VATIS UPDATE

Waste Management

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Highlights

- A new concept in recycling fibreglass
- Turning CRT glass into insulation
- Treatment of tannery wastewater
- Mobile technology for soil decontamination
- Bioremediation of agro-based pulp mill effluent
- Low-emission biofuel boiler system

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Economic and Social Commission for Asia and the Pacific

APCTT
ASIAN AND PACIFIC CENTRE FOR TRANSFER OF TECHNOLOGY

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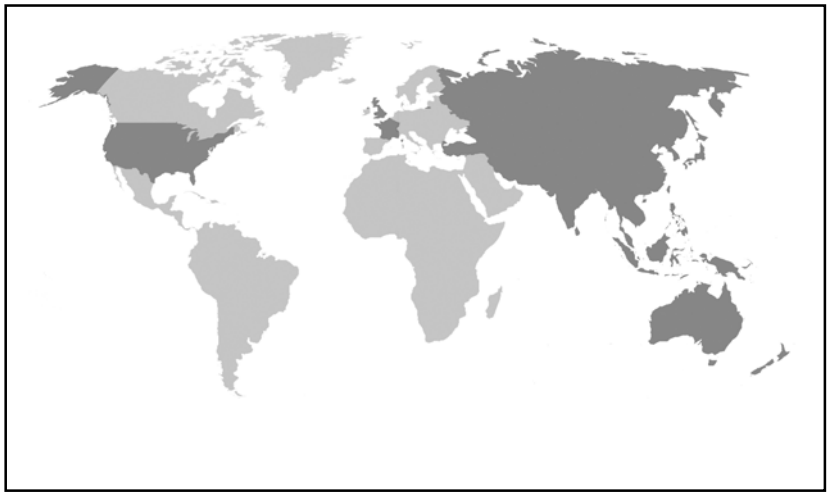
The **Asian and Pacific Centre for Transfer of Technology (APCTT)**, a subsidiary body of ESCAP, was established on 16 July 1977 with the objectives: to assist the members and associate members of ESCAP through strengthening their capabilities to develop and manage national innovation systems; develop, transfer, adapt and apply technology; improve the terms of transfer of technology; and identify and promote the development and transfer of technologies relevant to the region.

The Centre will achieve the above objectives by undertaking such functions as:

- Research and analysis of trends, conditions and opportunities;
- Advisory services;
- Dissemination of information and good practices;
- Networking and partnership with international organizations and key stakeholders; and
- Training of national personnel, particularly national scientists and policy analysts.



The shaded areas of the map indicate ESCAP members and associate members

Cover Photo

Fully automated prototype for treatment of industrial wastewater with UV light (see p.12)
(Credit: Fraunhofer IGB, Germany)

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*** Value Added Technology Information Service**

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Agreement on North-South movements of hazardous waste

Representatives of 118 members of Basel Convention, the global treaty on waste management, have made a historic agreement, known as the Ban Amendment, which unblocks an amendment to ban the export of hazardous wastes from the Organization for Economic Cooperation & Development (OECD) countries to non-OECD countries. The groundbreaking decision, containing a set of measures to strengthen international control of transboundary movements of hazardous wastes, was adopted on 21 October 2011, the closing day of the 10th meeting of the Parties to the Convention in Cartagena de Indias, Colombia. It allows the Ban Amendment to come into force for those countries that wish to adhere to it, but also moves forward in establishing a regime for countries that wish to trade in waste to ensure the minimization of health and environmental impacts, ensuring adequate social and labour conditions and creating new economic opportunities. It clarifies the interpretation of Article 17(5) of the Convention that sets the bar for entry into force of the Ban Amendment. The Ban Amendment agreement capped a week of negotiations between 700 participants of the meeting of the Parties to the Convention.

