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The Crucible

Mining Perspectives—Resources in the Abyss

China's 12th 5-year plan and the metal industry

The magazine of the Minor Metals Trade Association 4nd Edition 2014/September www.mmta.co.uk

Welcome from the Editor

Welcome to the latest edition of the Crucible, now officially a magazine. Over the summer, the MMTA has had the opportunity to visit some MMTA Members, seeing first-hand aspects of the minor metals business, which we've reported in this edition. Many thanks to those Member companies. I would like to draw your attention to our forthcoming events and hope to see you in London, Sheffield, New York or Toronto over the coming months. If you are not yet an MMTA Member, join now to take advantage of the benefits of MMTA Membership.

Maria Cox, MMTA

THE MMTA'S INTERNATIONAL MINOR METALS CONFERENCE 2015

TAKING PLACE AT THE FAIRMONT ROYAL YORK HOTEL, TORONTO,

FROM 27–29 APRIL 2015

Be sure to take full advantage of the MMTA Members' Early-Bird Rate which is available until 31st October. If you aren't yet an MMTA Member, don't delay in completing your application to ensure your Member discount.

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We will once again be hosting a high-quality speaker programme, as well as excellent networking opportunities.

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Letter from North America

Dear Members

I don't know how it's been for you, but the weather here in New York this summer has been, and, indeed, still is, quite lovely: warm, not sweltering; dry, not humid; and, sunny, sunny, sunny.

And this got me to thinking about solar energy and a number of interesting things that have been happening in industry, especially here in the USA. (I know that, for those of you involved with solar these will probably be old hat, but, for those who aren't, they may be of interest. They certainly were for me.)

In early May, just a few days after the release of the third U.S. National Climate Assessment, President Obama announced some 300 private and public sector commitments, "*advancing solar deployment and energy efficiency*", and representing "*more than 850 megawatts of solar deployed – enough to power nearly 130,000 homes*": a potentially useful shot in the arm for the industry.

But, then, reading the latest releases from the US national solar trade body, the Solar Energy Industries Association® (SEIA), you have to wonder whether it really needs such a shot. Not only was 2013 a record year for solar installations, with 4,751 MW of new photovoltaic (PV) capacity installed, but also, according to the SEIA's latest Solar Market Insight Report, "[t]*he U.S. installed 1,330 MW_{dc}* [direct current] *of solar PV in Q1 2014, up 79% over Q1 2013, making it the second-largest quarter for solar installations in the history of the market*", with "*74% of new electric generating capacity in the U.S. in Q1 2014* [coming] *from solar.*" Now that's quite something.

But recent solar records haven't been restricted just to installations. Ex-USA, back at the start of June, solar power provided Germany with some 50% of its electricity needs. On Whit Monday, June 9th and a bank holiday in the country, solar energy production topped out at 24.24 GW, just over 50% of electricity demand.

And back over here, just a couple of weeks ago, First Solar announced, from Arizona, that it had built in Ohio the "*highest efficiency thin film PV cell on record*", when one of its cadmium-telluride research cells achieved 21.0% efficiency. The company was crowing doubly as it noted: "[t]*he achievement also places First Solar's CdTe research cell efficiency above copper indium diselenide based solar cells (CIGS) at 20.9 percent, and well above multicrystalline silicon (mSi), which peaked at 20.4 percent in 2004.*" The competition between the different types of PV remains fierce!

Finally, two recent announcements in particular about innovations in the world of photovoltaics caught my eye. The first came from Michigan State University. It announced that a team of its researchers had "*a new type of solar concentrator that when placed over a window creates solar energy while allowing people to actually see through the window*". As the university notes, its transparency, and, therefore, non-intrusiveness, is the winning benefit – up 'til now the luminescent active layers have been colored. Just think if such a concentrator could be applied effectively to the windows of a skyscraper.

In the second announcement, Magnolia Solar reported that, working closely with a couple of departments at the State University of New York, and "*using nano-structured optical coatings that can minimise reflection losses and enhance light trapping…it is pioneering the application of nanotechnology for both flexible CIGS and III-V solar cells in order to boost performance and lower costs.*" Once again, the potential appears very exciting.

In closing, members may be interested to learn that, in fact, the Albany-Schenectady-Troy metropolitan area of New York (along the Hudson River), also known colloquially as "Tech Valley", is a highly-regarded centre for cutting-edge nanotechnology innovation, and our own very successful answer to California's "Silicon Valley".

With best wishes, as always, from New York, to MMTA members everywhere.

Tom Butcher, August 20th, 2014 Hard Assets Investor

INSIDE THIS ISSUE

The MMTA promotes essential elements that add quality, safety and enjoyment to our lives.

The MMTA is the world's leading minor metals industry organisation.

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Resources from the Sea: Mining the Abyss

In recent years, technical advances developed by the deep-sea oil industry have meant that deep-sea mining for metals is starting to become a real option. Major deposits have been known about for some time, but the challenge lies in reaching these deep-water resources and then mining and returning the minerals to dry land. With the depletion of easy-to-reach on-shore resources, historically high mineral prices and the exceptional quality of some sub-sea deposits, deep -sea mining may soon become a reality, finally opening up some of the least explored areas of the planet.

Advances in 3-D seismicity, mean there is a reliable way to identify the geological record of the sea-bed, with the deep seabed mining then being carried out remotely from a floating platform at the surface.

Deposits available include:

Polymetallic Nodules – manganese, iron, copper, cobalt, magnesium, titanium.

Located in all oceans and have been found in fresh water lakes. However, nodules concentrated to amounts to be of economic interest are located in the centre of the north central Pacific Ocean, the centre of the north Indian Ocean and the Peru Basin in the south-east Pacific Ocean.

Cobalt Rich Crusts – cobalt, nickel, platinum, titanium, tungsten, cerium.

Occur throughout the Pacific on seamounts, ridges and plates, with the central equatorial Pacific region offering more economically viable conditions and distributions.

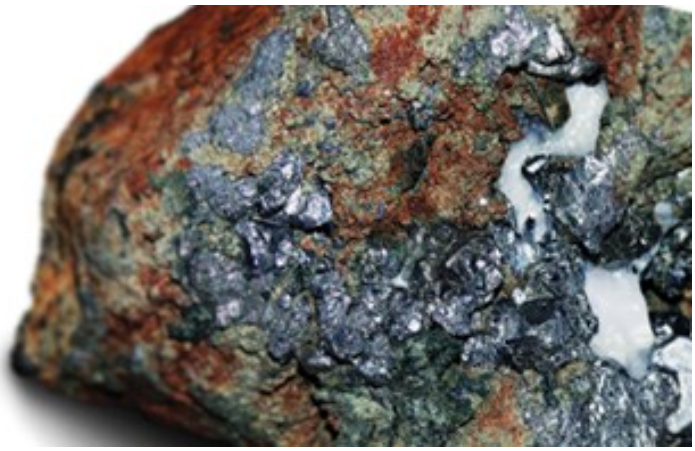
Seafloor Massive Sulphides (SMS) – copper, lead, zinc, silver, gold.

