UPDATES: MP&EM BOARD ACTIVITIES

- The third MP&EM Board meeting of 2016 was convened at the London offices of IOM3, 297 Euston Road, on 29 September. This was followed by the IMMA meeting which included an interesting presentation by Ian Duncan of the Australian Academy of Technological Sciences and Engineering on Nuclear Waste Disposal.

- Professor John Monhemius and Tony Francis attended the Young Persons lecture completion at the RSM on 10 March 2016 organised by MinSouth. The winner was Josh Read with a paper on Environmentally Sustainable Mining Practice. Full details are available from the MinSouth website, MinSouth.

- Those IOM3 members with an interest in MP&EM are reminded that the technical journal representing our discipline is IMM, Transactions C now published by Taylor & Francis and free to download via the web site. The journal publishes high quality refereed papers at the leading edge of MP&EM, MP&EM Trans C.

- The MP&EM annual report for 2016 is available to all IOM3 members from the web site.

- The CPD facility on the IOM3 web site is available for members to keep their records updated.

NOTES FROM THE EDITOR

We have a fantastic issue in store for you—just check out our cover photo! Professor John Monhemius, explains the story of Mining Gold from the Caucasus Mountains. Thank you for your insightful contribution, it’s a great read.

We are also joined this issue by Frances Perry who tells us all about how we can access the information contained on IMMAGE and in the technical library—a vital resource.

I would love to receive stories or articles from our members for publishing! If you have an article you would like to share, please get in touch with me (see page 9 for contact details). Until next time.....enjoy!
CALL TO CONFERENCE!

“The Minerals Processing & Extractive Metallurgy Board of IOM3 is arranging a highly topical Conference entitled “Emerging Trends in Minerals Engineering” focussing on the latest developments in MP&EM to improve efficiency and reduce costs. The event will be held at the headquarters of IOM3, 297 Euston Road on 12th and 13th December 2016. The provisional programme has been finalised with 24 interesting and relevant presentations including the keynote by Professor Sam Kingman on the Use of Microwaves in Minerals Processing, there are also poster displays. Late submission of abstracts will still be considered and registration is available through the web site”  

Tony Francis

MP&EM 2016 Conference

Sponsorship to date includes Behre Dolbear and Anglo Asian Mining Plc.
A quick glance at the “Technical Information” section of the IOM3 web site may raise more questions than it answers! **Why** is there such different provision for members of the material divisions and the mineral divisions? **Where** (if anywhere) is the easy-access electronic resource? All you want to know is (let’s say) the advantages and disadvantages of non-cyanide gold extractants, but **whom/how** do you ask?

**Why technical papers, not technical specialists?**

For purely historical reasons! Information on metals, polymers, ceramics and composites is provided by the information team giving direct advice from their professional experience or signposting members on to the appropriate body, whereas information on minerals and their extraction is given by reference to the technical literature collected and subject-indexed over the past century or more. That’s because by 2002, when IOM and IMM merged, the latter was continuing to maintain its technical library whereas the former had gone down a different path.

**Why not scan and put it online?**

The good news is that we’re about to scan all the Institute’s own publications, including those of the IMM and IMinE, to make them directly available to members online. It’ll take a while, but the pilot project is well under way and it’ll be the minerals and mining publications that will be done first, because a platform’s already available to host them – OneMine, which already includes the publications of several of the other Institutes of Mining and Metallurgy (SME, AusIMM, SAIMM etc.)

The bad news is that we can’t scan the rest of the library – logistically it would be a colossal task but in any case legally most of the material isn’t ours to copy! Even pre-war material is often still in copyright; think about it – if a young journalist or academic retained the copyright of something published in 1916 or even as early as 1906, there’s a fair chance they were still alive by 1946 or long after – and copyright now lasts for 70 years after the author’s death.

So apologies, we can’t give you electronic access to the entire text of every book, journal or conference volume in the library, much as we’d love to!
Where is the library nowadays if it’s not in London?

It’s all in Grantham now, serials/journals in The Boilerhouse and the rest 150 yards away in the new library unit (excitingly known as Unit 17). Grantham’s an hour north of King’s Cross and The Boilerhouse is 15 minutes walk from the station.

It’s still in London! That is, if what you need is limited to what Frances (our sturdy pack-horse) can carry on her back from Grantham twice a week. I’ve a shelf in the Members’ Area on the fourth floor of 297 Euston Road where I currently have volumes being used by three different library visitors who come in to consult them. When you’ve finished, I can take them back.

It’s at your desk! Loans, photocopies and online access to references and abstracts are still very much available, subject to postal and photocopying charges.

