For many years I’ve been involved in data generation, mainly creep, fatigue and crack propagation, primarily for power generation applications and aero gas turbines, from grey cast iron through to single crystal nickel alloys and taking in technical ceramics, fibre reinforced ceramics and polymers. Often the effects of coating, welding, cold work, thermal treatments, steam and combustion environments and hydrogen embrittlement have been included just to make life interesting. Similarly every PhD and MSc does a literature search often including material property data. Many of these projects have received either UK or EU funding and conducted in collaboration with various partners across Europe.

By now you should be asking “so what’s the point you’re making?” Well it’s simple - if the data was available we could have saved a lot of time and money. Over 30 plus years of data has been generated in Europe on materials for advanced ultra-super critical (AUSC) power plants with little chance of an AUSC plant ever being built in Europe. So for the companies generating this data it has little commercial value but is of enormous academic interest.

So my point is simple – let’s collect all this data in a central database for us all to access. I know this has been suggested before and attempts already made. So to get things going I have been working with a group of European partners to provide such a database that is free to access. The project was funded by the Research Fund for Coal and Steel, RFCS, and comes to a completion at the end of March 2018 and is called DP700-Phase 1, (Preparation for Commercial Demonstration Plant for 700°C Operation). Phase 1 is the collation of existing materials knowledge on AUSC materials. This database currently resides with the University of Cranfield and the Technical University of Graz.

I have proposed a Phase 1a including a wider selection of materials and the database supported on a commercial materials database company, but still free to access, and suggest that researchers across the globe could upload their references and data. To continue this effort some form of national/central funding is required. I am open to suggestions from any source that can help me keep this project going. I have an overview presentation that I gave at AUSC3 in Rome in Dec 2017 which you can view via the below link:

If you can help with funding; wish to collaborate or wish a copy of the presentation please contact me.
Dr Peter Barnard (Editor of EMG Newsletter and Co-ordinator of DP700-Phase 1)
peter.barnard@doosan.com
Energy Materials Information Streams

The EMG microsite is a mine of information relating to Energy Materials with links to various sources of information, including funding sources for collaborative research/development.

The EMG microsite is actively managed and regularly updated; the link to the appropriate location on the microsite is given below


Energy Materials Journal Contents

Volume 12, 2017, Issue 4

- Simulating novel gas turbine conditions for materials assessment: cascade design and operation
- Numerical simulation of the macrostructure evolution of a heavy steel ingot
- Study on carbide-bearing and carbide-free bainitic steels and their wear resistance
- Increased fatigue strength of partially stabilised zirconia achieved by shot peening
- Melt-spinning and semi-solid processing of bainitic steel
- Internal friction analysis of lath martensite in press hardened steel
- Analysis of flow behaviour of iron and steel using power law models
- Effect of cold rolling on plastic deformation and microstructure of bearing ring
- Microstructure and properties of Nb-bearing high-strength low-alloy surfacing layers
- Hot-rolled and continuously cooled bainitic steel with good strength–elongation combination

Volume 12, 2017, Issue 3

- Revealing heterogeneous C partitioning in a medium Mn steel by nanoindentation
- Two-body abrasion wear mechanism of super bainitic steel
- Review of principles and methods of severe plastic deformation for producing ultrafine-grained tubes
- The significance of fullerene electron acceptors in organic solar cell photo-oxidation
- Effect of manganese sulphide particle shape on the pinning of grain boundary
- Residual stress driven cracking in superalloy weldments
- Prediction of Type IV creep failure of a seam-welded mod. 9Cr-1Mo elbow based on microscopic damage simulation

IOM3 members have free online access to journal papers – log in to the IOM3 website at www.iom3.org/user and follow the link “Access online journals” at the right hand side of the page.
Committee Member Profile

Keith Barnes
(keith@keithbarnes.com)

Short CV

I have been in Packaging for over 50 years and still find it the most rewarding and interesting of careers. I am a Fellow of IOM3 and the Royal Society of Arts plus a Chartered Scientist, Chartered Environmentalist and an Accredited Packaging Professional. I was the Chairman of The Packaging Society until 2016 and remain as a Board member in addition to the Sustainability Development Group. In 2005 I was awarded Chartered Scientist status (C Sci) and subsequently Chartered Environmentalist (C Env) within IOM3.

