Mining Technology

I·M3

Mining Technology Division Newsletter

MTD NEWS AND VIEWS - Christine Blackmore MTD Chair

Introduction

Here we are in 2021 and in another lockdown, not the best start to a New Year, but on the good side a vaccine has been developed, let's hope and pray we can eradicate COVID-19 and all its variants soon. MTD has been adapting to virtual meetings like most of you, I`m sure while COVID goes away the advent of a virtual world is increasing. MTD have been busy planning their next booklet *The Mining Cycle* … so watch this space. In the Spring Newsletter (c May 2021) we will include further details and request for contributions.

MTD are disappointed to hear that Camborne School of Mines (CSM) is continuing to pause its undergraduate BEng (Hons) Mining Engineering for 2021. We understand that an official statement will be made. This will be a big blow to the mining industry both in the UK and worldwide. But in my opinion such a loss to the younger generation. Mining can offer such a broad opportunity.

COVID-19 has once again delayed our prestigious Mining Technology Division (MTD) Conference**: "Legacies of Mineral Extraction and Sustainability Opportunities"** as one of the celebrations to the re-opening of the new refurbishment of Neville Hall, Newcastle-upon-Tyne. The new date is to be confirmed, but is expected to be November 2021… subject to UK Government restrictions!

Our Newsletter is a mixed bag as usual and hopefully has something of interest for you all. Don't forget to have a look at the newly re-vamped IOM3 website especially our Mining Technology division page. If anyone wants to contribute to the Newsletter or comment, please get in touch or if you want to pose a question we shall try and answer them. Look forward to hearing from you. My email is: c.blackmore@iom3.org

We hear via LinkedIn that Hemerdon has produced their first tin ingots, well done to you Hemerdon! And it is reportedly "the largest quantity of Devon tin smelted in SW England for the better part of 100 years, continuing in a Devonian tradition stretching back millennia".

Hot off the press from Cumbrian News - "Steam trains in Wales could soon be powered by coal imported from Russia, the general manager of Talyllyn Railway has warned.

Ffos-y-fran, Merthyr Tydfil, the last coal mine in Wales that produces coal for steam trains, is to close. And a planning application for a new mine at Dewley Hill, England has been refused". Read more on http://bit.ly/3oBVmaR

STOP PRESS

See MTD webpage for latest articles:

- **Adventure in Central Asia...full article**
- **Innovations from Poland…full article**
- **Tin ...full article**
- **Local Society talks are underway for this year.**

Web Address: iom3.org/mining-technology-division

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EDITORIAL TEAM AND CONTRIBUTORS

Christine Blackmore Dr Rod Stace contact via Frances Perry (frances.perry@iom3.org).

PEOPLE: 50 YEARS OF MY LIFE IN MINING by Robin Dean (MTDBM)


1994

I am a proud coal mining engineer who started with the National Coal Board in 1970 making this my 50th year in the industry.

I was given a 'psychometric test' when British Coal was privatised in 1993 as part of the support to get another job and one comment was that 'you really enjoyed your job, didn't you?' And the truth is I did and still do.

Mining is not just a job, it's was a way of life that is everything it should be, challenging, fulfilling, and full of enthusiastic people to work with and be supported by.

My parents had nothing to do with the mining industry, a fact that I had to overcome in my earliest years, as a coal mining heritage was considered important. I first came into contact with the industry at a 'Focus on Mining' course at Nottingham University which had me hooked as it covered a diverse range of interesting subjects from geology to surveying to design. I started as a Student Apprentice attending Stoke Polytechnic. The course was a mix of people from schools and industry and we quickly realised each group had strengths the others did not, friendships and support for each other was created which have lasted the tests of time.

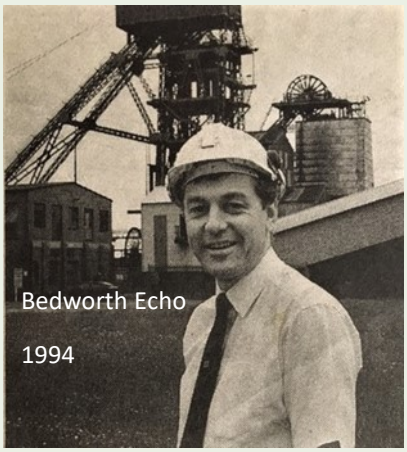
My first substantive post as Undermanager was at Daw Mill and I was over the moon at getting the job at such a modern mine. In terms of experience, it was invaluable and learning to manage or rather work with people was a big part of that. In that respect I have to thank a specific person, Alfie Gill, an overman on my main production district, who made me realise I did not have to have all the answers, but getting those that did to step forward and listen to what they had to say was a secret for success. I have always been a big believer in the strength of a good team, and also in acknowledging that!