Where’s the online access on the web site?
Before you look for anything, log in at www.iom3.org using your member username and PIN. Once you’ve done that, follow the prompts under “Publications – journals” http://www.iom3.org/journals for your free access to the full text of papers in the Institution’s technical journals (in your case, Mineral Processing and Extractive Metallurgy) from about 2002 onwards, or “Publications – IMMAGE” http://www.iom3.org/immage-reference-database-international-minerals-industry for your free access to references and technical abstracts of relevant library content from about 1979 onwards.

How do I find the answer I need right now?
Log in and search IMMAGE and/or ring or email Frances on 020 7451 7324 (Grantham library 01476 573 968) or Frances.Perry@iom3.org. For those non-cyanide lixivants I gave as an example, start with a global-text search of IMMAGE (put the search phrase in speech marks) and use that to choose keywords for a more targeted search e.g. I just tried Global Text: “alternatives to cyanide”, flicked through the ten abstracts and their keywords, then set the field to Keywords and tried out a few (using brackets and and/or/not) - Keywords: gold AND (lixiviants OR thiosulphates OR thiourea OR ammonium thiosulphate) – bingo! – 398 abstracts full of information from which to decide which suggestion to pursue in a more focused search. Sounds far too complicated? Ring or email me to ask!

How can I improve future provision?
Remember to keep using your library/information service. Ideally, get your company to subscribe to IMMAGE too, so your non-member colleagues have access and support the service financially. Keep giving me plenty of feedback – I need to know, for example, whether you’d rather we kept the link between IMMAGE and library (i.e. everything on IMMAGE is available from the library) or whether you’d prefer more IMMAGE coverage of other online journals, papers and reports that you can then get hold of yourself. Offer to donate any journals or conference proceedings you no longer need to have immediately to hand - so that everyone can benefit from their technical content over future decades!
Volunteer to pilot-test our scanned publications for OneMine as and when required. And if you have any other suggestions, let me know!

- Frances Perry
In 1860, Walter Siemens bought a copper mine near a place called Gedabek, which lay in Alpine-like meadows at an altitude of 5000ft in the Lower Caucasus mountains in the remote southern region of the Tsarist Russian Empire. Today this region is part of Azerbaijan, one of the several independent countries that emerged in Central Asia following the collapse of the Soviet Union in 1991. Walter was a member of the famous German Siemens family whose entrepreneurial activities in the nineteenth century, particularly those of his elder brother, Werner, established the industrial dynasty, Siemens AG, which today is the largest engineering conglomerate in the European Union. Werner Siemens’ principal activity at that time was installing telegraph communications systems between the major cities in the Russian Empire. To do this required enormous quantities of copper wire to cover the vast distances between cities in that huge country. Sourcing sufficient copper to supply all this wire for his brother’s activities was the rationale behind Walter’s purchase of the mine at Gedabek.

Copper had been mined intermittently at Gedabek since pre-historic times, from what today is recognised as a large, complex, copper-gold porphyry ore body. At the time Walter made his purchase, the mine was owned by Greeks, but the mining methods and the living conditions for the workers were extremely primitive and Walter was determined to bring modern German mining technology and living standards to the people of Gedabek. However he hadn’t bargained on the difficulties he would encounter in achieving these objectives. The distance between Gedabek and the

Gedabek mine and smelter in 1870s

Round reverbertory furnace at Gedabek
nearest seaport, Poti in Georgia, on the Black Sea, is over 500km and in those days, there was no railway, nor even proper road connections between the two places. All the materials and machinery required to build a mine, smelter and modern township had to be shipped from Europe via the Black Sea to Poti and then transported overland on primitive roads and tracks by horses and donkeys. In spite of these difficulties and the large investment required, Siemens persevered and within a few years Gedabek had a state-of-the-art underground mine, a copper smelter and refinery and a town with stone houses built in the German style, a church, a school and an inn.

Over the next half century, some 70,000 tons of copper were produced, together with significant amounts of gold and silver, and the town of Gedabek prospered. However in 1914, all this industrial activity was disrupted by the start of the First World War and the production of copper declined dramatically, finally ceasing in 1922, when the remaining Germans abruptly left the country, following the Bolshevik revolution and the formation of the Soviet Union. During the Soviet era, extensive geological exploration of the Gedabek region was undertaken by Soviet geologists, but mining was not recommenced and the local economy, which had slumped as copper production dwindled, had to rely primarily on subsistence agriculture throughout the protracted Soviet period.

In 1996, Reza Vaziri, an Iranian-born American entrepreneur, who had made a fortune importing Caspian caviar from Azerbaijan into the United States, signed an agreement with the Azeri government giving him the rights to explore and exploit the mineral potential in six blocks of territory within Azerbaijan. One of these blocks included the long defunct Siemens mining area at Gedabek. This was the first grant of mineral rights made by the Azeri government since the foundation of the independent Republic of Azerbaijan. As there was no mining code in the Azeri legislation, a Production Sharing Agreement was drawn up by government lawyers, modelled on the contracts used within Azerbaijan’s extensive oil and gas industry, wherein the government would receive part of the production from the mine in lieu of royalties.

