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NEWSLETTER

of the

Coal Research Forum

Edited by: Dr Alan Thompson

to all of our readers

EDITOR'S COMMENTS:

I hope all of our readers and contributors have enjoyed a pleasant and peaceful Christmas and New Year and that we are all refreshed from our break and suitably optimistic for a good year ahead. Already work is in progress for our biennial conference to be held this year in Edinburgh. We were heartened by the number of non-UK attendees at the 2002 conference in London so we have decided to rename the event a 'European conference' rather than a 'UK meeting'.

Events of note during this period have been the presentation at The Royal Institution by Professor John Patrick (University of Nottingham) of the 52nd Robens Coal Lecture entitled "Coal Conversion Science: Legacy and Outlook" and the CRF Autumn Meeting featuring BCURA project presentations and held at Alstom Power, in Whetstone. In addition, we have news from the antipodes with contributions from our erstwhile editor Svenja Hanson and Eric Gimber, who both attended the 12th International Conference on Coal Science held in Cairns, Australia in early November. Perhaps even more memorable for Eric was that he also saw England win the rugby World Cup!!

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DTI's Cleaner Coal Technology R&D Programme – 4th call for proposals

The DTI has announced a fourth call for proposals for its Cleaner Coal Technology R&D Programme. Companies interested in taking part in the programme — managed by Mott MacDonald — should submit outline proposals to be received by Mott MacDonald no later than 19 March 2004. This is the final call within the current plans of the Programme

Full details of the submission process can be found on the DTI's web site at www.dti.gov.uk/energy/coal/cfft/cct/randd/index.shtml, (which will not be accessible until 30 January 2004) or contact James Felton at Mott MacDonald on 01273 365157 or by e-mail at mailto:james.felton.mottmac.com.

January 2004

52nd BCURA Robens Coal Science Lecture: "Coal Conversion Science: Legacy and Outlook" by Professor John W. Patrick, University of Nottingham Monday 13th October 2003

Once again we gathered at that most august of venues the Royal Institution in central London for the 52nd Robens Coal Science lecture. This year the title was "Coal Conversion Science: Legacy and Outlook" and an expectant crowd gathered in the Michael Faraday lecture theatre. It was about to be presented in his own inimitable style by Professor John Patrick of the University of Nottingham.
I think John would probably be the first to agree that, in hindsight, his choice of topic presented him with a real challenge to cover in one hour. However, he managed it and the lecture provided me, and I'm sure many others, in the well-filled auditorium with many surprising facts and numerous thought-provoking comments.

Professor Patrick began by defining coal conversion and it seems to involve virtually all of the coal processes of importance today, (except perhaps coal carving of which more later!). Carbonisation, combustion, liquefaction and gasification are all examples and all, even the last two, are much older than one might have imagined.

We can forgive John for starting with coal carbonisation given his research interests and background! For those who are not sure, carbonisation is "the destructive distillation of coal at above 350^{O}C in the absence of air". One of cokes early uses was drying malt for brewing. Once the efficient brewing of ale could be achieved it was then appropriate to turn to the arguably more important use of coke which was in the iron smelting blast furnace. This was developed in 1740 by Abraham Darby in Coalbrookdale. The importance of this technology, particularly in the UK, can be judged the fact that by 1790 there were 81 coke-fired blast furnaces, and by 1835 the UK output of coke of 1,000,000 tons was more than the total combined output of France, Belgium, Germany, Russia and the USA.

In addition to coke production interest in its by-product, coal tar, blossomed at this time. In the late 18th century tar was used to protect the bottoms of ships

and an infant chemical industry was starting to grow from the wide variety of useful chemicals, oils and pitches that were suddenly available from coal tar. Coke-oven gas, another carbonisation by-product, made its debut in 1792 as an illuminant and the Gas Light and Coke Company of London was formed in 1812. For a period from about 1825 to 1870 steam engines were fired by coke, after which coal was used.

The process by which coke was made developed from the early method of heating coal heaps, a process which was difficult to control and limited in size, to beehive ovens, developed for the strongly-coking Durham coals. Rectangular ovens were designed for the coking of lean French and Belgian coals and the by-product ovens of today are variations of this type.

The profusion of valuable products extractable from coal tar meant that it held a prominent place in the chemical industry from the mid-1800's. Coal tar use peaked just after World War II with products ranging from aromatic solvents, dyes, explosives, resins, pitch, boiler fuels to even aviation spirit. However, the post war availability of cheap crude oil signalled the decline of the coal tar industry.

Attention was then turned to more technical issues regarding the carbonisation process, including graphitisation, what materials were graphitisable and what were not and how the structure of graphites varied. New structures, such as 'bucky balls' containing 60 and 70 carbon atoms in a spherical molecular shape were also illustrated.

John was able to show how an understanding of their important features could result in the production of cokes with specific properties, so-called 'tailor-made' cokes. Parameters of importance include the pore size and pore size distribution, which influence what is a key property, the coke strength.

Colourful microscopic views of the texture and variation in structure within coke particles rounded off the section on coal carbonisation.

The treatment of coal tar to produce pitch was highlighted since its use in aluminium smelting electrodes, in carbon-carbon composites and as a binder and impregnant encompasses several new and developing technologies. For example, high-modulus, high-density carbon fibres are produced from mesophase pitch. The fibres are melt spun, then oxidised and carbonised at up to 3,000^{O}C.

Active carbons suitable for use in water treatment, catalyst support, solvent recovery, air purification and as a decolourising agent are prepared by thermal treatment of coal.

Combustion was the next coal conversion process to come under scrutiny. It may have come as a surprise to some but combustion is by far the highest user of coal in the world today. Annually, some 4.5 billion tonnes of coal are produced with more than 50% being used for electric power generation. Although regarded as a fuel of the past, particularly in Europe, this is far from the truth in Asia and especially in China. Furthermore, it is predicted that over the next 20 years there will be a steady 2% to 3% increase in electricity demand. 38% of the worlds electricity is generated by coal and 69% is from fossil fuels as a whole. As much as the green lobby would like coal to be replaced by renewables, the only way in which this power demand will be met is by the continuing use of coal, albeit with sensible gas clean-up and CO_2 storage protocols.

Although outwardly a simple oxidation process, coal combustion, (or even more simply carbon combustion), is far from simple as was shown by seven reactions from a list much too long to present. This is partly the reason why so much coal-related research is still necessary in the world today. Many of the physical and chemical characteristics of coal influence the way it burns and the inter-relationships of these properties cause some of the uncertainties in predicting its performance. More specifically, problems still exist regarding efficiency, emissions, flame stability, char burnout and mineral effects.

Coal gasification is based on two processes: air-blown, in which the fuel gas contains carbon monoxide (~30%), hydrogen, (~12%) and nitrogen (~55%); and oxygen-blown, which contains ~60% carbon monoxide and 30% hydrogen.
Although still regarded as a new technology, coal gasification has been around for many years. The problem has been the economics of the process. However, the world is changing and the benefits of the gasification process have begun to take on much more significance. These include the ability to clean the fuel gas before burning, the use of high efficiency cycles involving gas turbines and heat-recovery steam generators, the production of carbon dioxide in a suitable concentration for ease of capture and storage and the possibility of tailoring the process to produce hydrogen. For these reasons, more advanced technologies such as integrated gasification combined cycle (IGCC) systems are now more likely to become a commercial reality.

Coal liquefaction may occur directly or indirectly. Indirect methods convert the coal into a gaseous product which is then used to synthesise other hydrocarbon materials. Direct liquefaction involves dissolution of the coal in a suitable hydrogen donor solvent, filtration and removal of the solvent.