My first appointment as a manager was at Asfordby and again I realised I was in a position not many people had been in, managing a mine project from day one. The 'mine' was a cottage in a green field when I got there, which was during the miner's strike in 1984.

From there I was advised to move back to production and went to Ellistown and then Bagworth/Ellistown before getting the job I really wanted which was to manage Daw Mill. It was comfortably doing 25K tonnes a week and making money when I got there, but it should have been doing more. We managed to increase production and eventually went for the national production record which, at the time, was 72K tonnes a week, held by Kellingley, and we smashed it at 90K! However, things moved on and I went to Littleton near Cannock and successfully finished my British Coal career on a high. On privatisation I went back into the Warwickshire Thick coal, managing Coventry for Coal Investments.

I went into consultancy soon after, working overseas for a lot of the time. I started in Bulgaria and then Romania, helping to remediate closed mines which was not what I had trained to do but the biggest joy I found was that mining people all over the world have the same problems, both socially and technically and relating to people is easier if you have that common link, and a good interpreter!

Consulting has been interesting, using my broad spectrum of experience to hopefully benefit others, and it has never been boring. I have been airlifted from a Columbian gold mine when the local terrorist organisations threatened to kill people if a 'toll' was not paid, I have been surrounded by angry villagers in Romania objecting to their Governments plans (I managed to talk my way out of that one!) and I have stayed in some interesting places from mine site containers to luxury hotels. The number of countries I have visited is too long to list but I have visited many places that tourists never see, and, I believe, met with the real people of the country, which has been a joy.


Bedworth Echo

1994

Remediating mines after they have closed brought home to me the legacy the general public see, which is not a good one. But mining engineers are excellent at coming up with solutions. If they are told production is everything, then that is what you get, which is what my early years were all about. Then we saw a concentration on production with better safety and in the last 30 years it has been making the operations generally more environmentally friendly. The problem with the legacy of the older mines is there for all to see and that is what we are judged by. However, we need to shout loudly and clearly that the 'new' technologies lauded as saving the planet, such as electric vehicles or wind turbines can only be developed with the support of a vibrant mining industry employing the best brains. Mining Engineers once again have to step up and show that modern mining is all about accessing the earth's bounty responsibly using new technologies in as sustainable a way as possible.

FEATURE: ADVENTURE IN CENTRAL ASIA (PT1) by Laurence Morris (MTDBM)

How can you worsen a badly run mine? Here is a cautionary tale of overreach and incompetence.

In the 1990s I accepted a job as chief mining engineer for an open-pit gold mine in Central Asia. The Soviet Union had collapsed and withdrawn from the 'Stans', leaving a high tide mark of Soviet and Russian residue. The mining village, lying in the foothills of the Pamirs, had a desolate grey Eastern European look about it, several blocks of high-rise flats in a litter strewn wasteland of broken swings, Marx-Lenin statues and dog faeces. Some of the flats were unfinished: partly built, without windows and partitions, and hanging over them were rusted tower cranes that looked like they were about to collapse. Despite the dilapidation the whole construction looked as if the workers had just popped out to lunch. Presumably, when word reached them of the collapse of the Soviet Union, they immediately packed their tools and left.

The mountainous backdrop to the grey landscape was a thing of beauty. Mountains, white tipped with snow and glaciers descended into grasslands, and high on one nearby mountain, as the sun set, was a cluster of twinkling lights. I was told that that was the mine itself; to get there you took a 12-kilometre long road that twisted up the mountainside to over 2,500 metres high; the camp was around 1,500 metres. The camp itself was no great shakes – a collection of Atco huts for accommodation, a bar and a canteen.

The mine had been bought by a British concern which was originally a service company in entertainment, who presumably had decided to risk a flutter on gold mining. But the company had not anticipated several immense problems; the ore body was small and nearly exhausted, the administration was required to employ upwards of 1,000 locals, and including the long haul to the plant, the mine was uneconomic. However, in my hubris as a young engineer I thought all it needed was a bit of effort and I would solve all their problems. Ha! Ha!

The bar was a strange scene. At one end were three Cornishmen and at the other four Scots. Both groups kept to themselves while drinking. The Scots were passionate nationalists and once they got deep into their cups, they would cry maudlin tears for their homeland, put on a tape recorder and out would boom 'Flower of Scotland' across the camp. Once it was played too many times, and the mill manager, a Welshman, pulled the tape out of the machine and tore it to shreds.

Despite that, we could only admire the work ethic of the Scots. They were the mechanical crew for the pit, and serviced mostly CAT equipment. The winters were severe, temperatures of -15C were not unusual, and the equipment was repaired on top of the frozen mud without any cover, and in a sea of mud during spring and autumn. Somehow, and by cannibalising parts, they kept enough machines running. Only in the last few years did the board have the money to approve a large tent, and that proved difficult to heat and keep clean.