Occur in the greatest abundance at the East Pacific Rise, the Northeast Pacific Rise and the Southeast Pacific Rise. SMS form along hydro-thermal vents where mineral-rich fluids spurt from cracks in the ocean crust.

Legal considerations are a key issue in developing a deep-sea mining industry. Under the United Nations Convention of the Law of the Sea (UNCLOS), *'the sea-bed and subsoil thereof beyond the limits of national jurisdiction is designated as the 'Area".* UNCLOS states that *'the Area and its resources, including all minerals, are the common heritage of mankind, with governance of the Area being vested in the International Seabed Authority (ISA)'.*

The ISA is the body responsible for granting prospecting, exploration and exploitation licenses for all mining activities in the Area. There is currently no regulatory framework in place to provide guidance for commercial mining activities in non-territorial waters nor a royalty or tax regime in relation to such. However, there is some guidance under UNCLOS on financial contributions required to be paid to the ISA.

Recently, the ISA has granted seven new licenses to explore the floors of the Pacific, Indian and Atlantic Oceans. Four licenses are for the Clarion-Clipperton zone between Hawaii and Mexico, and the Magellan Mountain in the northwest Pacific. Two cover part of the Indian Ocean Ridge, while one is for the Rio Grande Rise in the southern Atlantic.



UK Seabed Resources, a subsidiary of Lockheed Martin, Ocean Mineral Singapore, a subsidiary of Keppel Corporation, and the Cook Islands Investment Corporation will all explore the seabed of the Clarion-Clipperton zone for polymetallic nodules.

In addition, Nautilus Minerals, a Canadian mining company, has finally got the go ahead from the ISA and the Papua New Guinea (PNG) government, with whom a dispute has been ongoing since the early 1990s, over the terms of the operation, with their license being granted in April this year.

The finalised project aims to extract ores of copper, gold and other valuable metals from a depth of 1,500m with PNG taking a 15% stake in the mine by contributing $120m towards the costs of the operation. The primary resource in that region is a Seafloor Massive Sulphide, located around 1500m underwater, the project is known as Solwara 1.

Technology

One of the many new technological developments which have enabled the new projects to go ahead is made in the UK by underwater specialist manufacturer, Soil Machine Dynamics (SMD), based in Newcastle.

They have built a Bulk Cutter weighing 310 tonnes which is equipped with cameras and 3D sonar sensors. The robot is driven by two pilots from a control room on the vessel above, attached via a giant power cable.

3D sonar will allow it to make images and send them back to the control room.

The sea floor is cut up by the machine; the rocks are then sucked through a pipe and deposited behind the cutter, with the final stage being an as-yet unbuilt machine sucking the ore up to the surface.

Environment

Deep sea mining is controversial and faces opposition; earlier this year, New Zealand rejected a proposal to mine iron ore from the seabed offshore in the South Taranaki Bight. The seafood industry, amongst others, lobbied against mining in this region due to the unknown effect on fish stocks of dumping extracted material back onto the sea floor when the valuable minerals had been removed.

Although technology developed by deep-sea oil is helping deep-sea mining become a reality, it is also big oil spills that stick in people's memories when considering the environmental impact that mining may have. The deep-sea floor is an almost unknown ecosystem, and from the description of the Bulk Cutter robot, the mining is not going to be a delicate operation.

The International Seabed Authority (ISA), is currently drawing up guidelines for the environmental management of future seabed mining, although there are some rules in place covering the mining of polymetallic nodules.

Nautilus believes that the sea-bed is a resilient ecosystem and expects it to recover in 5-10 years. This operation will be watched closely, as the first of its kind, and any detrimental effects will certainly be scrutinised closely.

Tamara Alliot, MMTA with **Elliot Hyams,** BSc Geology

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The draft programme includes:

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- Factory of the Future tour
- Nuclear AMRC tour
- Presentation and discussion: Composites—threat or opportunity?
- Lunch and networking
- Castings Technology International tour — including casting design & development, and 3D printing
- Titanium Information Group presentation
- Design & Prototyping
- Medical AMRC

FREE NETWORKING DRINKS RECEPTION

The Member Day will be followed by a free networking drinks reception open to AMRC attendees and other MMTA Members. We would like to invite MMTA Members to bring a guest to join us for drinks. RSVP is required for the drinks reception.

THIS IS A MEMBERS' ONLY EVENT

Perspectives on Russia and Ukraine

According to Sergei Guriev, visiting professor of economics at Science Po, Paris, although "many critics argue that the sanctions imposed on Russia for its actions in Ukraine are ineffective, because they are too limited in scale and scope", he asserts that "these arguments are wrong. Though the sanctions are not backed by China, they are already having a powerful effect and the expectation that they will be tightened further is a huge concern for investors and the Russian government".

Professor Guriev, former Rector of the New Economic School in Moscow, argues that "the latest sanctions are unprecedented. The European Union went even further than the United States. Exposure to Russian markets varies widely among EU countries – and between the EU and the US. But, after the downing of Malaysia Airlines Flight 17, Russia can no longer pursue a divide-and-rule strategy that leverages these differences".

"Both the EU and the US have now sanctioned Russia's highest officials and leading companies and banks. The EU list includes all of the main state-owned banks (the country's largest). Most important, the EU added Sberbank, a cornerstone of Russia's financial system, with assets totalling almost 30% of Russian GDP and about half of Russian retail deposits".

"Currently, the sanctions only limit Sberbank's access to European capital markets. In the immediate future, Sberbank – and other sanctioned banks – will be able to replace European funds with liquidity provided by the Central Bank of Russia (CBR) or Asian sources. But the fact that Sberbank is on the list has created enormous anxiety for all foreign investors in Russia"

Professor Guriev believes that "they are right to be worried; Russia's financial system is highly vulnerable. The banking sector's total external debt is $214 billion, of which $107 billion is due within a year (and $129 billion within two years). Non-financial firms' external debt totals $432 billion, with $128 billion due within a year (and $175 billion within two years). These are large numbers even for Russia, with its currency reserves of $480 billion".

"Likewise," Guriev states, "though the ban on exports to Russia of technology for the oil and gas sector holds no immediate implications for the Russian economy, over the course of the next few years, Russia will have to use Western technology to develop new oil fields. Otherwise, its oil output will stagnate or even fall, hitting the ruble and living standards hard".

"Financial markets and Russia's government understand the gravity of the medium-term risks. To avoid ruble depreciation and inflationary pressure, the CBR raised its benchmark interest rate to 8% (from 5.5% before the Crimea crisis). But this may not be enough, given that Russia's recently introduced "counter-sanctions" – an embargo of food imports from the EU and the US – will contribute significantly to price growth " states Guriev.