This is another technology which is probably much older than many people imagine. Bertholet in 1869 succeeded in converting coal into an oil-like substance. Much progress was made, however, during the first part of the 20th century when the hydrogen donor process (Bergius, 1913), hydrocarbon synthesis (Fischer Tropsch, 1925) and solvent donor process (Pott Broche, 1927) were established. German production of coal liquefaction products outstripped that of all other countries just prior to World War II with a 1939 output of 1.15 million tonnes. Political necessity at the time dictated that South Africa become self-sufficient in liquid fuels in the 1950's and the SASOL process was developed. Based on the Fischer Tropsch process, SASOL 1 produced 270,000 tonnes of product in 1956, with the larger and more advanced SASOL 2 producing 1.5 million tonnes.

The situation for liquefaction is, to some extent, similar to that for gasification in that it is of proven technology but economically unfavourable at present. Unlike gasification, however, more needs to be done to solve outstanding process problems. There has been a reawakening of interest in coal liquefaction in some countries and this stems from a number of concerns. Some of the countries which supply crude oil are in politically unstable regions such as the Middle East and parts of South America. Add to it that many countries either have their own large coal reserves such as China or have access to supplies from stable regions such as Australia, South Africa or the U.S.A. and therein is seen an alternative route to security of supply for liquid fuels.

Professor Patrick summarised the situation for coal conversion in the future as he saw it. Coal will continue to be needed to meet the demands of power-hungry nations. Coal can provide security of supply and is widely available in many of the developing countries. Coal can provide a source for hydrogen via gasification and the CO-shift reaction. This will facilitate convenient carbon dioxide collection and

sequestration. Other options for coal use include co-firing with renewable fuels such as biomass to mitigate carbon dioxide emissions and underground coal gasification where appropriate.

Challenges still exist for continuing coal use and these include the need for cleaner coal combustion with even lower emission limits for NOx, SOx, particulates and toxic elements such as mercury. All future coal-generated power will need to address the issues of carbon dioxide capture and sequestration either pre- or post-combustion. The upbeat final comment was that continuing coal RD&D will be needed to achieve these objectives. That, if recognised by funding authorities, ought to keep the coal research community happy for some time to come!!

Having enjoyed the presentation and just when we thought it was all over it became apparent that John had brought with him some samples to show us. Quite a lot of samples in fact! He kept producing them one after the other like a magician with a hat! They included a number of highly detailed coal carvings which John had gathered during his travels and was, as I said earlier, about the only non-coal-conversion process he had talked about!!
The final act of what had been a thoroughly enjoyable event was for the audience to show our appreciation to Professor Patrick following the presentation of the BCURA Coal Science medal by the BCURA President Dr Joe Gibson, after which followed an excellent buffet.

It was a sobering thought that whilst browsing the Royal Institution website I came across a list of childrens Christmas lectures. It seemed that in 1864 there was a lecture by Edward Frankland entitled 'The Chemistry of a Coal', and then four years later one by William Odling entitled 'The Chemical Changes of Carbon' was given. What an amazing substance coal is! After so long and we still have so much more to learn about it (thank goodness!!).

Autumn Meeting 2003 "The Presentation of Current Projects Funded Through the BCURA/ DTI Programme, held at Alstom Power Technology Centre, Whetstone, 2nd December 2003.

The Autumn meeting took on a slightly different format this year. In the past, following the biennial ICCS meetings there has been an opportunity for those not attending this conference to hear selected UK presentations. The number of different UK bodies present at this years event was, however, rather small, no doubt due to the costs and distances involved. Consequently, it was decided to use this opportunity to showcase the quality, variety and scope of current BCURA projects.

In a remarkably short time, David McCaffrey was able to arrange the meeting and to persuade, cajole or otherwise encourage no less than 9 different organisations to make 16 presentations- without any "no-shows". The venue was Alstom Powers Technology Centre at Whetstone, just outside Leicester, and we must give our sincere thanks to Greg Kelsall for all his help in arranging the day for us.

Nick Otter, Alstoms' Director of Technology and External Affairs, welcomed the attendees and then Greg Kelsall gave a short presentation about Alstom Power and its technology centre. The Whetstone Technology Centre operates as a Technology & Engineering Services Business providing technology, development, design, testing and manufacture of equipment for gas turbine business, to other

Alstom companies and externally in industries including gas turbines, steam turbines, aero engines and space.

The Technology Centre is closely integrated with two other Alstom R&D laboratories in Switzerland and is able to offer an in-depth capability across a comprehensive range of skills such as combustion, simulation and aerodynamics.

As the presentations have been posted on the BCURA website only brief details of the individual topics are reported at this time.

David McCaffrey, BCURAs' Technical Officer, who chaired the meeting, opened the proceedings by inviting Denis Dugwell from Imperial College to present his paper on the reactivity of gasification chars (Project B55). This work focused on the chars from the air-blown gasification cycle. These materials are produced under conditions of about 1,000^{O}C and 25 bar. One of the devices used to study the chars was the heated wire mesh reactor (HWMR). It was found that the reactivity of the chars fell when they were held at temperature for short periods of time. Similar reactivity loss was observed when the reaction gas was carbon dioxide. A small, fluidised bed reactor has also been developed for this work. The work is on-going and a test matrix has been devised in which particle size (Daw Mill coal), hold time, pressure and temperature are to be varied.

Denis Dugwell then presented work (Project B67) on a new project, which started in July 2003, on the injection of coal into the blast furnace. The BOS method is still the main route to steel making which means that blast furnace operation, and the concomitant use of expensive coke, is still required. Injection of other fossil fuels has been used successfully as a partial replacement for coke and coal appears to work well. However, the maximum injection rate seems to be between 100 and 200kg/tonne of liquid metal. Unlike coke, crushed coal cannot be used as a burden support and if used in excess of the quoted figures carbon carry over into the top of the blast furnace may occur. Furthermore, raceways are affected and operational problems have been reported. The project aims to simulate the conditions within the blast furnace raceway where high temperatures, modest pressure (3 bar), extremely short residence times and explosive devolatilisation of the coal occurs. Use of the HTWMR using very short pulses of different gases has been demonstrated. Samples have been obtained (from other BCURA and ECSC projects) from the Corus pilot plant and from an operating blast furnace. Results obtained so far indicated that gasification increased with increasing temperature but that hold time lowered the char reactivity. The rate of CO_2 gasification was only 1/50th of that in oxygen.

Peter Hall from the University of Strathclyde then presented his findings on the irreversible sorption of CO_2 by coal (Project B59, running for 2 years). Coal has a number of advantages in terms of its CO_2 sorption behaviour. Unmineable coal is often located near to industrialised sites, methane displaced from coal by CO_2 can be collected and used, CO_2 binds strongly to coal due to its quadrupole nature and flue gas can be used without pre-concentration of CO_2. Coal beds also have high permeability and offer large storage capacity and the CO_2 is bound tightly to the coal but without developing large exotherms during sorption. Low rank coals have well-developed pore networks but bituminous coals do not have a connected pore structure. Nevertheless, CO_2 diffuses easily through bulk coal material. The aims of the project were to avoid expensive field tests, to provide information about the irreversible sorption of CO_2 on coal, including binding energies, to provide kinetic and heats of adsorption data. The techniques used were differential scanning calorimetry (DSC) and temperature-programmed desorption (TPD). Dried coals from the Argonne suite were used in the study. Using DSC a well-cooled sample of coal was allowed to warm up and then heated to 200^{O}C in

the presence of CO_2. A sharp adsorption exotherm was clearly visible at $-35^{O}C$. Upon re-cooling and repeating the exercise a similar peak was obtained. In the case of the North Dakota lignite the peak occurred at the same temperature but for higher rank coals the peak was displaced. The displacement was attributed the presence of irreversibly bound CO_2. TPD data showed the activation energy to be 10kcal/mole.