The worst problem the mine faced was the 12-kilometre haul from the pit to the processing plant in the village. The road was steep, too long to effectively surface and grade, and ore was carried by old 1950s and 60s vintage Kraz trucks, capacity 10 tonnes, which could never quite feed the plant. The trucks kept breaking down, and at any one time there would be 25 running out of a fleet of 50. Being unsophisticated they were easy to fix, but we never had enough spares. The drivers themselves were expected to fix their own trucks, and as a result no driver would hop on to any other man's truck. Their iron rule was to do three trips a day, carefully nursing their trucks, and every shift there was 20 or more drivers sleeping or playing cards around the workshop, waiting for parts for their own trucks.

I decided to fix this. I went to the Kraz workshop, pulled out the manager, a youngish local lad, and marshalled as many of the drivers I could find, and harangued them that they must do five trips an hour or I will cut pay. The drivers demurred of course, so I started to issue fines. The upshot was that I was given several death threats and had to have a KGB bodyguard until it cooled down. I quietly dropped the whole idea.

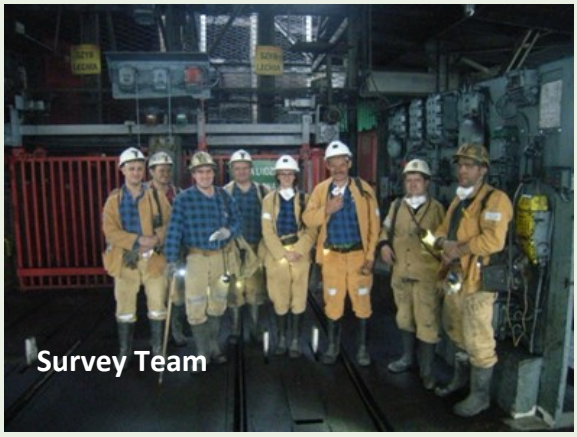
Read the full article on https://www.iom3.org/mining-technology-division

INTERNATIONAL: Innovations from Poland by Andy Birtles (MTDBM)

During these interesting times, I have been fortunate to have been able to travel to Poland to undertake some surveys on several coal mines in the Katowice region. Poland still has a thriving coal mining industry, but recent events in October 2020 regarding the restructuring of the coal industry to comply with European "carbon policies" effectively has started putting the nail in the coffins of the remaining collieries, with few, if any, "parastatal" operations continuing beyond 2049. This was the basis of an article in Time magazine, and during October, this was the key discussion point in many of the (Polish) national and local papers and journals. Typing into a search engine the phrase "restructuring of the Polish coal mining industry October 2020" will yield quite a bit of information.

This comes after the initial COVID-19 crisis, where many mines had to go onto care and maintenance for several weeks to try and curb the spread of the virus. Some innovations that have come out of this are "misters" or "foggers" with an appropriate disinfectant that one had to walk through before entering the mine, or the walkway to the cage. Many of the mines who had this approach have declared that there have been very few additional cases of the virus. Now how about applying that to our shopping malls and supermarkets!

Typical Mine Site



Survey Team

Poland's coal mining industry, particularly in the Upper Silesian Coal Basin, have been dealt an interesting hand. There are coal seams in excess of 10m thick, but there are the challenges as well. Not only are there fairly steep dipping seams at the edge of the coal basin (up to 30°), but there are a number of "Natural Hazards", which require approaches to longwall mining that I have not encountered before.

These hazards include methane, not surprisingly, and the risk category is classified according to the methane content. During the surveys it seemed to me that the desorption rate was very low. This did not prevent instances of CH_4 concentrations at a tailgate sensor exceeding 5% (obviously power was off and people withdrawn) on several occasions. CH_4 is captured and generally used in gas engines, heating plants, and for heating the change house water.

Spontaneous combustion is also classified as a Natural Hazard, and there are several methods of dealing with this. Most mines use fly ash (fly ash obtained from the local heating plants and power stations) which is mixed with water and pumped underground, to be injected into the "goaf" area behind the longwall to smother any coal remaining. Also, there are the nitrogen plants, which produce sufficient quantities of the inert gas. This is, again, pumped into the goaf, creating a reduced oxygen level, conditions which reduce the risk of coal self-ignition. Further, CO_2 is also pumped into the goaf, particularly if the longwall is mining to the rise (CO_2 being heavier than air and nitrogen).

There are some super new innovative means of detecting a heating. The Sensotransel system uses fibre optic cables to detect temperatures in the pillars between longwalls. Thermal Imaging Cameras can detect hotspots (good for checking temperatures on the workers too – COVID-19 testing without getting too close). The main method used is to take air samples (in plastic bags – not unlike a rugby ball "bladder" from the 1960s), and analyse them using a gas chromatograph. This can be very quick and is very accurate.

Now, how about this for the greenness of the coal mining industry in Poland? Some have solar panels to generate power for the offices and workshops, they use CH_4 to generate power and heating, and CO_2 is pumped underground. I have not done the calculations, but that sounds to me as being "carbon neutral"!