I was the Packaging manager at Ilford Ltd for 14 years when photography was pre digital, and subsequently worked at Boots on cost reduction and innovations. Currently I am a consultant with numerous ongoing projects and as a permanent coordinator for Michigan State University Packaging Summer School in the UK annually. I have lectured internationally and written on many aspects of packaging including Innovations, Sustainability, Climate Change and retail Packaging. I have organised and chaired many courses and conferences around the world.

For 4 years I acted as a judge for the annual Starpack awards and devised the structure and trained personnel for the Global New Product Development (GNPD) packaging section at Mintel International.

Materials Interests

Energy from waste is my connection here and I can see this advancing rapidly in the future. Energy supply is always changing and renewables are high if not at the top of the list. Recycling of waste should be a part of packaging thinking in addition to sustainability. This must become a priority for the future in our ever growing world.

Outside Interests

Packaging has been, is, and will continue to be my only real interest and passion. I could say that my outside interest was reading, but that's mainly journals on packaging.
**Organisation Profile**

**RFCS**

The Research Fund for Coal & Steel (RFCS) gives funding of over €50 million every year to innovative projects to enhance the safety, efficiency and competitive edge of the EU coal and steel industries. It was created in 2002 to build on the successes of the European Coal and Steel Community (ECSC). This visionary common market helped unite nations, reinvigorate the European economy and lay the foundations for the European Union as we know it today.

The ECSC was formed in 1951 with the administrative agency established by a treaty ratified in 1952, designed to integrate the coal and steel industries in Western Europe. The main aim of this community was the rebuilding of both coal and steel industries devastated during the 2nd world war. When the treaty expired in 2002, the ECSC was dissolved and the RFCS came into being.

Investment in research and innovation is vital if the EU coal and steel industries are to remain competitive in an increasingly fierce global market and contribute to economic growth and job creation in all member states. The Research Fund for Coal & Steel unites researchers from across Europe to work on cutting-edge projects that will benefit not only the EU’s 600,000 coal and steel workers but all citizens.

These projects cover: production processes; application, utilisation and conversion of resources; safety at work; environmental protection and reducing CO₂ emissions from coal use and steel production. The revenues generated from the assets of the European Coal and Steel Community (ECSC) have been transferred to the European Union in 2002 and are used to support the RFCS research programme activities.

The RFCS programme is managed by the European Commission and the following committee and groups established to assist the Commission as defined by a Council decision: the Coal and Steel Committee (COSCO), the Coal and Steel Advisory Groups (CAG, SAG) and 12 Technical Groups. The window for the submission of proposals normally opens in June with final submission by mid Sept. Each proposal is scored independently by 3 experts with these reviewed by either the CAG or SAG and finally COSCO during December. Applicants are usually notified of the success or failure of the application by end January. Contract negotiation and signature of the grant agreements usually take a few months so 1st June is a typical start date of the approved projects.

A full listing and synopsis/summaries of all completed RFCS funded projects are available on the RFCS website. A list of the ECSC final reports is also available. For more information on the proposal application and evaluation process please use the official RFCS website, rtd-steel-coal@ec.europa.eu.
Editor’s Titbits Section

**Germany Hosts World’s Largest Dynamic Hydrogen Electrolysis Plant**

The world’s largest dynamic hydrogen electrolysis plant based on proton exchange membrane technology has been inaugurated by H&R Ölwerke Schindler, a subsidiary of H&R GmbH & Co. KGaA (Salzbergen, Germany). The facility will produce several hundred tons of hydrogen annually, based on its 5 MW electric capacity electrolyzer from Siemens.

The dynamic electrolysis plant can take advantage of sudden surges in electricity production, such as from wind turbines, to produce hydrogen. About two per cent of potential electric power is currently wasted in Germany because the country occasionally produces more electricity than it consumes. As a result, solar facilities and wind turbines are shut down.

Hydrogen-generation plants can be used as buffer storage facilities to stabilize grids in periods of high alternative electricity generation as the hydrogen produced is exploited as feedstock for refining processes.

**Three firms team up for hybrid electric plane take off**

Airbus, Rolls-Royce and Siemens have teamed up to develop a hybrid electric aircraft for take-off in 2020. The E-Fan X hybrid-electric technology demonstrator aims to push and mature the technology, performance, safety and reliability, enabling quick progress on the hybrid electric technology. The programme also hopes to establish the requirements for future certification of electrically powered aircraft while training a new generation of designers and engineers.