Colin Snape of the University of Nottingham described work being carried out under BCURA contract B65 on the removal of CO_2 from flue gas streams using carbon separated from PFA. Conventional amine plants used to remove CO_2 in chemical processes for many years have a number of drawbacks such as the degradation of the amine, it corrosivity, the formation of foams, scaling and plugging in reactors, power requirements and overall costs. Cheaper, effective alternatives would undoubtedly be welcome. This project is looking at the collection, activation and characterisation of such carbons. So far steam activation and the use of polyethylene glycol and polyethyleneimine as impregnants have shown promise.

Jon Gibbins from Imperial College gave a presentation (Project B70) on reducing the cost of CO_2 removal using solvent scrubbing (SS). Studies indicated that the cost of electricity from supercritical PF combustion with amine scrubbing is comparable with that from IGCC with pre-combustion CO_2 removal. The general view was that the former option may be preferred to IGCC because it is viewed as a lower risk option by banks/venture capitalists. New-build plant is not therefore expected to have CO_2-capture in-built at this stage. The best option would seem to be to install "CO_2-ready" supercritical PF now, and retrofit back-end amine scrubbing as and when required. This would provide a high degree of flexibility. IGCC would be likely to have niche market opportunities for some coals and where hydrogen production were required.

Also discussed was the opportunity to exploit day/night electricity price variation to maximise plant income, i.e. if some amine storage capacity, (around 8h), was included it would be possible to store the CO_2-rich amine stream during peak electricity price. This would ensure that all of the steam goes to the steam cycle and the plant output is maintained (avoiding a 20% power loss). The stored amine would then be re-generated during low electricity price periods. The 20% 'extra' power would be virtually instantaneous and could therefore be likened to a "pumped storage system". Another option to lower the cost of solvent scrubbing was to consider alternative solvents to monoethanolamine (MEA) and a range of proprietary solvents, K1, K2 and K3 have been developed. These have a lower energy requirement for regeneration. Similarly, a reduction in the power output penalty of CO_2 capture by better thermodynamic integration between the capture/compression system and the power cycle would also be beneficial.

In conclusion it was felt that supercritical retrofits were important for PF economics (flue gas scrubbing and presumably oxyfuel). PF and IGCC costs need more detailed investigation. Flexibility can give added value to "CO_2 Capture and Sequestration" (CCS) electricity from very fast load changes, reserve capacity and the hydrogen option. There is a need to value these, and other, benefits of coal generation e.g. storable, diverse supply, no leakage, export potential and the Facilitation of low carbon generation in the developing world.

Edwige Sima-Ella from the University of Bath described the use of a new thermogravimetric (TG) analysis technique suitable for the improved determination of activation energies of chars (Project B56). The technique, which involved step-ramp heating, was found to be quicker and more reliable than the conventional methods. The duration of the test is longer but more peaks are

identified and the burnout temperature is lower with the new method. Further work is in progress to investigate the temperature difference between steps, to optimise the overshooting of temperatures and to compare PF reactivity to published results.

Jason Powis of Casella CRE Energy described the BCURA coal bank, its contents and how it is operated, (Project B57). In particular, reference was made to the problems and costs associated with the preparation and storage of the coals in the coal bank. Copies of the Handbook were made available to attendees.

Ed Lester from the University of Nottingham described new developments in understanding the nature of coal particles (Project B58) using image analysis. One of the objectives of this work was to develop methods for the measurement of maceral compositions of individual coal particles which could then be linked via intermediate char structure data to the prediction of burnout. In addition, burnout prediction using this data has been undertaken using a new modelling approach. Recent developments also include an improved method for the determination of liptinite and a novel method for categorising coal burnout based on both reactivity and coal particle size.

Phil Brisley of the University of Greenwich presented his work on digital imaging techniques for the visualisation and characterisation of fossil fuel flames (Project B60). Present flame monitoring instrumentation is limited to 'on-off' indication. However, it is known that flame characteristics are closely related to combustion efficiency, pollutant emissions and furnace safety. The present work aims to develop an imaging-based instrumentation system for the 3-dimensional quantitative characterisation of fossil fuel fired flames. Multi-camera systems provide full flame characterisation but are expensive. A single camera system is more cost-effective and simpler to install but provides a more limited characterisation of the flame. The work has so far demonstrated a 3-dimensional temperature profile using a single camera for gas flames.

Valentina Cvoro of the University of Edinburgh reported on her investigation into the effect on NOx of the interaction of burner flames in a multi-burner furnace (Project B63). Virtually all furnaces are multi-burner systems but their development and performance predictions are usually based solely on single burner test data. An understanding of the degree of burner interaction and its likely effect on NOx is therefore very important. Isothermal flow interactions and entrainment rates were measured using a $1/10^{th}$ scale model. The burner model consisted of two registers and a bluff body and the burner array was 3 x 3. Two different burner pitches were used 180mm (2d) and 144mm (1.6d). Clockwise and anticlockwise flows were modelled. Details of the effect of the interactions were reported for 2d and 1.6d configurations. Two turbulence models, the RSM and the $k\Sigma$ were found to give good agreement between measured and predicted effects.

Dr Jin Ooi from the University of Edinburgh described work recently completed on the arching propensity of coal in non-symmetrical coal bunkers (Project B54). A modelling approach has been used and the key influencing parameters that influence arching have been identified. The work is expected to lead to an engineering model which will determine the coal properties which lead to arching.

Dr Jin Ooi continued with a description of the development and testing of a coal handleability device (Project B62). Existing testers were deemed to have disadvantages in terms of speed of operation, complexity etc. In addition, 'borderline' coals were often not well predicted by existing equipment. Cohesion was found to play an important role in the process and results were found to

depend upon factors such as stress history, blending choices, moisture content and history and particle size of the coal. A device was shown which was simple, repeatable and quick to operate. For coals the moisture appears to be critical and a particular moisture content gives the highest stress value, i.e. the most difficult to handle. Work is now in progress to handle coals of particle size up to 50mm.

Mr J.R. Pillai from the University of Greenwich maintained the theme of coal handling but in this case the goal was the development of a continuous handleability monitor (Project B66). One of the aims was to develop an on-line instrument to give a continuous readout of wall friction of coal to assess its 'value of use'. Tests using a small rig have been completed using crushed glass to simulate coal and varying the speed of the feed conveyor belt. A literature survey regarding coal flow properties has been completed and further testing is planned.

Mr R. Carter from the University of Greenwich presented his first 6 months work on the development of an on-line non-intrusive system to measure particle size and PF concentration of PF in pipes (Project B68). Using a camera and laser sheet generator it has been possible to measure the size and shape of the particles. Using an electrostatic device the velocity of the particles should be measurable. The combined data should provide information on the mass flow rate of the solids. So far the technique has been demonstrated as being viable using salt and has been tested on the Innogy combustion test facility. Good agreement on particle size and concentration was achieved.

Mr N. S. Khan gave his presentation of the handling characteristics of biomass / coal mixes for co-firing (Project B69). The objectives were to provide more confidence to the users of biomass in terms of the assessment, selection and contracting for the purchase of biomass; to establish a logistics supply chain, reduce technical and financial risk and to benefit renewables and industry concerns. These would be achieved by characterising a range of biomasses and also the test equipment available to measure handleability. Methodology and validation of existing techniques would also be undertaken. The effect of segregation in coal / biomass blends was also subject to study.

