a novel composite stitching technology and, with SEEDA support, have contributed to collaborative R&D programmes such as Next Generation Composite Wing. GKN one of the world's leading suppliers of aerospace composite components, have established, with central government and SEEDA support, a centre of excellence in automated manufacturing technologies on the Isle of Wight under the National Composites Network initiative.

GKN and Rolls Royce have entered into a £30m JV to develop composite fan-blades with TSB and SEEDA support under the Environmental Lightweight Fan (ELF) programme. SEEDA investment of £7.4m over the next four years will see the creation of a state of the art pre-production facility for a range of blade variants on the Isle of Wight underpinning a strategy to develop the Island as a centre of excellence in composite propulsion systems.

Established with SEEDA support in 2008, the SE Composite Alliance has facilitated strong linkages between the region's leading technology companies and universities at a senior level to develop a blueprint for future collaboration in respect of composite skills, the supply chain and European funded research programmes.

SEEDA has been building on existing strengths in advanced Composites on the Isle of Wight. Vestas is building a £90m global R&D Centre into advanced technology for next generation off-shore wind turbines. The company has successfully bid for an Environmental Technology Fund contribution from DECC, which SEEDA will be match funding by £5m. The new Centre, for which enabling works of up to £10m have begun (with the main £80m production contract being signed in December), will over the next few years bring in a total of some 400 jobs, up from 150 now. In the past two months a prototype manufacturing facility has been established, with the potential to develop this should the economic conditions permit.

VT Group, based in Southampton, is a high technology company engaged in the design and manufacture of naval and specialised vessels. The company operates the VT Composites Technology centre which has extensive capabilities.

The leading composite universities are Southampton, Oxford, Cranfield and London's Imperial College, all of whom are involved in the Composites Gateway project (see Skills).

South West

The South West has a strong aerospace and marine sector and an emerging renewables sector. Bristol is home to Airbus UK and a significant part of its supply chain including GKN who are currently investing £199m in new manufacturing facilities for the

A350XWB and for other aircraft companies. Other aerospace companies engaged in Composites include AgustaWestland (rotorcraft), GE Aviation (power and fuel systems), Rolls-Royce, Cobham and Dowty Propellers. The South West RDA has invested in Composites facilities at Airbus and Bristol University (£3.3m) as well as significant contributions to Integrated Wing and Next Generation Composite Wing (£10.7m, combined budget).

The region has a significant marine sector. Although many companies are using GRP materials some such as Tods and Babcock Marine use carbon Composites. In the renewables area, the Wave Hub project will offer an off-shore plug-socket for wave-device developers, some of whom may use composite materials. Vestas have appointed Bristol University as its Composites research partner as have Rolls-Royce, GE Aviation, Airbus and AgustaWestland. Four other HEIs are engaged in Composites.

The new National Composites Centre announced as a key component of the National Composites Strategy will be located in the Bristol area. This project, led by the University of Bristol, aims to bring together investment from central Government, the South West RDA and industrial partners. The vision for the centre is:

'To be an independent open-access national Centre to deliver world-class innovation in the design and rapid manufacture of Composites that will enable widespread industrial exploitation. The Centre will form an internationally leading hub linking activities across all sectors of the UK in research, education and training, technology transfer and incubation of new enterprises'

The National Composites Centre will be a purpose-built facility in Bristol with workshop space, open-plan offices, meeting rooms and teaching facilities. It will be equipped to focus on optimised-design, analysis, rapid manufacture and testing. The project is working to ambitious timescales; it will be partly operational within months and fully open by March 2011.

The Centre will have the capacity and flexibility to develop the technologies needed to optimise the design and rapidly manufacture massive structures (such a wind turbine blades, marine and construction applications), large/ ultra-precision parts (such as aerospace spars, engine casings) and address the challenge of producing high-volume parts to meet the needs, for example, of the automotive industry. Specific commercial objectives include:

- Wind turbine blades: improve performance of materials used in blade manufacture and dramatically increase the speed by which they can be manufactured
- Aerospace: deposit 30 kilos per hour over complex shapes and reduce weight by up to 20% by optimising design
- Marine: design hulls with greater slamming resistance
- Off-shore oil and gas platform repairs: develop lay-up techniques suitable for use in wet, hostile conditions
- Construction: develop design competence and large scale manufacturing techniques

- Automotive: develop mass production solutions for low weight energy efficient structures and complete structural body-shells
- Defence: lightweight armour

A highly collaborative environment will be developed at the Centre, characterised by applied research, industrial engagement and technology transfer. It envisages support from material and equipment suppliers as well as end-users allowing it to become a self-sustaining entity. A material supplier and equipment manufacturer have indicated their interest in co-locating in the centre. It will both foster innovation and accelerate its adoption by means of seminars, conferences and road shows as part of a significant outreach programme.

Exploitation networks comprising industry, higher and further education technology support and skills providers will be headquartered on the site to provide an effective linkage between research and implementation in the supply chain. The aim is to disseminate and integrate programmes across a number of different supply chain delivery locations across the UK through the work of such networks, including the National Composites Network.

The Centre will also provide an essential location where the higher level skills and understanding of advances in technology can be developed prior to implementation by industry.