Nitrogen Plant

Read the full article on https://www.iom3.org/mining-technology-division

Photos by Andy Birtles

LITTLE KNOWN COMMODITIES: TIN by Reimar Seltmann and Alla Dolgopolova, CERCAMS, Dept. Earth Sciences, NHM London

Introduction:

Tin is one of the earliest metals known and used. Because of its easy to work low-temperature 232°C melting point and hardening effect on copper, tin was used in bronze implements as early as 3,500 BC. ("*Bronze Age*" from ~3,300 BC), although the silver-white pure metal itself was not used until about 600 BC. Tin was mined in Turkey, France, Spain and Britain and traded around the Mediterranean Sea as documented in the times of Julius Caesar. Beside bronze, pewter became another popular alloy of 85-90% Sn with Cu, Sb, Pb, mainly used for tableware.

Geology and Metallogeny: Tin is a relatively scarce element with an abundance in the earth's crust of about 2 parts per million (ppm = g/t). Tin is accumulated by endogenic processes in pegmatites (DRC, Rwanda, Nigeria, Brazil etc.) and in continental collision "tin" belts, formed in Precambrian, Paleozoic and Mesozoic settings. Primary tin ore deposits are part of magmatic-hydrothermal systems invariably related to late granite phases (tin granites, pegmatites, tin porphyries, skarns), and may become dispersed by exogenic processes and then eventually form placer deposits within a few km from their primary source, due to the density of cassiterite, its hardness and chemical stability. Exogenic (weathering) processes enable formation of regolith (Syrymbet) and accessory cassiterite forms part of mineral sands (marine and fluviatile placers). Magma-ore fractionation processes and structural focus control formation of economic ore bodies. Examples of hard-rock sources are granitic pegmatites (Uis, Namibia), granite-related vein and stockwork greisen systems (Figure 1) including tin porphyries (South Crofty, Cornwall; Cinovec-Zinnwald, Krusne hory-Erzgebirge; Syrymbet, Kazakhstan; Lallagua, Bolivia), tin skarns (Tellerhäuser, Erzgebirge; Geiju, China) and massive sulphide deposits with Sn as by-product (Neves Corvo, Portugal).

Fig. 1. Sheeted greisen veins at Cligga Head, Cornwall (Photograph: R. Seltmann) Mineralogy

The only mineral of commercial importance as a source of tin is cassiterite (SnO_2) (Figure 2), although small quantities of tin are recovered from complex sulfides such as stannite, cylindrite, franckeite, canfieldite, and teallite.

Mining and Metallurgy: About 85 % of all historically mined tin of about 27 million tonnes Sn is from a few tin ore provinces within larger granite belts. About 35 countries mine tin throughout the world. Alluvial placer deposits were usually the starting point for tin mining, and have provided at least half of all tin mined. Nowadays most of the world's tin is produced from placer deposits; at least one-half comes from Southeast Asia. World resources, principally in western Africa, SE Asia [Indonesia, Thailand, Malaysia, Myanmar], China, Australia, Bolivia, Peru, Brazil, and Russia, are extensive and, if developed, could sustain recent annual production rates well into the future. Recently published flowsheets for deposits under development (Cinovec: Sn-Li; Syrymbet: Sn, Cu, F; Tellerhäuser – Sn, Zn, In, Fe), combine hydro- and pyrometallurgy (gravity concentration, magnetic separation, flotation) and consider a by-product recovery.

Fig. 2. Cassiterite pseudomorph after Karlsbad twin K-feldspar, Wheal Coates, Cornwall © Mineral Collections NHM London, Specimen # BM 410

Use and importance: Tin does not oxidize on exposure to air and as a result the practise of tin-plating ironware has been used to coat other metals and prevent corrosion. Most tin is used as a protective coating or as an alloy with other metals such as lead or zinc. Tin is used in coatings for steel containers, in solders for joining pipes or electrical / electronic circuits, in bearing alloys, in glass-making, and in a wide range of tin chemical applications. Secondary, or scrap, tin is an increasingly important source of the tin supply. Tin-based materials are strong candidates as the anode for the next generation of lithium-ion batteries. Regardless of the prediction that tin may become one of the drivers of the green, decarbonised economy and a related recovery of the tin price that has almost doubled compared to March 2020, tin has still not been included into the list of the 30 critical metals following the 2020 criticality assessment of the EC.

Read the full article on https://www.iom3.org/group/mining-technology-division.html

WHAT'S IN THE NEWS: ROUND UP by Robin Dean (MTDBM)

UK support for mining projects!! No it's not an oxymoron!

Back in October the UK Government announced, through the HMRC, that British mining companies could receive £5m in research and development tax credits. The funds are targeted at new technological innovation and the Government is apparently keen to encourage further R&D in the mining field and support miners in their efforts to reopen and start new mines.