Professor J. Ward from the University of Glamorgan described improvements to the design of sparge pipe air distributors in fluidised bed combustion systems, (Project B71). The project objectives were to improve the design and reliability of the simple horizontal sparge pipe, to study the fluid mechanics of a typical pipe to improve flow distribution and pressure drop and to understand the reasons for pipe distortions. The collaborators are British Sugar and a beet residue drier at their Cantley factory is being used in the project. The present status is that plant measurements are complete, a laboratory model has been developed and installed and the initial CFD predictions have been undertaken.

The Chairman closed the meeting, at 4.30pm after a well-earned vote of thanks was given to the presenters and also to the hosts. The general consensus that the meeting had been a great success and further similar events are likely to prove popular in the future.

Notes from Australia: Impressions of the 12th International Conference on Coal Science, held in Cairns, Australia, November 2nd to 6th 2003.

- A personal experience…..by Dr Svenja Hanson

…..I was going to say view, but that would have been an understatement. I volunteered to go to the conference, and to write about it, and it is only becoming clear to me now why I did it. Firstly, there is an air of change blowing through the dusty corridors of coal science – coal science is not what it once was, just plain coal science, but has taken on a political dimension. Our Australian hosts have made 'sustainability' the main theme of the conference, and I think their choice perfectly captured the 'spirit of the time'. Secondly, holding a conference this far from home for the 'usual North American and Western European crowd', attracted a whole different set of people. I spotted some of the familiar faces, but many more new ones, especially from Australia and Asia. It may not have been the largest ICCS with around 250 attendees, but it was certainly one of the most interesting and inspiring ones. I learnt a lot over the four days of the conference, not just about coal, but also about different countries around the world. And if there is one thing I want to say to the UK coal research community after the ICCS 2003 experience, it is: Think globally! Coal may not be the 'fuel of choice' in the UK at present, though these things have been known to change, but it has an enormous potential world-wide, and we can help to fulfil this.

Back to the conference. I arrived in Cairns on the Saturday afternoon before the conference, and one thing was clear from the start – this was not a place people usually go to work. I was the only person disembarking with a lap-top computer in tow. I would like to use this space to officially thank my colleague and friend Dr Karen Steel from saving me from the many distractions (mostly related to boats, fish and the Great Barrier Reef). Firstly by warning me about them, and secondly by organising a snorkelling session for us the day after the conference. Without her foresight I would have succumbed to the temptation of 'outdoor pursuits' like so many other delegates. So, here is my only criticism: Queensland was too nice a place, I've been thinking about booking a holiday and going back there ever since my plane touched down back home.

Incidentally, the lap-top computer proved completely superfluous. All our presentations were loaded into a central computer and were waiting on-line, just a mouse-click away, in each session, with a technician standing by in each meeting room just in case. And there were plenty of computers around for last minute revision or sneak previews of the proceedings CD. The organisation was perfect. Normally I do not like 'floating' between parallel sessions, but the timing was so immaculate and the rooms so close together, that it was perfectly feasible at this venue. My congratulations to the speakers, chair-persons and organisers. It was so well organised, we barely noticed you - that was meant as a compliment!!

The opening session started with an unexpected cultural treat; a few Aboriginal dances during which a fire was lit in a traditional fire-making ceremony, albeit using biomass rather than coal. Roy Jackson delivered the opening address on behalf of the Organising Committee. It was not one of the most up-beat opening addresses I have heard, informing us that coal is 'not the flavour of the month' with many governments around the world and that future ICCS events will have to adapt by becoming self-financing.

The theme of changes was picked up by the first keynote speaker David Cain, who asked us if 'we were ready to face the future'. Luckily he also told us what he thought we could expect from the future. And I for one was quite taken by the prospect of greater emphasis on sustainability. Once thought mutually exclusive, 'coal' and 'sustainability' are now being put together, and even ardent environmentalists realise that in the short term we will not be able to fulfil the need for affordable energy without coal. Maybe I need to get out more, but this was the first time that I have heard the 'them' or 'us' attitude of the renewables and coal lobbies rejected outright. Consensus has it that both are needed, and we may even come to like it and work together. That is not to say, however, that we can ignore the environmental challenges for coal ahead. On the contrary, the research community have an important role to play in solving these, mostly carbon-based, problems. Criticism from the ranks was immediately forthcoming – why, it was asked, if CO_2 capture and storage are so crucial to the future use of coal, were there a mere 5 presentations on that topic at the conference? (There were exactly five as well, I listened to all of them on Wednesday morning.) Apparently the subject has become so important that it has split off from mainstream coal science and formed its own research community. What was that about 'them' and 'us' attitudes!!

Motivated by the excellent keynote speech, I made straight for the first session on 'coal sustainability and research' and was not disappointed. It was especially interesting to hear Professor Rao's perspective. He described the status of coal in India, and concluded that without coal the country could not fulfil the basic energy needs of its growing population. I hope I do not misrepresent him in saying this – but to me he made it clear that it was not up to countries such as his to develop and try out new clean coal technologies. If we are seriously concerned about the environmental impact of coal use – and it will have to be used one way or the other – it is up to the more developed nations to demonstrate clean coal technologies and make them available through technology transfer.

Unfortunately I was unable to attend the second sustainability session, as I was presenting our work in the lesser fashionable metallurgical coke session. Carbonisation sessions at UK events can be lonely, heart-rending experiences, so I was prepared for the worst. In the event it was very pleasant, reasonably well attended and lively. There may not be much interest in Europe, but steel industries, and with them carbonisation research, are alive and kicking elsewhere. Delegates from Australia, Canada, China and Japan, to name just a few countries, were assuring me that they were still very much interested in explaining coking phenomena and improving coke quality. I'd just like to say another 'think globally' to our critics in the UK who, on occasions, have questioned the wisdom of continuing to pursue carbonisation research.

The second day of the conference started well with John Topper's keynote speech on emission standards. A look at, amongst other issues, environmental legislation may seem a little heavy for nine o'clock in the morning – and I did regret that 'last one for the road' I absolutely had to have the night before – but he kept my attention, pencil poised, throughout the 40 minutes. A full recount would amount to an entire article in its own right, and not a short one either (a suggestion to the Editor, maybe, if Dr Topper could be persuaded to make a contribution to our humble newsletter). But the outcome again was that having gone through the full SO_2, NOx – and in the US, also mercury – experience, the crucial factor is now carbon itself, in the form of CO_2. It has given rise to a new type of environmental legislation, using economic tools and limits for whole regions with a fair degree of flexibility. It also is the driving force behind current clean coal technology programmes.

After the keynote speech, I decided that Tuesday was my 'session-hopping' day, and I managed to not attend the same session for more than two consecutive presentations, thereby being treated to topics as diverse as trace element analysis, oxidation detection, microwaving, defluidisation, NOx and petrology. If I had to pick a favourite for the day, it would go to the petrology and Ms H. Beath from CSIRO: She attempted and succeeded in conducting petrographic analysis on samples containing biomass, which in my view could prove to be a valuable tool for assessing co-firing options. It impressed me, because if I had been asked to do this, I would have shaken my head in disbelief and denied it could be done. There's a lesson in there: Never say 'can't be done' unless you've tried and failed!