The conference in Cartagena also adopted a Strategic Framework for the implementation of the Convention over the 2012-2021 period, setting out a vision, guiding principles, strategic objectives, means of implementation and indicators of achievements. The Strategic Framework aims at strengthening the environmentally sound management of hazardous wastes as a contribution to promoting human health and sustainable livelihoods, and eradicating poverty. Technical Guidelines were adopted on co-processing of hazardous wastes in cement kilns, and environmentally sound management of mercury wastes and used tyres. The Parties also adopted the Cartagena Declaration on prevention and minimization of hazardous wastes. The declaration complements the Strategic Framework in determining the work under the Bael Convention in years to come. It also reaffirms that the Basel Convention is the primary global legal instrument for guiding the environmentally sound management of hazardous and other wastes and their disposal, and efficiently and safely manage those that cannot be avoided. The declaration calls for creating a global methodology for the accurate measurement of national waste generation, as a tool for gauging national efforts to make progress in waste prevention. *Contact: Ms. Katharina Kummer Peiry, Executive Secretary, Secretariat of the Basel Convention, 11-13 Chemin des Anémones - 1219 Châtelaine, Switzerland. Tel: +41 (22) 9175488; E-mail: Katharina.Kummer@unep.org.*

Source: www.basel.int

China hosts Basel Convention Centre

This year marks a noteworthy anniversary – the centenary of Tsinghua University, which was founded in 1911 at the site of Qing Hua Yuan (Tsinghua Garden) – a former royal garden of the Qing Dynasty located northwest of Beijing, China. This year, Tsinghua University opened the doors to its newly established School of Environment, which now hosts the Basel Convention Coordinating Centre for Training and Technology Transfer for Asia and the Pacific and the Stockholm Convention Regional Centre for Capacity-building and the Transfer of Technology in Asia and the Pacific. Prof. Jinhui Li, a leading expert on chemical and waste management, leads both centres at Tsinghua's School of Environment.

Source: www.basel.int

Malaysia rolls out e-waste project

Malaysia generated about 163,000 tonnes of used electronic products, or e-waste, last year, according to Penang Department of Environment (DOE) Director Mr. Datuk Hassan Mat. "E-waste has caused environmental pollution and has an adverse impact on public health," said Mr. Hassan Mat. To counter such problems, Penang state has developed a project model for the collection of e-waste. The project, conducted with the help of the Japanese International Cooperation Agency (JICA), is expected to be completed by March 2013, Mr. Hassan Mat said. Penang will be the first state in the country to set up such a project.

Source: www.eco-business.com

Philippines takes up wastewater treatment in hospitals

Poor sanitation and lack of sewage treatment in the Philippines form leading causes of illness, economic losses and death. A 2007 study by World Bank and the United States Agency for International Development (USAID) estimated that preventable waterborne diseases cause 55 deaths in the Philippines each day and economic losses US$1.4 billion (78 billion pesos) per year. The Iorma Medical Centre and College in San Fernando City, La Union province in the northern Philippines is using a model wastewater treatment system to help reverse this trend. With technical assistance from the USAID Philippine Sanita-

tion Alliance (PSA), the system offers an affordable means for the hospital to avoid risks from harmful microbes and excessive nutrients in its wastewater. The hospital is now in compliance with government effluent standards.

The system – with an initial capital expenditure of just US$36,000 – requires minimal operation and maintenance to produce an effluent that is compliant with local discharge standards. The system has been in continuous operation since 2008 and is helping to revitalize the city's estuary that is used for recreation, fishing and domestic purposes. PSA is a USAID programme that brings together cities and private sector partners to develop affordable solutions to sanitation challenges. The Iorma project demonstrates a very effective and relatively low-cost sanitation alternative that is applicable to addressing many point sources of pollution in the Philippines.

Source: psa.ph

Plasma gasification facility for Sri Lanka

A US$248 million plasma gasification facility is built in Sri Lanka by Octagon Consolidated Bhd., a waste to energy company from Malaysia. The 1,000 t/d facility will use gasification technology to treat locally collected municipal solid waste and generate a minimum of 40 MW of electricity, which will be sold to the Ceylon Electricity Board. Octagon Consolidated licences the advanced thermal gasification technology from Green Energy and Technology Sdn. Bhd., Malaysia. The plasma torch technology is capable of producing very high temperatures in the order of 10,000°C within the plasma torch and as high as 8,000°C at the visible plasma gas tip. The temperature profile in the gasifier is sustained by using thermal energy from the plasma gas, which in turn breaks down the molecular compounds in a very short period of time, often milliseconds. This avoids the formation of secondary combustion products and the production of polluting flue gas, says Octagon.