"Since January, Russian stocks have lost 16% of their value on the MSCI index, after already trading at a 50% discount in 2013, while Brazilian and Turkish equities are up by 13% and 27%, respectively. With MSCI now set to offer investors emerging-markets indices that exclude Russia, a massive sell-off of Russian stocks by index funds will drive down prices further. Indeed, the net capital outflow is expected to grow from $60 billion in 2013 to at least $100 billion dollars this year, with some estimates as high as $200 billion".

"One consequence of all of this is that the government can no longer balance its books and has started to discuss spending cuts and new taxes" says Guriev, who points also to "Finance Minister Anton Siluanov [announcing] that the government must use this year's pension contributions for projects in Crimea, while some highway construction has been postponed indefinitely".

"Apparently", he argues, "fear of even more serious economic troubles – for example, further capital flight when taxes are raised – has precluded an open invasion of eastern Ukraine. Russian leaders seem to understand that, despite rising support for "self-sufficiency," autarky has never worked for Russia. Even in the Stalin era – when the economy was much more closed than in Czarist times – industrialization required the import of Western capital and knowhow".

Guriev argues that "Putin's popularity rests on historically high living standards. Annual household consumption is now double the level achieved in the Soviet Union's dying days. Consumption growth has been driven largely by Russia's integration into the global economy – and cannot be sustained without it".

"The last generation of Soviet leaders well understood the importance of maintaining living standards, which is why they used revenues from oil and gas exports to import consumer goods. When oil prices collapsed in the mid-1980s, household consumption collapsed; soon after, so did the Soviet Union".

"Today", Guriev argues, "though oil prices remain high, Russia's budget and financial system face severe problems over the next 2-3 years. If the West introduces full-blown sanctions against the largest Russian banks – as the US has already done against relatively small banks – those problems may become insurmountable".

The full article is published in Project Syndicate, entitled Putin's Dilemma

Euler Hermes

Ukraine: Outlook remains precarious

President Poroshenko dissolved parliament on 25th August and called early elections for end-October, as a new government had not been formed within 30 days after the previous coalition collapsed on 24 July. The move could pave the way for the passage of crucial reforms linked to the USD17 billion programme loan with the IMF, in place since May, which has been blocked by opposition parties. Meanwhile, government forces continue to fight separatist forces in eastern Ukraine, with no end in sight in the near term. That conflict has taken a toll on economic activity. Real GDP declined by -4.7% y/y in Q2, after -1.1% y/y in Q1. EH forecasts full-year 2014 GDP will contract by nearly -7%. After stabilising in May to mid-July, the UAH has since fallen by another 17% against the USD, bringing the year-to-year depreciation to 68%. Driven by the currency weakening and sharply rising energy prices, inflation accelerated to 12.6% y/y in July and is expected to rise further.

Atradius

Russia Outlook, Jason Curtis, Credit Insurance

Russia currently experiences a slowdown in economic growth, and the situation is most likely to deteriorate further as a result of the newly imposed sanctions. We observe that currently all sectors are affected by decreasing domestic demand, a weaker rouble exchange rate, a rise in inflation, limited access to external financing and international capital outflow.

However, some sectors are more affected than others, especially those that are heavily dependent on imports and or/consumer demand, such as consumer durables and consumer electronics. Russia´s sanctions on imports of food and agricultural products will hit the domestic food sector, in particular the fish, meat and dairy subsectors, with a negative impact on the whole value chain - from importers and wholesalers to major retailer chains and smaller regional traders.

While the oil and gas industry is still performing well thanks to high commodity prices, businesses in other strategic sectors such as metals & mining are suffering, and may not be able to refinance their large debts. While the Russian government is ready to provide financial support, its reserves, though ample, are limited.

However, some sectors, such as the pharmaceuticals sector, are expected to be less impacted and local agricultural production could even benefit from restrictions on food imports. In case of price controls, however, business profits may be hit given higher costs that cannot be transferred to consumers in such case.

DATES FOR THE DIARY

REACH: Are you complying or dying?
10th September 2014,
MMTA Office, London, UK
LAST CHANCE TO BOOK THIS EVENT

MMTA'S 41st Anniversary Dinner
21st October 2014,
InterContinental, London, UK
BOOK THIS EVENT

Advanced Manufacturing Research Centre Day & Networking Drinks
20th November 2014,
AMRC Sheffield, UK
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New York Dinner
4th December 2014,
Circus, New York, USA
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MMTA Christmas Lunch
17th December 2014
Ironmongers' Hall, London, UK
REGISTER YOUR INTEREST
SPONSOR THIS EVENT

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CHINA'S 12TH FIVE-YEAR PLAN: CHALLENGES AND OPPORTUNITIES FOR THE METAL INDUSTRY

Vital Materials, is a rare metals oriented materials technology group. As the market leader in the global rare metals industry, Vital is the largest producer of selenium and tellurium materials, as well as the key producer of gallium, indium, germanium, bismuth, and cadmium products. Its products are widely used in the fields of electronics, photovoltaics, LED, infrared materials, acousto-optics, thermo-electrics, photosensor, radiation detectors, pharmaceutical, feed additives, glass, ceramics, metallurgy etc. Vital has industrial and commercial operations in Asia, Europe, North and South America with over 1700 employees worldwide.

China's Five-Year Plan (FYP) for National Economic and Social Development is a strategically important instrument used by the government, to establish the perspective and overall objectives related to social and economic growth and industrial planning in key sectors and regions, as guidelines and frameworks for policy-makers at all levels of government to achieve in five -year cycles. It sets up the vision and benchmark as a blueprint, shaping the landscape for the country's future progress and development with a far-reaching impact on each and every social level.

Approved by the Communist Party of China's (CPC) Central Committee in October 2010 and ratified by the National People's Congress (NPC) in March 2011, China's 12th Five-Year Plan (2011-2015) has now been in progress for more than 3 years. The plan's key themes are sustainable growth, industrial upgrading, promotion of domestic consumption and protecting the environment, reflecting the government's focus on "Inclusive Growth", promoting social equality and ensuring the "fruits" of reform and economic growth will be enjoyed by a greater proportion of Chinese citizens. Four sectors to be sustained and encouraged by the 12th FYP are health care and social welfare, energy and technology. As a major part of economic restructure, the government has unveiled several preferential tax, fiscal and procurement policies aimed to develop seven "Strategic Emerging Industries"(SEIs), which are considered to be the mainstay of China's economy in the decades ahead, and where Chinese enterprises are expected to succeed on a global scale. The seven industries are new energy, high-end equipment manufacturing, energy conservation and environmental protection, clean-energy vehicles, new materials, bio-technology, and next-generation IT, many of which are related to the metal industry. The principles and policies of this FYP have had and will continue to have a profound impact on the metal industry for many years to come.

Although economic rebalancing has been a government priority for many years, the significant decrease in China's exports during the global financial crisis in 2008, has made the government even more aware of the importance and urgency of shifting its growth model from overreliance on investments and exports to consumption-driven growth.