The other highlight of the Tuesday was, of course, the conference dinner. Luckily we had been warned that it would be less formal than in some years, so I suppose, with it being Australia, I should have guessed there would be a BBQ involved. The dinner took place outside on the lawn of the Cairns Hilton, and having got over my initial surprise, I really like the freedom to walk around and join different people for informal chats. It made it so much easier to socialise than stiff, formal sit-down dinners. The most remarkable part was the traditional Australian entertainment, especially the didgeridoo playing competition. I apologise for mentioning it, but the winner, Professor Baoqing Li, almost managed to outdo his own keynote speech, which was the main reason for getting up the following morning, in the memorability stakes. This was a most enjoyable evening indeed.

By Wednesday morning some of us were starting to show the first signs of fatigue, but that would not keep us from a bright, early start with an excellent presentation on coal R&D in China by Professor Li. As with the other keynote speeches, I could not possibly do it justice here; so, Professor Li if you are reading this, contributions to the CRF newsletter are always more than welcome. What never ceases to amaze me about China is the shear scale of everything. Think of any aspect of coal research and somebody, somewhere in China is probably working on it right now. I am most impressed by the work carried out on direct liquefaction and on underground gasification, which both in their scale and nature are unique to China, and would, or even could, not be carried out anywhere else in the world.

For the remainder of the Wednesday I assumed my usual sedentary position and listened in full to the CO_2 and pyrolysis sessions, enjoying the high quality presentations in both.

By Thursday things were definitely going downhill rapidly. To my utter shame I have to confess I missed Professor Takarada's keynote speech, which is unforgivable, as opportunities to find out about research in Japan do not abound, unless one reads Japanese fluently. It had just occurred to me that I had one more presentation to give myself, and at 9.40, so I was off doing the aforementioned last minute revision. Having survived my presentation – and I would personally like to thank all of the delegates who turned up for it so close to 'the end' - I emerged to find that two out of the three talks I had earmarked for the rest of the morning were cancelled on account of the speakers not showing up. As I said, things were going downhill fast. So it was a pleasant surprise indeed that the very last session included the very interesting, and reasonably well attended co-pyrolysis session. Definitely one of the highlights of the conference for me, and I'm glad I lasted the distance for this alone. Well, saying that, we did have to literally run for the bus and missed the closing ceremony. So I'm afraid, I do not have a clue where the next ICCS is going to be held - somewhere in Japan, was it? You will just have to watch out for the official

announcement. 2005 is a long time to plan ahead, but based on Cairns 2003, I can warmly recommend it – well worth the time, effort and expense. Did I mention I had a really great time? Just one last criticism – I didn't see a single kangaroo, or wallaby, or koala, or platypus……..

- Reflections on 12th UCCS by Eric Gimber, University of Nottingham

With great excitement on a cold and dingy autumn day I set out for Heathrow from Nottingham on the first leg of a 10,000 mile journey to the tropical location of Cairns situated in northern Queensland, Australia to attend my first major international conference. Having set out on Thursday I arrived on Saturday thanks to the 11 hour time difference after over 20 hours of flight time and a short wander round Bangkok airport. After a much needed nights rest to attempt partial recovery from jet lag the conference started on the Sunday with registration. Having found a local bar to watch the England v Uruguay rugby World Cup fixture a welcome social was held at the convention centre which gave an early opportunity to meet other delegates before the start of the conference proper.

The conference was attended by nearly 300 delegates from a wide range of countries with Australia, Japan and China being particularly well represented. It was held in the purpose-built Cairns Convention Centre which is less than ten years old. The opening ceremony contained a traditional aboriginal fire-lighting ceremony as well as didgeridoo playing and dancing. This was a great way to start the conference and wake up some travel weary delegates. In the opening keynote speech, David Cain highlighted the future for coal, where it can be used for many years to come, with technology increasing the efficiency and reducing emissions arising from its use. This is especially true in developing nations such as India and China who have large populations with a desire for energy with a plentiful supply of coal.

The conference had five parallel sessions on the first day and four on subsequent days with two poster sessions on the Tuesday and Wednesday. As with all large conferences it was sometimes a challenge to decide which session to attend but the program was structured so that most topics of interest to me did not clash. I presented my paper entitled 'Mixed Gas Sorption Studies of Coal' on the Wednesday morning, with about 20 delegates attending and a few interesting questions on my work. The conference dinner was held on the Wednesday evening and was a great success with a huge variety of food and great entertainment, the highlight being the didgeridoo playing competition.

One of the major changes for the next conference is a change of title to 'The International Conference on Coal Science and Technology' to represent the broad range of topics to be discussed. Therefore the next ICCS & T will be held in Naha, Okinawa, Japan in October 2005.

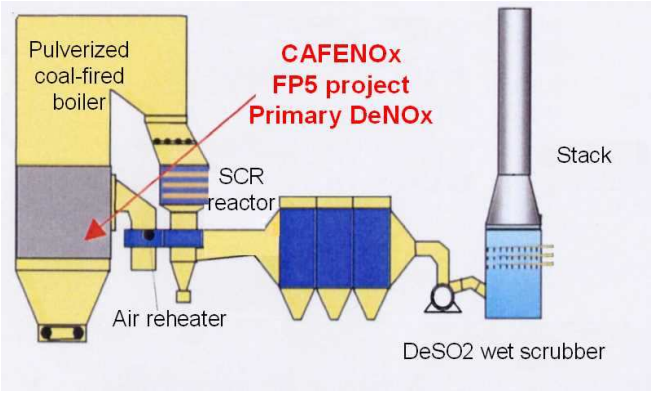
Whilst in Australia I took the opportunity to visit Brisbane and Sydney where some rugby matches were taking place, culminating in watching 'the kick' live as England won the Rugby World Cup.

DG-TREN CAFENOx PROJECT ANNOUNCEMENT

The Co-ordinator, Jacques Blondin of the research department CERCHAR of the French power company LA SNET (La Société Nationale d'Electricité et de Thermique), had announced the commencement earlier in the year of a new

Framework 5 DG-TREN project entitled CAFENOx, (Cost Abatement for Effective NOx Reduction in PF Coal-Fired Power Plants). This project has a duration of 2 years and is currently planned to be completed at the end of December 2004, (although it is possible that this end date may be extended until the end of June 2005) and will consider all aspects of primary DeNOx for existing European PF power plants facing the new environmental 2001/80 & 81 EC Directives objectives.


Centrale de Provence



The CAFENOx project is aiming at providing information, within the next 2 years, to power plant operators and investors which will enable them to determine if primary DeNOx solutions in the combustion chamber will need to be compulsory and/or sufficient prior to the introduction of the new Directive in 2008. This project and the information generated will also take into account the eventual implementation of secondary DeNOx equipment, (e.g. by SCR) with respect to the future low NOx emission limit values which will be introduced in 2016.

The CAFENOx Consortium is lead by CERCHAR as the Co-ordinator and consists of 2 European power companies, LA SNET in France, who operate coal-based power plants and PPC in Greece, who operate lignite-based power plants, 2 Universities, the University of Zaragoza in Spain (CIRCE), the University of Athens in Greece (NTUA-LSB), both of them skilled in coal combustion and modelling and the research organisation IFRF-RS in the Netherlands, who are specialists in all aspects of combustion.

Among the tasks to be carried out by the Consortium, one of the first will be devoted to a peer review of the existing PF power plants covered by these new European regulations, to include both those who have already solved their NOx problems and those who are still awaiting the appropriate information to allow them to choose the most suitable solution. CERCHAR/LA SNET kindly seeks the co-operation of the operators and owner of these coal-fired units with the Consortium members who will be asking them for information about their units, the solutions they have already implemented and their experiences with the installation and operation of NOx emission reduction equipment.