Airbus will be responsible for the control architecture of the propulsion system and batteries and its integration with flight controls. Rolls-Royce will provide a 2MW generator and power electronics while Siemens will deliver the 2MW electric motor.

**Siemens Awarded by American Society of Mechanical Engineers**

Siemens received an award from the American Society of Mechanical Engineers (ASME) for its outstanding technological achievement with the first successfully 3D-printed and fully tested gas turbine blades.

Earlier this year, Siemens has achieved a breakthrough by finishing its first full-load engine tests for gas turbine blades completely produced using Additive Manufacturing (AM) technology. The company successfully validated multiple 3D-printed turbine blades with a conventional blade design at full engine conditions. This means the components were tested at 13,000 revolutions per minute and temperatures beyond 1,250 degrees Celsius. Furthermore, Siemens tested a new blade design with a completely revised and improved internal cooling geometry manufactured using the AM technology.

Source Information Global Energy World: Dec 13, 2017
The past year has been the UK’s greenest on record

That is in terms of how much of the country’s power comes from clean sources. According to the latest statistics from National Grid renewable technologies and low carbon innovations have helped break a number of energy records.

For the first time, June saw wind, nuclear and solar power generate more power than gas and coal combined and in April, the UK had its first 24-hour period without using any coal power since the Industrial Revolution.

Britain’s power system is now the fourth cleanest in Europe and seventh cleanest worldwide, after halving carbon emissions in the sector since 2012.

Wind farms produced more electricity than coal plants on more than three-quarters of days through the year, which saw the cost of offshore wind fall below the price of nuclear for the first time. However, wind outstripped the output of gas on only two days of the year and overall, renewables beat fossil fuels for only 23 days in total.

Battery Storage Prevents Blackout

Tesla’s recently installed backup battery unit in South Australia has already prevented a blackout by providing 100MW of power to the grid in just 140 milliseconds. It restored power following an outage caused by a failure at the coal-fired Loy Yang power plant in Victoria. The lithium-ion battery, said to be the world’s largest, draws power from 99 turbines at a nearby wind farm and has the capacity to power as many as 30,000 homes for up to an hour in the event of a severe blackout.

Vehicle Integrated Powertrain Energy Recovery

Jaguar Land Rover is leading a project aiming to recover car exhaust heat and use it to make petrol engines more efficient. Other partners in the initiative, which is called VIPER2 (Vehicle Integrated Powertrain Energy Recovery), include Ford, European Thermodynamics and Nottingham University.

The aim is to develop a technology to recover 300 watts of power from a petrol engine and use it to drive a hybrid motor, which could boost the fuel efficiency of these vehicles by 5%. Conventional petrol engines only convert around a third of their fuel into mechanical power while the rest is lost as heat and friction. The developers hope the exhaust will heat one side of a superconductor – if the other end of the device is kept cold, a direct electric current can be generated.

Feel like you’re overpaying on energy bills?

Then feel for Mary Horomanski from Erie, Pennsylvania, who was hit with an electricity charge of more than $284 billion (£212bn), just before Xmas. Luckily for her the bill was a mistake but what a shock, the actual amount proved to be $284.46.

That’s one hell of a Xmas present!

(Ed Note: The source publication for many of these titbits is Energy Live News)
Upcoming Events

Next Committee Meetings
Wednesday 31 Jan 2018, at IOM3, 297 Euston Rd, London

EMG Workshops/Conferences
Materials Protecting the Environment Seminar – 21 Feb, 297 Euston Road, London

Other Workshops/Conferences of Interest
Energy Storage 2018 Conference, 31 Jan – 1 Feb 2018, Cologne, Germany
Lignofuels 2018 Conference, 7 - 8 Feb 2018, Amsterdam, Netherlands
ASME Symposium on Elevated Temperature Applications of Materials for Fossil, Nuclear, and Petrochemical Industries, 3 – 5 April 2018, Seattle, USA
EPRI Expert Workshop on Creep Continuum Damage Models for Structural Mechanics in Collaboration with ASME PVP, 19-20 July 2018, Prague, CZ
EuroSuperalloys 2018, 9 – 13 Sept 2018, Oxford University, UK
Parsons 2019, 16 – 18 September 2019, Cranfield University, UK

For a list of events visit www.iom3.org/energy-materials-group/events

Interested in EMG Activities?
Contact: Prof Stuart Irvine, sj.c.irvine@swansea.ac.uk
Items Relating to Newsletter Contact: Dr Peter Barnard, peter.barnard@doosan.com