GDP growth rate is no longer a major focus, replacing "Quantity" with "Quality", transforming from "Made in China" to "Designed in China", has become the major target and mission for all the industrial sectors,

indigenous innovation is being backed and promoted by the government with encouraging policies.

For the metal industry, eliminating outdated and inefficient capacities has been one of the major tasks during the past few years. Recently China's Ministry of Industry & Information Technology (MIIT) released the list of outdated capacity in 15 industries targeted to be eliminated this year. The 2014 list covers 725,600 tonnes of copper capacity, 356,000 tonnes of lead capacity, 8.48 million kvah of lead-acid battery polar plate capacity, and 5.31 million kvah of lead-acid battery assembling capacity. The amount of zinc capacity required to be shut-down this year is lower than last year, while the aluminium industry is facing higher pressures, with inefficient capacity targeted for retirement this year almost doubling that of 2013.

Throughout the years, a series of laws and measures have been published and implemented to regulate the export of primary raw materials and energy intensive products. To further restrict the import of materials containing hazardous elements, and thousands of plants with highly polluting and high energy consumption, production has been ordered to shut down and rectify, showing the determination of the government for economic restructure and industrial upgrading.

While the outdated industrial sectors are facing unprecedented pressures and challenges, some other far-sighted enterprises have been enjoying the benefits from the favourable policies from the government, to further strengthen their early established high-tech and innovation oriented operation model, and further elevate their core-competitiveness.

Vital Materials is one of them, with its $300 million investment, the 52 hectares new plant will be producing more high-tech and value-added downstream products, carrying on Vital's philosophy of fully vertical integration with extended value chain. Being the National New and High-tech Enterprise for many years, Vital now has two national level technology centers (National Minor Metals Engineering Research Center and National Enterprise Technology Center), one Post-Doctorate Work Station and one Technical Committee led by a China Academy of Science (CAS) Fellow. Equipped with strong scientific and technological strength, first-class R&D facilities and professional team, thousands of new and high-tech enterprises like Vital will continue to develop their independent innovation with government's incentives as well as self-investment, to become the leading roles in their sectors and contribute to China's industrialization and economic growth.

"Change or Out", this is the one and only choice lying in front of all the industries in China, especially for the metal industry, as it involves many aspects addressed in the 12th FYP, including energy conservation and environmental protection, new materials, technology and innovation, industrial transformation and upgrading. Only those who can seize the opportunities and triumph over the challenges will win at the end and become even more stronger, competitive and sustainable in the long run, and contribute to the long-term prosperity for the entire nation.

Vicky Zeng, Vital Materials Co. Ltd

MMTA VISITS MAGNESIUM ELEKTRON

During the summer, the MMTA travelled to Swinton near Manchester to visit Magnesium Elektron, an MMTA member and a world leader in the development of high quality magnesium alloys. We were welcomed by Gary McCabe and Jim Hickey, who kindly introduced us to the company and gave us a tour of the facilities.

Magnesium is best known for its lightweight properties: a quarter of the weight of steel and a third of the weight of aluminium. In the automotive and aerospace industries this is particularly valued for increasing fuel efficiency and, consequently, reducing CO_2 emissions. This helps with meeting the strict emission limits set out in legislation, as well as keeping down the cost of fuel for aviation companies. Some of magnesium's other attributes include a high strength to weight ratio, machinability and the wide range of processing methods, including casting, extrusion, powder metallurgy and rolling.

Most of us will be familiar with the memorable school experiment demonstrating the bright white light of burning magnesium, but you will be relieved to know that innovative new alloys developed by Magnesium Elektron are inherently flame resistant beyond their melting point, realising their lightweight advantage with no detriment to safety standards. These diverse characteristics mean that magnesium makes its mark in a myriad of industries.

History of Magnesium Elektron

The company first began processing magnesium in 1936, and has manufacturing facilities not only in the UK, but also in the USA, Canada and the Czech Republic. The company is a division of the Luxfer Group, an international group of businesses that specialise in the design, manufacture and supply of high performance engineering materials, alloys and semi-fabricated components using aluminium, zirconium and composites, as well as magnesium, of course.

Magnesium Elektron is a market leader in research and technical expertise, pushing forward the boundaries of magnesium alloy technology, specialising in high value niche patented alloys. Their Research Centre has in fact developed more alloys than any other company in the world.

The site tour

After picking us up from the station and giving us a fantastic tour of vibrant Manchester and Salford, seeing the numerous developments and new businesses popping up, we arrived at the Magnesium Elektron site, situated to the north of the city in Salford.

Following an introduction to the company, we began a tour of the plant, visiting the foundry, the extrusion facility, the rolling facility, as well as some of the support areas such as the testing and quality control rooms. We also saw Magnesium Elektron Graphic Arts workshop, where we were surprised to learn about the use of chemically etched magnesium plates. The process for producing these is that a photosensitive coating is applied to a special magnesium photo engraving plate, which allows the user to chemically etch an image into the magnesium plate after exposing a film negative and developing that image on the plate. Engraving plates are most often used to create dies to foil stamp and emboss printed products such as greetings cards, books and packaging.

Did you know?.....

the tiny life-saving light on your airplane life jacket is powered by a small battery using magnesium and silver chloride which uses water as its electrolyte.

Until it is required it can be kept dry, so there is no deterioration of the chemicals.

A magnesium battery will start producing current as soon as it is dropped into water – and the magnesium slowly dissolves providing light for a couple of days, just what is required for life jacket and lifeboat marker lights.

A water-activated magnesium cell cannot be recharged and can only be used once – but is perfect for a life jacket, which will hopefully be used very rarely.

In the extrusion facility we saw the recently installed 2750 ton extrusion machine, where magnesium billets are heated until they are pliable and then passed through the extrusion press creating long pieces with a wide variety of profiles. The extrusions are then cut to the appropriate length or go through other treatments.

In terms of ensuring the quality of the products, Magnesium Electron has an ultrasonic immersion testing machine. This is a non-destructive test in which a large billet or flat plate, up to 3 metres long, can be tested. The part is immersed in water and is ultrasonically scanned to detect defects or inclusions. A 3-D view of the part can be produced, and the defective area can be marked by the machine straight on to the part.

Products

Magnesium is used in a diverse range of markets and applications, each one exploiting the unique physical and mechanical properties of the element and its alloys.

Below are just a few of the possible uses, giving a taster to the adaptability of the magnesium technology available:

In the Automotive sector, magnesium is used for structural applications, engine components and gear box housings.

Magnesium with zirconium alloys can be used at high operating temperatures with the zirconium acting as a grain refiner in the metal. Magnesium Elektron alloys are used in helicopter transmission castings.

Magnesium in its powder form retains its 'bright' properties and is often used in deploy flares, ordnance applications and also to illuminate landing areas for parachutes.