The Framework 5 CAFENOx project will then hold an international public seminar, in Greece, at the end of this project, to present the results which have been obtained and which, at that stage, should be the most accurate and reliable information available dealing with efficient and cost effective primary DeNOx solutions for PF units.

For further information on this CAFENOx project, please contact the Co-ordinator, Jacques Blondin at CERCHAR/LA SNET, Rue Aimé Dubost, BP No.19, FR-62670 Mazingarbe, France, E-mail, jacques.blondin@snet-electricite.fr.

UK Coal agrees £200 million supply deal

From Process Engineering, 13 November 2003,

UK Coal PLC has agreed terms with EDF Energy under which between seven and eight million tonnes of coal will be supplied to the company's two Midlands power stations over a three-year period. The agreement, worth around £200 million, takes effect in January 2004 and supplements existing arrangements under which around half a million tonnes of coal will be supplied to EDF Energy's West Burton and Cottam power stations in 2004. EDF Energy's West Burton and Cottam stations are both of 2000MW capacity, and are in the process of being equipped with flue gas desulphurisation (FGD) plant designed to remove around 90% of sulphur dioxide emissions from the coal combustion process.

'This agreement will provide both security for our collieries and employees and for the power stations and their customers,' said UK COAL Chief Executive Gordon McPhie. 'Long term contracts like these will help to reduce the impact on our customers of the volatility of wholesale prices. Stable fuel costs have obvious benefits throughout the whole energy chain and support low, stable prices for customers,' commented EDF Energy's Chief Executive Vincent de Rivaz.

Threat to industry, says UK Coal as government faces sulphur dilemma

Mark Milner - Monday November 17, 2003 - The Guardian

The government has 10 days to decide how to fulfil a Brussels directive on sulphur emissions which could threaten the future of the British coal industry, according to the country's leading producer. UK Coal believes that if the government opts for a national plan under the large combustion plant directive, most coal-fired power generators would be forced to switch to imported coal which has a lower sulphur content, decimating demand for UK coal. But big energy users argue that the national plan, which allocates individual producers with defined levels of sulphur dioxide based on past emission levels, would be cheaper for consumers.

Gordon McPhie, the chief executive of UK Coal said Britain was being asked to reduce sulphur dioxide emissions by 575,000 tonnes a year, but that the electricity supply industry was being asked to find the bulk of the reductions. "The whole policy is based on getting the generators to reduce their emission levels," said Mr McPhie, but using any plant not fitted with flue gas desulphurisation equipment (FGD) and burning British coal would soon hit their emission levels and force them to halt generation. "The impact could be to close down the indigenous coal industry." Instead Mr McPhie argues for the alternative based on emission limit values - a system which allows coal-fired power stations to keep producing if flue gas emissions reach a certain standard of cleanliness. He equates this to standard MOT car exhaust tests and says it would provide greater flexibility though it would require those producers not fitted with FGDs to have them installed. But others favour the national plan. Jeremy Nicholson, the director of the intensive energy users group, an umbrella organisation for industries such as coal, steel and chemicals said: "The national plan option will be the lowest cost [option] for industry."

The Department for the Environment, Food and Rural Affairs is still deliberating the issue. "This is not going to be an easy decision. It must be based on a considered assessment of the costs and benefits to all UK industry," a spokesman said.

UK's Blair woos banks for emissions trading scheme

UK: October 27, 2003

LONDON - Ten major investment banks sat down to an "environmental" breakfast with Britain's Prime Minister Tony Blair at Downing Street this week to discuss a new European emissions trading scheme.

Senior executives from Morgan Stanley (MWD.N: Quote, Profile, Research), French bank Societe Generale (SOGN.PA: Quote, Profile, Research) and Barclays Capital (BARC.L: Quote, Profile, Research), were among those invited to discuss an emissions trading market for the City of London, a Downing Street spokeswoman confirmed on Friday.

One banker who attended said Blair wanted to discuss what the City of London could do to help with the climate change initiative. "There are a lot of emission rights which could be traded in the future when the new EU directive is put in place," he said. Margaret Beckett, Minister for the Environment, Food and Rural Affairs, also attended the breakfast.

From 2005 European Union companies in the power, iron, steel, glass, cement, ceramic, pulp and paper industries will have to have "emission rights" or "carbon permits" to cover their carbon dioxide emission each year. In Britain this will involve about 2,000 installations. Under an emissions trading scheme, companies which cut emissions by more than they initially pledged, would be able to sell them on as "credits" to firms unable to meet required reductions.

Britain has been running a voluntary emissions trading scheme since April last year. But from January 1, 2005, a European emissions trading scheme will come into force for all 15 member states, plus the 10 accession states.

"This should be an attractive market for financial institutions to be involved in and with our experience of the voluntary scheme, London is ideally placed to be a base," the Downing Street spokeswoman said.

The proposed UK scheme could mirror a similar exchange set up in Chicago. The Chicago Climate Exchange gives companies credits for cutting carbon dioxide emissions.

Story by Alistair MacDonald and Jane Merriman

REUTERS NEWS SERVICE

World's First Coal Mine Methane Fuel Cell Powers Up in Ohio.

Issued on: October 22, 2003 by US DoE Office of Fossil Energy.

New Technology Mitigates Coal Mine Methane Emissions, Produces Electricity

Hopedale, OH - In a novel pairing of old and new, FuelCell Energy of Danbury, Conn., has begun operating the world's first fuel cell powered by coal mine

methane. Funded by the Department of Energy, the demonstration harnesses the power of a pollutant - methane emissions from coal mines - to produce electricity in a new, 21st Century fuel cell. "We believe this technology can reduce coal mine methane emissions significantly while producing clean, efficient, and reliable high-quality power," Secretary of Energy Spencer Abraham said. "This has the dual benefit of reducing greenhouse gases while supporting our energy security by generating power from readily available domestic fuels." The technology supports President Bush's initiative to reduce America's dependence on foreign oil by developing commercially viable fuel cells to power cars, trucks, homes and businesses. Because it's fuelled by coal mine methane - a greenhouse gas that could otherwise be released to the atmosphere - the demonstration project also supports the President's Climate Change Initiative. The six-month demonstration at the Rose Valley coal mine methane test site in Hopedale, Ohio, features FuelCell Energy's innovative Direct FuelCell® technology. The 200-kW power plant generates enough electricity to supply an average of 40 homes. A successful demonstration could pave the way to the use of fuel cells to mitigate coal mine methane emissions while producing power at high efficiency and very low emissions. Fuel cells operate somewhat like batteries - but unlike batteries, a fuel cell does not run down or need recharging; it will produce electricity and heat as long as fuel is supplied. Since the fuel is not burned, there is none of the pollution commonly associated with the combustion of fossil fuels. Fuel cells are quiet, efficient, and virtually pollution-free. In addition to these advantages, Direct FuelCell® power plants can use hydrocarbon fuels to produce electricity without the need to first create hydrogen in an external fuel processor. Because hydrogen is generated directly within the fuel cell module from readily available fuels—in this case, coal mine methane—these power plants are ready today, and do not require the creation of an extensive hydrogen infrastructure. Methane is the second major contributor to global warming after carbon dioxide, and emissions from coal mines account for approximately 10 percent of anthropogenic methane emissions world-wide. In 2000, U.S. coal mines released 196 billion cubic feet of carbon dioxide equivalent; of this, only 18 percent was recovered and used. Coal mine methane has an estimated world-wide energy potential of more than 1,000 MW. If this potential were harnessed efficiently with fuel cells, it could help meet an increasing demand for energy while having a beneficial effect on the environment. "We anticipate that this demonstration will lead to the utilisation of fuel cells at other coal mine methane locations world-wide," said Dr. Hans Maru, Executive Vice President and Chief Technology Officer of FuelCell Energy. "FuelCell Energy's Direct FuelCell power plants are currently operating globally on natural gas, digester gas, and, later this year, on syngas from coal. The addition of coal mine methane to the list of useable fuels demonstrates the flexibility of Direct FuelCell power plants, that can operate on any hydrocarbon fuel." The National Energy Technology Laboratory, the research laboratory for the Department of Energy's Office of Fossil Energy, is managing the three-year project. Total cost of the project is approximately $7 million dollars, shared equally between the Department of Energy and FuelCell Energy.