MTD has long supported the mining industry, obviously! This new initiative at a time when self-sufficiency in certain minerals is an aim will go some way (well at £5m, not that far) to support that. Technological innovation is exactly what is required for a sustainable mining industry which supports the green economy.

Green Hydrogen

The World Platinum Investment Council has said that a string of spending commitments and investments are "pointing to a future where hydrogen will be a mainstream source of sustainable fuel." However, it is only "truly sustainable" when it is green hydrogen. Hydrogen is produced through the electrolysis of water and, during this process, an electric current is used to separate water into its component elements – hydrogen and oxygen. It is green hydrogen when the electrolysis is derived from a renewable source. Platinum is also important in this process as it is a catalyst to provide the performance and durability needed for commercial scale systems. Demand for Platinum is growing as it is used in fuel cells for electric vehicles. By 2050, the global hydrogen economy will be estimated to be worth $2.5 trillion, which will be a huge benefit for Platinum.

MTD notes again that only by encouraging the mining of certain minerals will the technology be available to meet environmental targets, so all the pressure groups and NGO's pushing for mining exploration and projects to cease should be careful they don't chuck the baby out with the bathwater!!

Permanent Magnets:

NdefB , or neodymium magnets are the most widely used rare-earth permanent magnets (Wikipedia). Wind turbines currently represent ~70% of current NdfeB magnet market according to Roskill. In wind turbines large neodymium magnetics are used to produce their own magnetic field . This apparently decreases the wind speed required to produce energy.

The global permanent magnet market is large and growing (US$20.74bn in 2010) with the automotive industry expected to become a major growth area with permanent magnet motors driving most new electric vehicles.

The market for Magnet Rare Earth oxides, mainly Neodynium (Nd) and Praseodymium (Pr) is expected to increase by five times by 2030. A 5-megawatt direct-drive wind turbine with a permanent-magnet generator will use around three tonnes of permanent magnets, of which one tonne is a rare earth oxide alloy or another rare earth compound (according to Adamas).

Typical permanent magnet content of turbine generators (Wind Power Monthly / Science Direct) contains Neodymium (Nd): 29%; Dysprosium (Dy): 2-4%; Praseodymium (Pr): less than 1% ;and Iron (Fe), Boron (B) and other metals: 66-68%.

MTD Comment - need we say more, the amount of rare earths currently required means that there will be shortages unless alternatives are found and mined, or production increases .

China threatens to restrict the supply of REEs and other critical raw materials to countries and companies it does not like

Legislation passed at the end of 2020 enabled the Chinese government to restrict exports to foreign companies and nations it chooses to punish (NikkeiAsia). China has long been using access to REEs and other materials to persuade companies to set up manufacturing in China.

The decision to ban the export of goods and materials marks an escalation of the strategy to control critical commodity markets and gain the upper hand on Western manufacturing and is one response to US tariffs.

The new legislation enables Chinese leaders to control critical exports increasing the risk of significant corruption and interference in global supply chains.

MTD says exploration to produce significant locally mined alternatives to China's stranglehold on supply must have merit. However, as Europe is so far behind China in mine production and mineral processing, it is very hard to see how the EU is going to stimulate sufficient local production to meet new demand from its automotive, wind turbine and other manufacturers.

IOM3 new visual identity & website

Mining Technology

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In November 2020, IOM3 launched its new logo, visual identity and website, devised to reinforce Institute core values of being forward looking, dynamic, mindful, environmentally conscious, innovative and global. IOM3 wanted a new visual identity that was strong, simple and striking, embodying its forward-looking nature but also using different shapes to represent our history, the mergers of diverse bodies, and the eclectic mix of people and ideas, which have come together to form the Institute we know today. The various shapes make reference to the fact that our differences can become our strengths when we work together towards a common goal.

To streamline our visual identity, IOM3 created a logo system using our Governance structure and Technical Communities. The colour wheel has been spread between all our technical communities so that no two are similar and that every community has a distinct and recognisable colour.

Highlights of the new website:

Customised content

Members logging into the website will see content customised according to members' sector interests. **We encourage all members to log in and visit your profile and make sure that you have selected your subject area interests so that you can benefit from this new feature.**

Links to online membership benefits and Finding relevant content.

Our Member Portal – My IOM3 – now provides direct links to all online member benefits. This includes access to online journals via the Taylor & Francis portal, to OneMine, the IOM3 Digital Library and the new ICON library catalogue which lists our library holdings. Links are also provided to the online page-turner version of *Materials World*, upcoming member-only events and workshops, IOM3 events and all of our other member services. As well as an improved search function, there is a library of all website resources that can be searched by content type, topic and subject area to find specific content more easily. Our events calendar has filters to narrow down events by event type, topic, region and subject area, so that you can see events relevant to your interests.