Recent testing by the Federal Aviation Administration (FAA) has shown that aircraft seats made of Magnesium Elektron alloys show no reduction in safety when subject to fire testing than aluminium frames, making magnesium an excellent lightweight choice.

12
Mg
24.305

The History of Magnesium

Magnesium is the eighth most common element in the world and the sixth most abundant metal, comprising about 2.5% of the earth's surface. Seawater contains 0.14% magnesium and the element is abundant in the minerals Carnallite ($MgCl.KCl.6H2O$), Dolomite ($MgCO3.CaCO3$), and Magnesite ($MgCO3$).

The name 'magnesium' comes from the Greek town of Magnesia where magnesium was first found in an area of Thessaly/Greece. The ore can still be found in great quantities there.

Sources:
Magnesium Elektron and International Magnesium Association

Magnesium Sustainability

Not only do the lightweight qualities of magnesium mean that it's 'use-phase' produces lower emissions than other materials in certain applications, but at the end-of-life, magnesium is completely recyclable.

Alloys used for structural applications can be recycled back into products displaying the same chemical, physical and mechanical characteristics as primary material. This attribute is being actively encouraged within the industry, given its positive impact upon the environment. Recycling requires only 5-10% (IMA) of the energy required to produce the primary product.

At Magnesium Elektron, processes for waste and scrap are extremely efficient with no metal wasted. They have their own waste and recycling plant with waste treatment ponds. Another sustainability initiative from the company is that they have installed scrubbers in the foundry, which filter any emissions through lime creating an exceptionally clean environment. The lime itself is then returned to the supplier for recycling.

We would like to thank Gary and Jim for taking the time to host us and for the informative and enjoyable visit.

Tamara Alliot, MMTA, visiting Magnesium Electron

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Aluminum – pure pebbles, ingots
Chromium – DDB, electrolytic, aluminothermic, targets, powder
Hafnium – crystal bar, scrap, targets, ingots
Magnesium – pure, nickel-magnesium
Manganese – electrolytic flake (Selenium free available)
Molybdenum – pure bar, plate, scrap, TZM – vac and airmelt
Niobium – EBM ingot, scrap, nickel-niobium
Rhenium – pure pellets, APR
Silicon – pure metal lumps, powder, solar scrap
Tantalum – EICC EBM ingot, scrap
Titanium – CP and 6/4 scrap, sponge, Ferro Titanium 70%
Tungsten – pure bar, plate, scrap, WC, WCCo, Densalloy, WTi
Vanadium – pure, nickel-vanadium, vanadium-aluminum
Zirconium – pure, nickel zirconium, scrap 702, 704, 705, Zircalloy 2/4

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We also supply a range of aluminum-based master alloys manufactured in house:
Al-Cr, Al-Cu, Al-Fe, Al-Mg, Al-Mn, Al-Ni, Al-Sc, Al-Si, Al-Sr, Al-Ti, Al-V, Al-Zr

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Buyers and sellers of conflict-free Tantalum scrap – solids, turnings, sputtering targets, capacitors, anodes, top hats, pins, TaW and Ta containing alloys

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Buyers and sellers of Ni/Co superalloys scraps – grindings, solids

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Buyers of Rhenium-bearing scraps – solids, turnings, grindings, sludges

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Buyers of spent sputter targets – Cr, Ta, Mo, W, Nb, Re, Hf, Zr, Al, Ti, NiV, MoTi, WTi

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Avon Metals Ltd, Ashville Road, Gloucester, GL2 5DA, United Kingdom
Tel: + 44 1452 529696 Fax: + 44 1452 300624

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MMTA 41st Anniversary Dinner

21st October 2014

Intercontinental Hotel, Park Lane, London

BOOK NOW FOR THE MMTA'S FLAGSHIP EVENT

The MMTA's Anniversary dinner is the place to be on the Tuesday of LME Week for anyone with an interest in minor metals. Growing in importance each year, this year's black tie event will again welcome MMTA Members and their guests, as well as other industry professionals.

Timings for the Evening:

18.45—20.15: The evening will begin with a networking drinks reception for attendees sponsored by Avon Metals Ltd

20.30—22.00: The main dinner is sponsored by Argus Media and will include a 4-course dinner with wine

Starter	*Herb Gratinated Cornish Monkfish and scallop on leaf spinach with a Champagne Mushroom cream* ***or*** *Rocket and cucumber maki roll, marinated palm heart, tomato and avocado salad*
Main	*Slow braised shoulder fillet of New Romney lamb with a haricot bean ragout Violet potato crush and preserved tomatoes, basil jus* ***or*** *Root vegetable dauphinoise with a crust of feta cheese and red pepper Served with red and white wine*
Dessert	*Warm apple Bakewell tart, berry compote Clotted cream ice cream, blackberry sauce followed by* *Tea/Coffee and petits fours*

22.00—01.30: Late bar and after-dinner entertainment

We will once again be holding a charity business card raffle in support of the MMTA's link with Mufulira in Zambia, this year sponsored by Alex Stewart International

Member tickets £105 (+ VAT where applicable)

Non-member tickets £150 (+ VAT where applicable)

Please see our Terms and Conditions at **http://www.mmta.co.uk/terms-and-conditions**

Minor Metals: What should be in your supplements?

Over time rocks containing minerals are eroded into tiny fragments forming dust and sand, which become incorporated into soil. Plants absorb these minerals from the soil. When animals eat the plants, these minerals are then passed on to the animals. These minerals are then transferred to humans when they eat the animals and plants. Once eaten, minerals are absorbed into the blood, which then carries them to all body cells, where they carry out their functions. Trace minerals are only needed in small quantities by the body but are very important in maintaining health. Some of these trace minerals are listed in the paragraphs below.

Chromium

Chromium is essential for producing a substance in the body called glucose tolerance factor (GTF). This factor helps insulin regulate sugar levels in the blood. Low levels of this mineral can lead to increases in levels of blood sugar and cholesterol leading to an increased risk of diabetes and heart disease. Good food sources of chromium include whole grain bread, oats, lean meats, cheeses, black pepper, thyme, nuts, prunes, mushrooms and brewer's yeast. Chromium is difficult to absorb from food so high doses usually only occur when it is taken in supplement form. Too much chromium can reduce the effects of insulin in controlling blood sugar and can also cause symptoms such as irregular heartbeat, liver and kidney problems.

Manganese

Manganese is found in tiny amounts in the body but has a number of functions. It helps the body form connective tissue, provides the framework for bone and its growth, forms blood clotting factors and sex hormones, is involved in fat and carbohydrate metabolism, regulates blood sugar and calcium absorption, has antioxidant properties and is needed for brain and nerve function. Dietary sources of manganese include, nuts, seeds, wheat germ, whole grains, pineapples, beans, ginger and tea. Low levels of manganese have been linked to infertility, weak bones and seizures. High levels have been found to accumulate in the brain and cause neurological disorders similar to Parkinson's disease and poor cognitive function in children.