ScotPower joins talks for US clean coal project

The Times, Monday November 20 2003 by Angela Jameson

Scottish Power is in discussions with the US Department of Energy and rival power companies to develop a power station that runs on clean coal as a solution to the problems of global warming. The Scottish company is one of nine electricity companies and coal mining groups working with the US Government on a $1billion initiative launched by President Bush. The aim of the programme is to develop a power station that does not emit harmful greenhouse gases that damage the environment. If successful, the plant will help to silence critics of the

Republican Administration who are angry at President Bush's refusal to sign the Kyoto Protocol, designed to reduce global carbon dioxide emissions. President Bush, when launching the programme known as FutureGen said:"This project will be undertaken with international partners to dramatically reduce air pollution and capture and store emissions of greenhouse gases". Scottish Power is one of nine companies that have signed up to the programme. Other participants include American Electric Power, Southern Company, TXU and Kennecott Energy, a member of the Rio Tinto group. Talks are continuing over the financial commitment each company will make to FutureGen but it is understood that by the time the project reaches an operational phase there is likely to be revenue from the sale and the company stand to share any yield gain with the government. A deal over the financial commitment and likely return that each company will make is expected in the new year. The partnership between the private sector companies and the US Government has been kicked off with several million dollars of government funding and is likely to span the next ten years. At present discussions have concentrated on the structure of the agreement but research and development work is expected to begin next year. The priority of the project is to develop and construct a unique power station that runs off coal and is capable of producing electricity and hydrogen with almost no emissions. The power station will produce electricity for consumers as well as hydrogen to power a fuel cell-based transportation system. A critical part of the project will be finding a way to capture the carbon dioxide generated in the process and to store it underground. Techniques used in the oil industry are likely to be adapted to store carbon dioxide permanently underground in appropriate geological strata. The underground locations would have to be constantly monitored and would probably only be appropriate in unpopulated areas of the US. Washington's decision to find a way of relying on coal comes as other Western economies are turning their backs on the solid fuel as their main source of cheap electricity. In Europe, environmental legislation is making coal-fired power plants uneconomic. The UK in future is planning to supply 80 per cent of its energy needs from gas and 20 per cent from renewable sources. The US, however, has coal deposits of more than 300 years, and the reward for discovering a way of burning the fossil fuel in a clean way would be far more advantageous than it is in other Western economies.

Malaysia plans to build more coal-fired power plants - report

KUALA LUMPUR, Nov 26, 2003 (AFX-Asia via COMTEX) --
More coal-fired power plants are being planned to increase the country's electricity sources and reduce dependency on natural gas, The Star newspaper reported, quoting Energy Commission chairman Mohd Annas Mohd Nor. Presently, about 70 pct of Malaysia's electricity comes from natural gas, with the remainder from diesel, oil, hydropower and biomass. Over the next 10 years, the plan is to increase coal's contribution to about 25-30 pct of the generation of fuel sources, from about 8 pct currently, Mohd Annas said. "We know that it is not a clean source of fuel, but it is abundant and affordable," he said. Electricity demand for residential and commercial use is likely to increase by an average of 6-8 pct a year, he noted.

One of the River Tyne's most important monuments to the coal industry has been partially destroyed in a fire.

BBC News - Thursday, 20 November, 2003, 11:36 GMT

A large section of Dunston Coal Staithes, reputedly the largest wooden structure in Europe, has collapsed into the water. The timber pier-like structure was constructed in 1890 by the North Eastern Railway Company and was used to carry coal onto ships for transport to London and the continent. The site around the staithes is currently being developed by designers Wayne and Geraldine Hemingway with Wimpey Homes in a high-profile housing development called Staiths South Bank. The "intense" blaze broke out on the 1,700-feet-long Gateshead landmark at 0230 GMT on Thursday. At the height of the fire, 17 appliances and 67 fire-fighters, some wearing life jackets, were at the scene along with the fire boat. Mr Hemingway said he was "devastated" by the fire. "The staithes is a lot more than just a lump of wood in the Tyne, it is a magnificent structure and very important to the area's industrial heritage. "I'm an optimist and I hope that people will now do their utmost to recognise its importance and get the staithes back into use over the next few years." Ronnie Baird, managing director of George Wimpey City, said the company was "extremely sad" to hear the extent of the damage."

Tailings

- American Electric Power is looking to sell its UK power stations by the end of 2004, including Ferrybridge in Yorkshire and Fiddler's Ferry in Cheshire. 20-Oct-03
- Innogy is to revive the Fifoots Point power station in South Wales, as part of an agreement with the plant's receivers KPMG. 13-Oct-03
- Coalpower has placed Hatfield Colliery into administration, casting doubt on the future of 220 jobs. 04-Dec-03
- The Department of Trade & Industry has awarded a £1.1m grant for the expansion of the Aberpergwm Colliery near Glynneath, with the creation of up to 78 jobs. 02-Dec-03
- UK Coal has secured a £36m government grant to invest in eight deep mines in Yorkshire, the Midlands and the North-East. 01-Dec-03

Student Bursaries for the 2004

Up to 6 travel bursaries for up to £250 are on offer to bona-fide full-time students wishing to attend a suitable coal-related conference. To apply, please send the abstract submitted to the conference with a brief supporting letter from your supervisor to:

Prof. J.W. Patrick
SChEME
The University of Nottingham
Nottingham
NG7 2RD

The bursaries come with no obligations to the recipient other than to supply a short essay about his or her impressions of the conference to the Newsletter for inclusion in the next edition.

Forthcoming Events

"The Fossil Fuel Foundation of Africa are pleased to announce a Colloquium on "Fluidised Bed Combustion and Gasification for Power Generation" to be held at Montecasino, Johannesburg, South Africa on 18th February 2004. The subjects covered by this Colloquium will include current South African environmental legislation, qualities of low grade coal and discard, process technologies for power generation, EU environmental legislation, cleaner coal technologies, FBC pros and

cons, case studies, economics and efficiencies, FB gasification and biomass and future considerations.

"The IEA Clean Coal Technology Centre are pleased to announce the "21st Annual International Pittsburgh Coal Conference", to be held at Osaka, Japan on 13-17th September 2004. The Conference, focusing on "Coal - Energy and the Environment" will present an in-depth update of new and emerging technologies as well as an examination of the recent environmental issues and their effect on the utilisation of coal from a global perspective.

Full details of both of these events, including contact addresses, are shown in the Calendar of Events below.