Other infrastructural projects underway/planned in the South West include:

- Composite Structures Development Centre (ongoing) at Airbus and Bristol University (with £3.3m South West RDA funding) is a 6,000m² facility with 10m autoclave, out-of autoclave and high-volume tape-laying equipment. The focus is on design, development and testing of composite structures and the development of additive-layer manufacturing technologies. The facilities are available for third party use and have been used by marine, automotive and other aerospace companies. The National Composites Centre will build on the expertise created here.
- Centre for Fluid Mechanic Simulation (planned): A £7m project developed by Rolls-Royce, EADS, BAE Systems, Williams F1 and IBM which aims to use high-performance computing to radically improve the speed and functionality of design tools for use in a wide range of sectors.
- Business Technology Centres (planned). The Agency and ERDF funds are being used to fund up to 10 Business Technology Centres over the next 5 years, each worth around £2m based on a Yorkshire Forward model.

West Midlands

The West Midlands is a diverse manufacturing-based economy with strengths in automotive, aerospace, rail, construction and energy sectors. It has identified structural Composites, materials modelling and advanced manufacturing techniques as areas of focus. Current composite users tend to be 2nd or 3rd tier companies.

Advantage West Midlands and *emda* are jointly investing (with £25m and £15m respectively) in the Manufacturing Technology Centre (MTC) at Ansty, which will be a large, world-class manufacturing research, development and demonstration organisation. The MTC has been identified as a key element of the Government's Manufacturing Strategy, and was officially launched on the 29th October. It will bring together Tier 1 manufacturing companies, and their supply chains, the Universities of Birmingham, Nottingham and Loughborough, and The Welding Institute (TWI). It aims to deliver productivity gains of over 50% in sectors including aerospace, automotive and energy. The MTC will start with 4 initial members, Rolls-Royce, Aero Engine Controls (formerly Goodrich Electrical Systems), Airbus UK and Jaguar Land Rover. Composite related activities taking place at the MTC will include tooling and fixturing, joining, automation and automation, and operational performance.

Other major ongoing and planned AWM-supported Composites projects include:

- ADComp Demonstrator Project (ongoing): A £0.42m thermoplastics Composites demonstrator project involving JCB, Airbus UK and GKN, materials suppliers (TENCATE, Victrex, Owens Corning), Composites parts manufacturers and fabricators (EPM), mould tool manufacturers (MNB), and Warwick Manufacturing Group (Processing) and Birmingham University (Characterisation and Testing) to develop process routes for the manufacture of thermoplastic parts.
- ADCOMP – Thermoplastics Composites Centre - £10m (planned): The aim is to develop and manufacture structural composite prototypes for industry, the development of processing technologies for forming and assembly and it will serve industry predominantly at Technology Readiness Levels of 4-6.
- COMSTAR – Computational Modelling for Advanced Materials - £10m (planned) COMSTAR's vision is to create a national Computational Science Centre in Materials Modelling - linking the key manufacturing research centres located within the West Midlands (MTC), South Yorkshire (AMRC), Strathclyde (AFRC), and South West (CFMS). The project will focus on both metallic and Composites materials to deliver cost reduction, process/product development and skills development. The project's objectives are to:
 - establish optimised joining methodologies for the fabrication of high integrity components in metallic and composite materials
 - deliver training programmes on the application and development of predictive modelling tools
 - deliver an awareness, engagement and dissemination programme to manufacturers.

Yorkshire and Humber

The Advanced Composites industry within the Yorkshire and Humber region is a relatively small but growing sub-sector of the region's advanced engineering and materials sector.

Regional industry performs well in niche products and niche markets and there are some companies with a world-wide reputation in the automotive, leisure, aviation and marine sectors. They include Slingsby Advanced Composites (design and manufacture of advanced Composites products primarily for the defence and transport sectors) and Linear Composites (manufacture of textile reinforced plastic Composites).

Expertise in Composites has been identified in 5 of the 8 universities in the region. In particular Leeds University have expertise in 3-D weaving and spread-tow technology for textile pre-forms and Sheffield University have established the AMRC Composites Centre.

Major ongoing and planned Yorkshire-Forward-supported Composites projects include:

- Advanced Manufacturing Research Centre (AMRC) (ongoing): AMRC Composites Centre is probably the largest non-private Composites technology facility of its kind in the country, focusing at TRL 4-7, and containing a full suite of equipment needed to develop composite engineering components products and processes. The vision is to create a world-class centre for the development and use of advanced materials including Composites, metal-matrix Composites and hybrid materials with a focus on the design and manufacture of hybrid structures (in particular titanium / composite) and the development of out-of-autoclave processing technology and automated fibre and tape placement. The centre has access to the latest in composite manufacturing technology as well as industrial-sized processing equipment capable of producing large scale aerospace components. The project aims to stimulate the growth of a new and advanced Composites sector in the Yorkshire and Humber region. Yorkshire Forward funding until 2009 totalled £6.2m.
- Expansion of the AMRC (planned): A new and larger facility is already in planning for construction in 2010 which will expand the capability and resources of the centre and include incubator units allowing companies to use the equipment and expertise to develop composite engineering solutions.