Molybdenum

Molybdenum is found in the liver, bones and kidneys. It is also used by the body for nitrogen metabolism, activation of some enzymes, bone growth and strengthening of the teeth. Dietary sources of molybdenum include beans, calves liver, whole grains, dark green leafy vegetables and peas. A deficiency of molybdenum can cause impotence in older men and mouth and gum disease. Low doses have also been associated with increased risk of cancer. High doses of molybdenum may lead to the development of gout and can interfere with copper metabolism.

Selenium

Selenium is often associated with antioxidant activity as its main function in the body is to help in the formation of antioxidant enzymes. In addition selenium is vital in regulating thyroid hormones and fat metabolism and it also helps to maintain a healthy heart, liver, pancreas and the elasticity of skin. It has also been found to protect against certain types of tumors and supports the immune system. Dietary sources of selenium include brazil nuts, broccoli, liver, brewer's yeast, butter, fish, shellfish, garlic, whole grains and sunflower seeds. However the level of selenium in foods depends on how much selenium was in the soil where the food was grown. Selenium deficiency is becoming quite common now due to low selenium in soils. Common symptoms of selenium deficiency are exhaustion, poor growth, high cholesterol levels, viral infections, liver impairment and sterility. On the other end of the scale, symptoms such as arthritis, brittle nails, garlicky breath odor, hair loss, tooth loss and digestive problems can occur as a result of excessively high selenium levels.

Cobalt

Cobalt forms part of a vitamin known as vitamin B12. B12 is essential in producing red blood cells and nerve cells. Dietary sources of cobalt include meat, liver, kidney, clams, oysters, milk, ocean fish and sea vegetables such as seaweed. High doses of cobalt can be toxic and lead to an enlarged heart, thyroid problems and thickened blood. A deficiency of cobalt is not a problem as long as there is enough B12 in the body. However if cobalt deficiency leads to decreased B12 levels then pernicious anaemia and nerve damage can occur. Due to the prevalence of cobalt in animal foods vegans need to make sure they have adequate vitamin B12 in their diet.

Silicon

There are approximately 7g of silicon in the tissues and fluids of the body. It is essential for the formation of bones, the strength of nails and hair and maintains the health of skin and joints. Silicon is also needed to keep arteries flexible, helps prevent Alzheimer's and osteoporosis and stimulates the immune system. Dietary sources of silicon include alfalfa, brown rice, bell peppers, soybeans, leafy green vegetables and whole grains. A deficiency of silicon can cause skeletal deformities and weak joints. High dietary intakes of silicon have not yet been linked to specific symptoms. However inhaling industrial silicon dust for a long time can affect the respiratory system.

Vanadium

Vanadium has only recently been described as an essential trace mineral. The body contains about 20-25mg of vanadium and some of this is stored in fat tissue. Studies on vanadium, mainly carried out on rats however, show it is needed for the formation of teeth and bones. It has also been associated with growth, reproduction, inhibition of cholesterol synthesis and improved insulin metabolism. Dietary sources of vanadium include the herb dill, fish, olives, meat, radishes, whole grains and vegetable oils. Like selenium, the amount of vanadium in these dietary sources depends on the amount of vanadium in the soil the food sources came from. Vanadium deficiency has been linked to cardiovascular and kidney disease, impaired reproduction and increased infant mortality. Vanadium is difficult to absorb but toxicity can occur and has been shown to cause mania and depression.

Loliya Harrison, Nutritional Therapist **Visit** http://www.loliyaharrison.com

Selling the Eiffel Tower- a Great Metal Con

Victor Lustig, born in the Czech Republic in 1890, was a well-known con man and a master of deception. From gambling scams on board trans-Atlantic liners to profiting from the prohibition era in the United States, this polyglot trickster, who had up to 45 aliases, was destined to succeed in one of the most audacious cons in history.

In 1925, Lustig travelled to Paris, and after reading a newspaper article about the high cost of repairs needed for the Eiffel Tower, which included a comment about the possibility of the government ripping it down rather than paying to repair it, an idea was born. In the mind of Lustig, this was a golden opportunity. He set a plan into motion by having copies of official government stationery printed, appointed himself as an official and then produced letters to 5 different scrap metal dealers. These letters were not specific, but instead invited the men to a meeting at a hotel.

He announced to the metal dealers, after some entertaining, that the government intended to tear down the Eiffel Tower and sell it for scrap. Obviously this was confidential information, so the men were urged to keep quiet about the plans to avoid a public outcry. The dealers all submitted their bids a few days later. However, it was not the highest bidder who won the contract, but rather the scrap dealer who Lustig had already decided was the most gullible, the 'lucky' winner being André Poisson.

Lustig's scheme didn't stop there; after dropping hints about the life and financial pressures of a public servant, Poisson also paid a bribe to Lustig to guarantee him the contract. After Poisson had paid him again for the tower, Lustig quickly fled the country, waiting in Austria for the story to hit the press, but it turns out that Poisson was too embarrassed to report the deception to the police, and instead swallowed his losses.

At this point Lustig went back to Paris and repeated the whole scam, but with five new scrap dealers! The second time he was reported to the police and so he fled back to the USA to escape justice.

MMTA members are encouraged to buy from reputable and verified sources!

More details of the story can be found in the book ***'The man who sold the Eiffel Tower'*** by James F Johnson with Floyd Miller.

Tamara Alliot, MMTA

Maria Cox Interviews Argus Media Chief Operating Officer, Neil Bradford

Neil Bradford is Chief Operating Officer for Argus, based in London. Neil joined Argus in 2010, overseeing all global operations, leading Argus' technology development and merger and acquisition activity.

Neil started his career at McKinsey, and then co-founded Fletcher Research, a technology information firm, which he sold to Forrester Research in 1999. He subsequently became President, Americas for Forrester Research in Boston, MA. Most recently he was CEO of WGSN, a global information business for the fashion and style industries.

Neil was educated at Oxford University where he took his BA and MA degrees in Geography.

argus
argusmedia.com

It may be that not everyone in the minor metals sector is aware of Argus Media, so could you tell me a little about the company and how it's developed.

Argus was founded in 1970 to provide news, prices and information on the nascent European oil markets. The timing couldn't have been better—oil price volatility accelerated in the 70s and that, combined with the breakup of the major oil companies' dominance of supply meant that market participants needed reliable price assessments and intelligence about what was happening. Argus prices became trusted benchmarks for international oil trade, and now billions of dollars of supply contracts reference Argus prices, along with a number of financial derivatives.

Over time Argus expanded coverage to other energy commodities. We moved first into gas, as gas prices in Europe are often linked to oil, and then to power, as those markets are influenced by gas, and so on. We now cover all of the energy commodities, bioenergy, emissions, petrochemicals, fertilizers and now of course metals.