Vaziri had no experience of the mining industry and had to learn the hard way. Eventually, after a number of false starts, in 2006 he floated a company on the London AIM stock market to raise capital and Anglo Asian Mining plc was born, with Vaziri as its President and principal shareholder. Three years later, in June 2009, a new open pit mine and processing plant at Gedabek was formally opened by the President of Azerbaijan, Ilham Aliyev. The new mine was situated on the same ore body that had been exploited during the Siemens era, but instead of copper, Anglo Asian’s principal objective was the production of gold from the mineral deposit.

Like many start-up gold mining companies, Anglo Asian Mining selected low cost heap leaching with cyanide to extract gold from its ores. However, because of the copper minerals in the Gedabek ore body, it chose not to use conventional carbon adsorption to recover gold from the leach solutions, because of the poor performance of carbon when there are significant concentrations of copper in solution.
Instead, the company decided to pioneer the use of a gold-selective ion exchange resin called Minix, which had been developed in South Africa at Mintek and commercialised by Dow Chemicals, a major resin manufacturer. Furthermore, in order to control the amount of copper in the recirculating leach solutions, it was also decided to install a SART plant, another new technology developed to recover copper from cyanide solutions. These were brave decisions for a new mining company, with few technical or financial resources, operating in a remote part of a country in which no mining had been undertaken for several generations. Happily for the company, thanks to the engineering skill of its Iranian technical director, ably assisted by an experienced South African operations manager, and a locally-recruited workforce eager to make a success of the venture, commissioning of the mine and plant went fairly smoothly. Within three months of start-up, gold was being poured on a regular basis, with full design capacity being reached by the beginning of 2010.

Anglo Asian Mining’s Ore Processing Facilities at Gedabek
Foreground: Agitation leaching, with RIP and flotation. Behind right: ARD and SART plants.
Background: Leach heaps and solution storage ponds.
In that first full year of operation, Anglo Asian Mining produced 67,000 ozs of gold, together with 47,000 ozs of silver and 180 tons of copper, the latter in the form of copper sulphide concentrate from its SART plant. Fortunately, the start of production coincided with a period of healthy gold prices and so in its 2010 Annual Report, the company was able to announce a profit before tax of US$20M and a near halving of outstanding debt from $42M to $25M.

After a couple of years of good production, during which the company reduced its debt financing to near zero, it became evident that the reserves of oxidised ore, on which the satisfactory performance of the heap leach depended, were rapidly being depleted and gold production was falling. In response, the company’s Board authorised the design and construction of an agitation leach plant to treat the harder, less oxidised, ores that were being produced as the Gedabek open pit cut deeper into the ore body. This decision involved a $50M investment, again to be debt financed, and a significant technical risk because untried resin-in-pulp (RIP) technology would have to be used for gold extraction, instead of the conventional carbon-in-pulp (CIP) process. This was because of the copper minerals in the ore, whose dissolution would be exacerbated by the fine grinding required for the agitation leach process. Once again, Anglo Asian Mining’s pioneering spirit paid off and the new agitation leach plant, which was built in less than 12 months and 15% under budget, was successfully commissioned by September 2013. However, although the new plant worked perfectly from a mechanical point-of-view, dissolution of the copper minerals was greater than anticipated, which lead to unacceptably high consumptions of cyanide in the leaching process. To overcome this problem, a rarely used technique of adding ammonia into the cyanide leach to suppress the dissolution of copper was adopted. This process modification significantly reduced the consumption of cyanide and brought the operating costs down to an acceptable range.

The most recent addition to the process plants at Gedabek is a conventional flotation plant, which was built in 2015 to treat the tailings from the agitation leach plant to recover copper minerals, together with some of the unleached gold in the tailings. This plant has significantly increased the recoveries of both gold and copper, with the result that at the beginning of 2016, Anglo Asian Mining was able to announce a target production for the year of between 73,000 and 77,000 ozs of gold in bullion and 1,700 to 2,100 tonnes of copper, contained in both SART and flotation concentrates.

- Professor John Monhemius
WE WOULD LIKE TO HEAR FROM YOU!

We’re always interested in hearing from our members! If you would like to share a story, publish an article or just provide some feedback on the newsletter, please get in touch! All enquiries can be sent to our editor:

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HOW DO I JOIN?

Individual membership of the MP&EM Division is achieved by joining the Institute of Materials, Minerals and Mining. You can join IOM3 online at www.iom3.org/join to get immediate access to member benefits, or you can complete our printed membership application form. For details of membership grades and professional qualifications visit: www.iom3.org/membership

Company membership: More information about Industry Affiliate membership and an application form are available at: www.iom3.org/ias