Join a community, Check your grade.

Another feature of the new site is the ability for members to find the communities within IOM3 that cater for their interests. The Community Finder page lists all technical communities, member groups and local societies, again with filters so that you can narrow these down to those that interest you. You can sign up to be part of a community from that community's page and this will be logged on your member record. The functionality associated with these groups is currently being rolled out but in future it will provide a much easier way for you to interact with these groups and get regular updates from them.

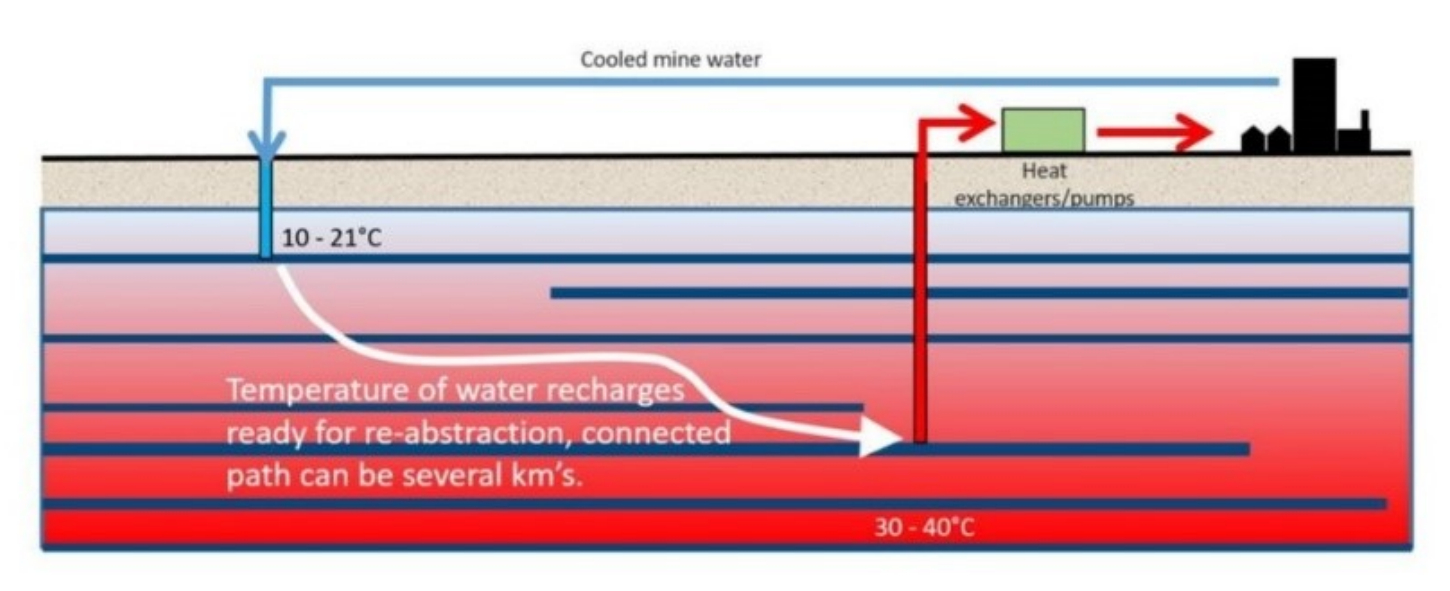
We've also got a new Grade Finder tool which takes you through a few simple steps to find out which IOM3 grade you qualify for – check this out and you may find that you are eligible for upgrading. There's a simple online form for you to complete with details of your experience and qualifications, and once we've received that we'll be in touch with you to advise how to go about upgrading. There is also information about professional registration.

You can watch a video on how the designs were formed and what the new branding represents, as well as taking a brief tour of the new website at www.iom3.org/resource/iom3-visual-identity.html

FEATURE: LIFE IN THE OLD DOG YET? by David Seath (MTDBM)

Whilst coal extraction is all but over in the UK, the mines themselves may still have a vital role to play in the UK's energy mix as a host of green initiatives aimed at tapping into the vast labyrinth of tunnels, shafts and roadways beneath its towns and cities gather momentum.

For many years, this legacy of Britain's industrial past has been viewed as a liability but they are being looked at in a totally different way now. The Coal Authority is on record as saying when you look at the opportunities that sit around these mines, they could become an asset of strategic importance to the UK. Currently, there are around 30 different projects aimed at tapping into the estimated 2.2 million GWh of annually renewable zero carbon geothermal energy held within the mines. The core concept is simple: a borehole is sunk into the workings of the mine, water is pumped to the surface and fed into a heat pump or heat exchanger where it is used to heat water that is then circulated around a district heating system. Cooled mine water is reinjected back into the mine via a separate borehole so that it can be warmed all over again.