Having been founded in London, Argus reports on markets globally and has around 650 staff in 19 offices in all the main commodity business regions.

What was it about the metals sector that made it of particular interest to Argus?

We came into metals through coal. We have several well-established thermal coal publications with prices that are widely used in contracts. Our customers then asked us to extend our coverage to coking coal, so we launched a steel feed-stocks report in 2013, covering iron ore as well as coking coal. The success of this service made us look for more opportunities in metals, and so we were delighted to acquire Metal-Pages earlier this year.

In what ways will Metal-Pages change now that it has become part of Argus and in what ways will it remain the same?

We're aiming to merge Metal-Pages' deep sector expertise with Argus' global resources.

Under Nigel Tunna's leadership, Metal-Pages has built a strong reputation for reliable, in-depth coverage of minor metals, rare earths and ferro-alloys. We are expanding the teams covering these areas, and will be launching a new weekly report on rare earths, plus many additional new price assessments.

We have joined together the Argus and Metal-Pages offices in London and Beijing so that the teams can work closely together. We are also investing in conferences and have started to provide consultancy work - we have already begun our first project, on rare earths, for a long standing Metal-Pages client.

Do you see similarities between the development of the energy and the metals markets?

There are many differences between the sectors, such as the ability to recycle metals as scrap, which means the markets work in different ways and Argus is always careful not to follow a "one size fits all" approach.

But equally, there are many similarities. Both are rooted in the physical transfer of goods from supplier to consumer. There can be many other types of company in the transaction train, for instance traders and brokers. Most product moves on a long term contract basis, though spot trade is very important for establishing the index price. Prices produced by Argus and Metal-Pages are used extensively in contracts internationally. Sometimes markets are not very actively traded and often they are opaque, underlining the need for intelligent information.

Both sectors are absolutely vital to everyday life. Trade is very international – supplies are concentrated in specific regions, some of which are subject to unpredictable change and consuming centres can be far away.

Are there issues that have been faced in energy from which lessons can be learnt in the metals world?

I think one key crossover between the two commodities sectors will be regulatory scrutiny on markets and prices. In recent years regulators have turned their attention to energy markets and I believe this will extend to metals in time. There

is already attention on the gold and silver fix for instance and I believe this will extend to the other metals.

In energy markets, Argus has been working with different international regulators for many years now, explaining to them how physical markets work and ensuring that their work to foster best practice is fully supported. A challenge for companies like us is to ensure that regulation is appropriate for the areas we cover. For instance commodity markets are quite different from financial markets and legislation governing the latter may be counterproductive and damaging if applied to the former. Argus has been working hard to ensure that regulators understand the particular characteristics of each market, so that they can devise appropriate legislation.

Argus is well placed when it comes to this kind of scrutiny. We have transparent methodologies showing how we come up with prices and a global compliance team who ensure that procedures are followed. We do annual audits of our benchmarks and we are proud to be defining industry best practice.

Are there aspects of the metals world that have surprised you since moving into this sector?

There have only been pleasant surprises! We have found that the metals community has been very welcoming to us. We know Argus is a relatively new entrant, but clearly Metal-Pages had a great reputation and the people we have met have been very open, helpful and insightful. We are really glad to be in this market now.

Also, we knew that the industry was diverse, but its scale and breadth have impressed us. From steelmaking and rebar forming, to the essential ingredients that make mobile phones or laptops work, we have been introduced to a vast array of different companies with varying needs.

Finally, how did you become involved in commodities and is it a sector you would recommend to others?

I joined Argus as Chief Operating Officer in 2010, with a background in B2B publishing and information businesses. I chose Argus because I could see that the need for good market information on global commodities markets would only increase, and that Argus was well positioned to provide that.

But given my university degree was geography, the true fascination of commodity markets is their global nature and interplay of political, economic, technological, environmental and even cultural factors across countries and continents. So I would recommend commodities to geographers and even to holders of other degrees.

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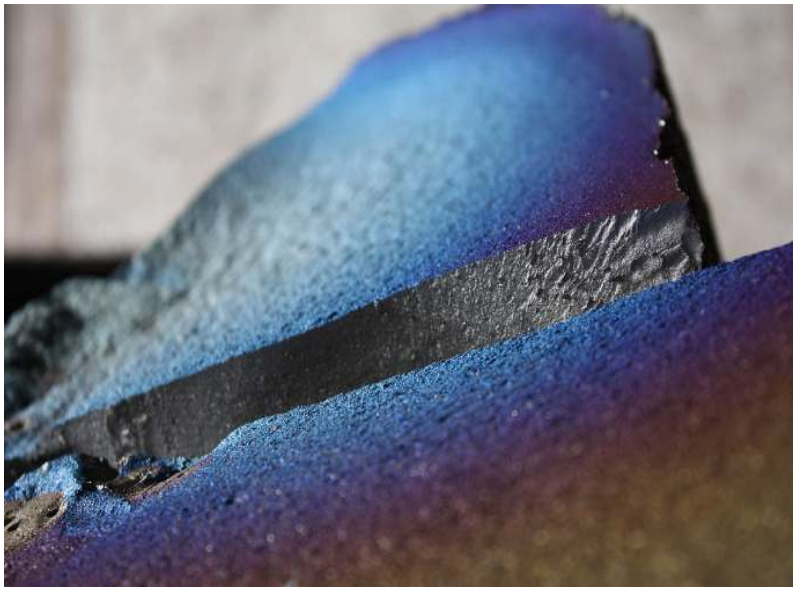
If you would like to find out more about our opportunities, please contact us at employment@argusmedia.com

MMTA Visit to Sims FE Mottram



The MMTA travelled up to the 'steel city' of Sheffield in July to visit Sims F.E Mottram, a Ferro-titanium producer and member of the association. We were impressed to see that this traditional industrial city is experiencing a real renaissance for manufacturing and industry.

We started the day at Sims F.E Mottram, where Daniel Nix, the Managing Director kindly showed us around the site. Although Sims F.E Mottram's main product is Ferro-titanium, but they also have capacity for ferro-aluminium.

The site was divided into areas; firstly we looked at where the titanium scrap was brought in, some of it from some pretty interesting origins, and sorted. The quality of the scrap is very important, with Daniel explaining to us the problems associated with having too much oil on the metal or even having metal bonded to other substances, such as rubber. Sims F.E Mottram buys scrap from different sources and this can be from the end-of-life of a product or in-process scrap from, for example, machining a titanium component. After the scrap is sorted it is then crushed and the 'ingredients' for ferro-titanium mixed together, re-melted and then poured to make ingots.

Due to the diversity of the scrap coming on to the site, making sure that the mix of the materials being melted together to make high quality ferro-titanium seemed to be a highly specialised job at least, and more like an art-form!

The testing and quality control process is taken care of by the on-site laboratory, where samples are taken of the metal and tested to ensure the product is of the highest quality, throughout the production steps.