Update on current EPSRC projects – subject Coal Technology

1. New Catalysts For the Hydrocracking of High RMM Fractions of Coal Derived Liquids And of Heavy Hydrocarbon Liquids.
   Principal Investigator: Professor AV Bridgwater
   Other Investigators: Dr JA Hriljac
   Project Partner: Volclay Ltd
   Department: Sch of Engineering & Applied Science
   Organisation: Aston University
   Starts: 1 April 2002 Ends: 31 March 2005, Value: £94,361

2. A Study of the Combustion of Coal by Imaging the Burn-Out of Carbon and the Formation of Ash.
   Principal Investigator: Professor AR Jones
   Department: Chemical Engineering & Chem Technology
   Organisation: Imperial College London
   Starts: 1 April 2002 Ends: 31 March 2004, Value: £178,690

3. Investigation of Synergistic Activity During the Co-Pyrolysis of Coal and Biomass. Principal Investigator: Dr JM Jones
   Other Investigators: Professor KD Bartle, Professor A Williams
   Department: Fuel and Energy
   Organisation: University of Leeds
   Starts: 1 July 2003 Ends: 30 June 2006,Value: £189,327

4. JREI: Thermal Analysis Equipment to Underpin the Fuel Technology Programme Encompassing Clean Coal Research .
   Principal Investigator: Professor CE Snape
   Other Investigators: Dr M Cloke, Dr E Lester
   Project Partners: Powergen U K Plc, TXU-Europe, CPL Environmental & Analytical, Thermal Instruments Ltd., Perkin Elmer Ltd., BCURA.
   Department: SChEME Organisation: University of Nottingham
   Starts: 30 April 2002 Ends: 29 April 2005, Value: £65,256

5. Modelling the Uncertainty and Risks Associated with the Design and Life Cycle of CO_2 Sequestration in Coalbed Methane Reservoirs.
   Principal Investigator: Dr A Korre
   Project Partner: Alberta Research Council
   Department: Environmental Science & Technology
   Organisation: Imperial College London
   Starts: 1 September 2003 Ends: 31 August 2006, Value: £126,960

6. An Innovative Coal Gasifier Utilising Steam From Waste Incineration Raised to Ultra-High Temperature.
   Principal Investigator: Dr NV Russell
   Other Investigators: Professor J Swithenbank
   Department: Chemical & Process Engineering
   Organisation: University of Sheffield
   Starts: 30 July 2001 Ends: 29 July 2004, Value: £66,588

7. New Catalysts For the Hydrocracking of High RMM Fractions of Coal Derived Liquids and Heavy Hydrocarbon Liquids.
   Principal Investigator: Professor R Kandiyoti
   Other Investigators: Professor DR Dugwell, Dr AA Herod
   Department: Chemical Engineering & Chem Technology
   Organisation: Imperial College London
   Starts: 1 December 2001 Ends: 30 November 2004, Value: £110,715

8. The Development & Implementation of An Advanced Coal Combustion Sub-Model For CFD codes.
   Principal Investigator: Professor A Williams
   Other Investigators: Professor M Pourkashanian, Dr JM Jones
   Project Partner: Powergen U K Plc
   Department: Fuel and Energy
   Organisation: University of Leeds
   Starts: 1 January 2001 Ends: 30 September 2003, Value: £130,484

9. The Link Between Coalbed Methane Sorption & Microlithotype Structure
   Principal Investigator: Dr E Lester
   Department: SChEME
   Organisation: University of Nottingham
   Starts: 1 September 2000 Ends: 31 August 2003, Value: £62,602

10. YAN-CE: Young Academics Network for Chemical Engineering
    Principal Investigator: Dr MJH Simmons
    Other Investigators: Dr P Styring, Dr W McMinn, Dr B Saha, Dr P Lettieri, Dr P Linke,
    Dr Y Ding, Dr KVK Boodhoo.
    Department: Chemical Engineering
    Organisation: University of Birmingham
    Starts: 1 April 2003 Ends: 31 March 2006, Value: £63,478

Total number of projects:	**10**
Total value of support:	**£1,088,462**

CALENDAR OF COAL RESEARCH MEETINGS AND EVENTS

Date	Title	Location	Contact
17-19 February 2004	Zero emissions technology	Conrad Jupiters Convention Center, Gold Coast, Queensland.	Zero emissions technology Further details on IEA Coal Research webpage.
18 February 2004	"Fluidised Bed Combustion and Gasification for Power Generation", hosted by the Fossil Fuel Foundation of Africa	Montecasino, Johannesburg, South Africa	The Conference Secretariat AquaOrange Event Coordinators PO BOX 411699 Craighall 2024 Johannesburg, RSA Tel : +27-83-278-5886 Fax : +27-11-880-1237 E-mail: heather@aquaorange.co.za Website: www.fossilfuel.co.za
March 2004 (Date to be announced)	Meeting of the Coal Preparation Division	Venue to be announced	Mr A Bailey, UK Coal Mining Ltd., Harworth Park, Blythe Road, Harworth, Doncaster, South Yorks, DN11 8DB Tel : 01302-755100 Fax : 01302-755254 E-mail : abailey@ukcoal.com
21 Apr 2004	McCloskey's 8th coal UK conference	London, UK,	Justine Clark, The McCloskey Group, PO Box 15, Petersfield, Hampshire, GU32 3HX, UK Tel: +44 1730 265095 Fax:: +44 1730 260044 Email: justine.clark@mccloskeycoal.com
May 2004 (Date to be announced)	Annual Meeting of the Coal Research Forum/ Coal Characterisation Divisional Meeting	Venue to be announced	Dr D J A McCaffrey The Coal Research Forum P.O. Box 154 Cheltenham GL52 5YL Tel: 01242 236973 Fax: 01242 516672 E-mail: david.mccaffrey@easynet.co.uk
25-27 May 2004	Power-Gen Europe	Barcelona, Spain,	Jane Stevens, PennWell Corporation, PennWell House, Horseshoe Hill, Upshire, Essex EN9 3SR, UK Tel: +44 1992 656 637 Fax: +44 1992 656 704 E-mail: attendingpge@pennwell.com Internet:

			www.powergeneurope.com
June 2004 (Date to be announced)	Meeting of Combustion Division/ Presentation of the work of Industry to Academe	Provisionally, Longannet Power Station, Scotland	Dr A W Thompson, SChEME, The University of Nottingham, Nottingham, NG7 2RD Tel: 0115-951-4198 Fax: 0115-951-4115 E-mail: alan.thompson@nottingham.ac.uk
July 2004 (Date to be announced)	Joint Meeting of the Environment and Advanced Power Generation Divisions, provisionally "Underground Coal Gasification"	Venue to be announced	Mr P R Cooper Tel and Fax: 01473-727997 E-mail: prcooper@hotmail.com Mr P W Sage Tel: 01235-432098 Fax: 01235-452753 E-mail: peter.sage@aeat.co.uk
6-8 September 2004	5th European Conference on Coal Research & Its Applications	University of Edinburgh	Organised by the Coal Research Forum Contact Dr A.W.Thompson Tel: +44 115 951 4198 Fax: +44 115 951 4115 Email: alan.thompson@nottingham.ac.uk
13-17 September 2004	21st Annual International Pittsburgh Coal Conference	Osaka International Convention Centre, Osaka, Japan	University of Pittsburgh School of Engineering Dominion Centre for Environment and Energy 1249 Benedum Hall Pittsburgh, PA 15261, USA Tel : +1-412-624-7440 Fax : +1-412-624-1480 E-mail: pcc@engr.pitt.edu Website: www.engr.pitt.edu/pcc
11 October 2004	53rd BCURA Robens Coal Science Lecture	The Royal Institution, Albermarle Street, London	Mr J D Gardner, BCURA Company Secretary, Gardner Brown Ltd., Calderwood House, 7 Montpellier Parade, Cheltenham, GLOS, GL50 1UA Tel : 01242-224886 Fax : 01242-577116 E-mail : john@gardnerbrown.co.uk