Schematic showing the workings of a geothermal mine energy scheme. Image used by permission of the Coal Authority ©2020, All rights reserved

Here the UK has a particularly useful tool at its disposal courtesy of mining legislation that has been in place for more than 150 years and which placed a legal requirement on mine operators to file plans showing exactly where they mined. Armed with this information, as well as historical data on mine temperatures, engineers are able to work with the complexity of the mine to identify the optimum locations for abstraction and reinjection points.

Alongside geothermal, there is the potential of using the mines as so-called 'thermal flasks', which could store waste heat or heat from other sources such as solar power installations, that could then be fed back into heating networks at times of high demand. Above ground thermal stores are already widely used in Scandinavian countries for district heating schemes. In the UK, the long narrow profile of mine shafts makes them particularly well suited to this application. The Coal Authority is now considering a potential development in Shawfair, a new town being built largely on the site of the former Monktonhall Colliery in Midlothian. If it goes ahead, the development would represent the world's first use of an abandoned mine shaft as a thermal flask.

Edinburgh-based firm Gravitricity is looking into the untapped potential of the UK's abandoned coal mines. The firm has developed an elegantly simple gravity-based energy storage concept based on the use of large weights. The system works by using electric winches to raise weights through vertical shafts when there is excess power on the grid. At times of demand, the controlled release of these weights is used to drive motors and generate power. Following discussions with the Coal Authority, the firm believes that in the UK there are at least 100 potentially viable deep vertical mine shafts and so a future portfolio of 2.4GWh of capacity is possible.

For the time being, the company is concentrating on the development of its first physical system, an above ground, 250kW device that will be installed in the Port of Leith. This initial demonstrator will consist of a 16m high lattice tower containing two winches and two 25□tonne weights suspended from steel cables. During operation these weights will drop through 7m at 0.6m/s, generating 250kW of output.

LOCAL SOCIETY NEWS by Stephen T Martin (NEIMME President)

North of England Institute of Mining and Mechanical Engineers

Like all Institutes and Societies, NEIMME has of necessity made changes in how we give lectures and interface with our Council, but feel we have adapted well to the forced change, and have found the versatility in working with Zoom, Social Media and email.

2020 was a very busy time for NEIMME, as our building, Neville Hall in Newcastle, continued with its extensive renovations to make it a modern, spacious and useful space to hold lectures and meetings, with new facilities for catering and hospitality. We expected the construction company to hand over the building in mid-December, allowing us to re-locate the Library in the Nicholas Wood Memorial Hall in the early New Year.

At our AGM, the incumbent President, Rick Smith, stood down, as did our Hon. Secretary, Derek Newton, who both gave NEIMME their sterling and untiring efforts, and handed over to Steve Martin as President, and Andrew Dobrzański as Hon. Secretary. Andrew is dedicated to forging new alliances with other Institutes and Societies to give us a wide spectrum of lectures for our forthcoming series. Both Steve and Andrew assure MTD of the continuation of the close bond between our institutes.

Our Zoom and YouTube Lectures have proven a success, with 'Inland Jet Mining in the North Yorkshire Moors' by Chris Twigg in October, with 'The Rise and Fall of Dinosaurs' by Prof Steve Brusette in November bringing in over 500 interested attendees, making it an outstanding event. Our lectures also included:

- Dr David Bell spoke of 'Geology, Mining and Narrow Gauge Railways of New Zealand' on 21 January, followed on 18 February by Dr Hannah Hughes of Camborne School of Mining giving us 'Rocks that go Bang: The Curious case of Bursting Lamprophyres in the Mine'.
- A special talk to commemorate the Hartley Colliery disaster (16 January) was given by Norman Jackson, on Zoom and YouTube at the timing of this tragic event.
- Conferences in 2021 are going ahead, with our joint conference on 'Legacies of Mineral Extraction and Sustainability Solutions' , which looks almost certain to be in Neville Hall, coronavirus (COVID-19) permitting, the date to be announced. We also have a joint conference with Durham Energy Institute on 15 and 16 April on the 'Northern Energy Transition' which will be held in the Large Lecture Theatre, Durham University and will include speakers from economic geology and materials science disciplines.

Additionally, a Field Trip to Poland is being proposed for a limited number of Student Members. The purpose of the trip is to introduce British geology and engineering students in the North of England to the geology of Poland and the mining engineering of salt, coal and copper mines.

As of 2015, Poland ranked second and fifth among the countries holding the largest anticipated economic resources of silver and copper, respectively. Moreover, Poland is a leading producer of electrolytic copper and the leader of silver production. This trip will also provide the students with an insight into modern coal mining technology, enabling us to bridge the gap between today's generation of current students without coal mining experience and those who worked in the coal mines in the North of England. There must of course be a contingency plan, which will divert the field trip to perhaps the North Pennines Orefield, the Lake District and possibly as far north as the Ballantrae Complex of the Southern Uplands, should restrictions dictate overseas travel impossible. Suggestions from MTD members on key outcrops to visit in any of these areas would be welcomed.