Following a conversion of one of their furnaces earlier in the year, from ferro-aluminium to ferro-titanium, the plant's production capacity has increased to 700 tpm, making it the largest ferro-titanium producer in the UK.

Thank you to Daniel Nix and Graham Battershill for their time and hospitality.

MMTA Executive Team

About Ferro-Titanium

During steelmaking, titanium is usually introduced in the form of Ferro-titanium because of its lower melting temperature and higher density compared with those of titanium scrap.

Ferro-titanium is an alloy of iron and titanium, with around 70% titanium content for metal made using titanium scrap and iron in an induction furnace. It is used in steel making, with the addition of ferro-titanium giving the steel a finer grain structure. Titanium is also used for de-oxidation and carbon and nitrogen control.

In stainless steel, ferro-titanium is used as a stabiliser, preventing chromium carbide forming at grain boundaries. Steels with relatively high titanium content include interstitial-free, stainless, and high-strength low-alloy steels. (USGS) The titanium scrap used comes from an array of sources from machining waste, to end of life products.

The MMTA has recently become a member of the Critical Raw Materials Alliance. The CRM Alliance promotes the importance of critical materials to the EU and supports a critical materials policy.

Given the fact that many CRMs are minor metals, the MMTA takes a keen interest in the developments in this area.

For more information on the CRM Alliance, visit http://criticalrawmaterials.org/

Supporting Supply Chain Resource Sustainability

The MMTA recently attended a collaborative workshop on Sustainable Supply at the Advanced Manufacturing Research Centre in Sheffield. The aim of the event was to foster closer working relationships between researchers at The University of Sheffield and leading businesses in key strategic areas including advanced materials and manufacturing, energy and nuclear, water and agritech/food.

Professor Lenny Koh, supported by a team of respected academics, led the Supply Chain Resource Sustainability (SCRS) workshop, helping to shape the vision and programme of supply chain resource sustainability research.

At the start of the day, Professor Ian Shellard, former Director of Physical Logistics at Rolls-Royce, gave an industry perspective of Sustainable Supply Chains. He emphasised the importance of being able to visualise, understand and calculate the full impact of, for example, using 'green' energy or implementing a Corporate Social Responsibility programme, along with the costs and investment required. He also asked for better tools for creating viable business cases for 'green' programmes that are focused on real savings and/or increased sales, comparable to traditional business cases.

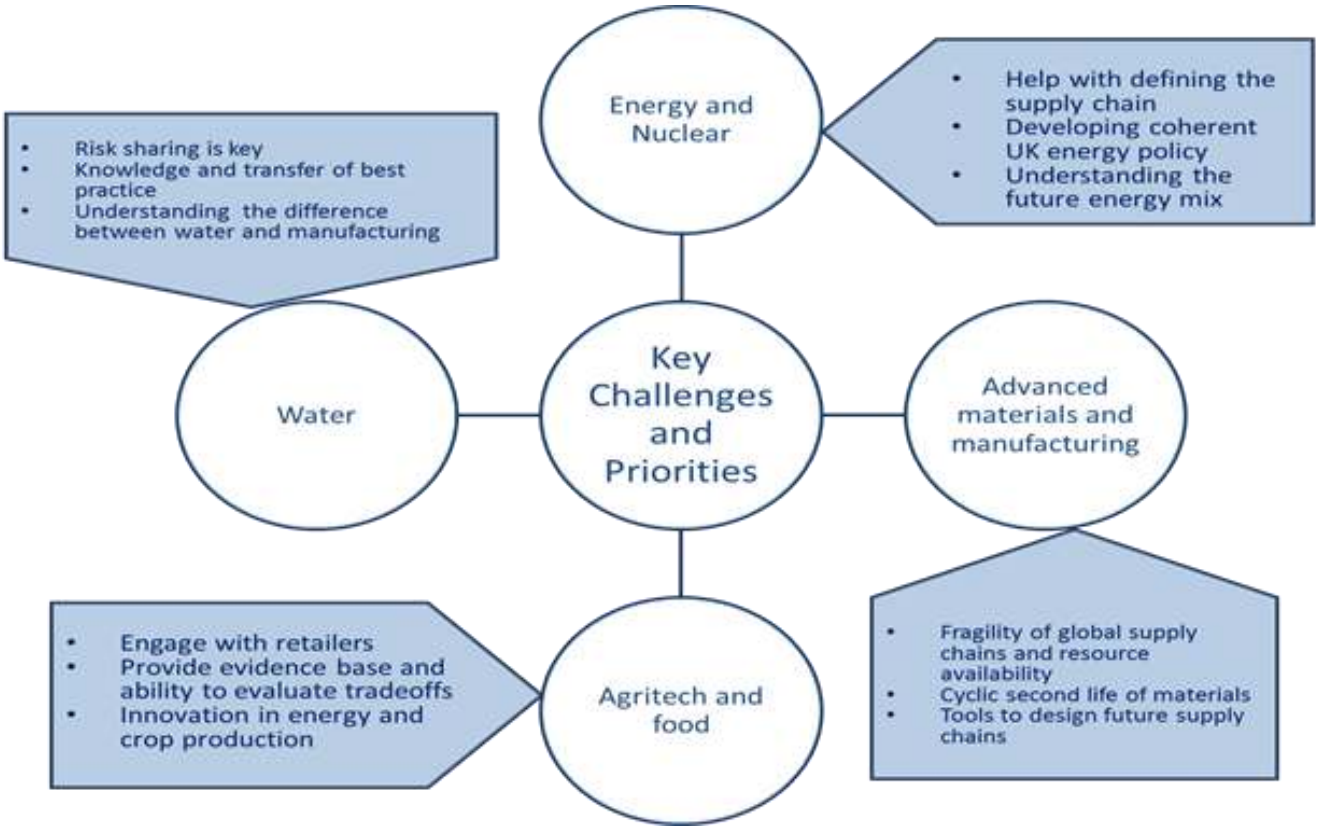
The workshop also introduced the Advanced Resource Efficiency Centre (AREC), a facility for supporting the development of competitive advantage by creating world leading, resource sustainable supply chains through collaborative action between industry and academia, especially in the thematic areas where The University of Sheffield has deep expertise. The MMTA attended breakout sessions on Advanced Materials & Manufacturing and Nuclear Energy.

Within the Nuclear Energy group, the discussions ranged from the role of nuclear in the low carbon economy, to the steps and investment needed to extend the life span of current plants, as well as the importance of having a highly qualified workforce and public support.

A key focus of the Advanced Materials & Manufacturing group was the extent to which the availability of essential resources impacted global supply chains, and the need to design supply chains for the future that take this into account by reducing dependence on single suppliers. The group also discussed the impact of recycled materials on easing supply availability.

The key challenges/priorities in each of these sectors are summarised in the diagram with a full report being released in mid-September, to be followed by a collaborative steering group meeting.

MMTA Executive Team



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