We look forward to an exciting year ahead, and that we will be able once more to have face-to-face lectures and meetings, and discussions in a comfortable social atmosphere.

GOLD EXPLORATION IN SCOTLAND

Erris Resources and GreenOre plc have entered into an option agreement to explore for gold on the Loch Tay Licence in Perthshire, Central Scotland. The licence area comprises 237 square kilometres of highly prospective ground within the Grampian Gold Belt, a region of Dalradian rocks which host several significant mineral occurrences and deposits of high-grade gold, base metals and baryte across Northern Ireland and Scotland.

Grampian gold deposits include the Curraghinalt deposit in Northern Ireland (6.09 Moz at 13.6g/t Au) and the Cononish deposit in Scotland (266 Koz at 13.4 g/t Au). An initial due diligence review, which involved preliminary prospecting and mapping by Erris Resources, has identified two priority target areas, Lead Trial and Glen Almond, as having excellent gold potential based on the presence of historic workings, mineralised outcrops and alluvial gold occurrences. With further work in February and early March 2020, prior to the restrictions introduced by the UK government to combat the outbreak of COVID-19, the Lead Trial prospect was significantly expanded with several high-grade gold boulders sampled in the Lead Trial – Dunan valley between 1.4km and 3km southeast of the historic workings at the Lead Trial Prospect. Other areas of interest have been identified to north and south of the Glen Almond and Lead Trial areas which merit investigation.

Press reports highlight the discovery of a 10g nugget as well as some alluvial gold in the area by a team from Leeds University in summer 2019. Erris Resources note the area is accessible and has agreements with the landowners to access the land. On 10 August 2020, Erris Resources issued an updated audio-visual presentation on the Loch Tay Gold Project (https://www.youtube.com/watch?v=C7iO9BSVmJA&t=3s).

HERITAGE by Christine Blackmore MTD Chair

Tallies *Photo by Rod Stace*

Mining Heritage - Littleton Pit, Huntington, Cannock, Staffordshire

Cannock Chase, Staffordshire has always been noted among the Coal mining areas, with several pits within a few miles of each other. One of the larger of these was Littleton Colliery, Huntington. Even today, there is still a strong bond between the former miners and nostalgic reminders displayed in the "local" Littleton Arms public house.

When the pit closed in 1993 the local Parish council decided to buy 26 acres of the land from the Coal Authority and turn it into a leisure park. The colliery spoil mound was planted with trees and a circuit of paths lead to the top, where there are spectacular views over Staffordshire. The two pit wheels were salvaged as a reminder of the former mining community at the entrance to the park and remained there for many years. However, the trees grew, the tip vegetated and the wheels became hidden, the Huntington heritage was in danger of fading. So, when plans for the landscaping of the village green and the creation of a mining memorial garden started to emerge, what better place to relocate one of the pit wheels to and incorporate the war memorial for Huntington community fallen from two world wars. The memorial also commemorates those that worked at Littleton more recently.

The sinking of deep mine shafts in Huntington began at the end of the nineteenth century and the mine flourished until its closure as the last deep mine in the Cannock Chase coalfield, in December 1993. At its peak in 1980 the mine employed 2,000 men and produced a million tonnes of coal per year.

The garden is still a work in progress and can be seen from the A34, however a celebration of the movement and installation of the pit wheel was marked by a ceremony in May 2019 of local dignitaries. Their very special guest was **Robin Dean**, MTD Board Member and the last Manager of Littleton Colliery before its closure in 1993.

Christine Blackmore


Littleton Pit today *Photo by Daniel Blackmore*

MTD - Sustainable Development Committee

MTD have formed a Sustainable Development Committee (SDC) as an off-take of the IOM3 Sustainable Development Group (SDG). The SDC will undertake a more focussed approach to sustainable development for mining and the extractives industries, and indeed complement the work currently being undertaken by the SDG. MTD propose to align themselves with the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals prepared in 2015. Through this Agenda, 193 member states pledged to ensure sustained and inclusive economic growth, social inclusion and environmental protection, and to do so in partnership and peace. The 2030 Agenda is universal, transformative and rights-based.

Our emphasis will be to better understand, manage and promote the welfare, protection of the environment and ecosystems that the mining and extractives industries affect throughout the world, and in line with the principles and goals laid out in the Agenda. Our mission banner will be "**Conservation for Preservation".**

EVENTS: CONFERENCE UPDATES

Mining Technology Division (MTD) Conference—Legacies of mineral extraction and sustainability opportunities, Neville Hall, Newcastle-upon-Tyne—delayed due to COVID-19– rescheduled for November 2021, date tbc.

Any questions about the conference, please contact David Seath (MTD-Conferences@iom3materialscycle.org)

Web Address: iom3.org/mining-technology-division