Source: renewable-energy-database.com

India sets guidelines for tackling e-waste

India's Ministry of Environment and Forests has recently notified the "E-Waste Management and Handling Rules, 2011". These rules apply to producers, consumers and bulk consumers engaged in the manufacture, sale, purchase as well as processing of electronic equipment and/or components, and to recyclers, collection centres and dismantlers of e-waste. Batteries and radioactive waste are excluded from the ambit of the rules, as are micro and small enterprises.

The rules prescribe responsibilities of the producer, collection centres, consumers, dismantlers and recycler. E-waste has to be properly segregated and collected through approved vendors. Collection centres will store the e-waste in the right form and in a secure place as per prescribed standards and procedures. Dismantlers and recyclers are also required to follow a set of procedures. Refining of all metals can be done only by recyclers who are registered with the Central Pollution Control Board (CPCB). E-waste handlers have to seek authorization of the respective State Pollution Control Board, while recycling facilities have to be registered with CPCB. Normally, e-waste can be stored for a maximum of three months unless otherwise permitted by the respective State Pollution Control Board. Proper records of sale, segregation and transfer have to be kept. The manufacturing process of electronic equipment should not include "listed elements" such as lead, chromium, mercury, etc. Even if they are used in unavoidable cases, the percentage should not exceed about 0.1 per cent.

Source: ewasteguide.info/india-releases

Viet Nam to use modern technology for waste treatment

Under Viet Nam's national strategy on solid waste treatment, by 2020, 90 per cent of solid waste would be collected and treated to protect the environment. Of this, 85 per cent would be recycled and reused to recreate energy or converted into organic fertilizer. According to the Ministry of Natural Resources and the Environment (MONRE), there are 755 urban areas in Viet Nam where landfill remains the main method of waste treatment, causing serious environment pollution. Latest reports by the World Bank show that the volume of domestic waste generated by urban areas tends to increase by 10-16 per cent per annum. Viet Nam, which generates 25,000 t/d of domestic garbage, have only 22 plants to treat/incinerate/recycle waste and most are located in urban areas.

Besides landfill and recycling technologies in use in Viet Nam, waste can be processed into organic fertilizer or fuel pellets. For instance, Song Cong waste treatment plant in Thai Nguyen City uses a technology that allows treating waste in different ways, with most of the waste recycled into useful products. Currently, a solid waste treatment and power generation plant is being developed in Soc Son district in Hanoi at a capital investment of US$21 million. This is believed to be a perfect alternative to polluting landfill

technologies. However, all localities do not have the financial capability to launch such projects.

Source: en.baomoi.com

Hundreds of battery plants closed in China

In China, 583 plants that manufacture lead-acid batteries have been shut down as part of a campaign to strictly enforce environmental standards on this booming sector, according to a statement issued by the country's Ministry of Environmental Protection (MEP). The plants were forced to close for a variety of reasons ranging from improper disposal of hazardous waste through to their small production scale and poor technical standards.

Under a nationwide exercise initiated in March 2011, a total of 1,930 lead-acid battery production, assembly and recycling plants had been inspected in five months by nine government departments, including the National Development and Reform Commission and MEP. Of these, 252 were permitted to continue operation, the operations at 1,015 were suspended and 80 others are still under construction. Details of all the lead-acid battery plants have been revealed, including their current production status and capacity, production process used, and whether their emissions meet the required standards.

Source: www.recyclinginternational.com

LG Electronics first to commit to certified e-waste recycling

LG Electronics, headquartered in the Republic of Korea, has declared its commitment to use third-party certification for verifying how its e-waste is recycled worldwide. By becoming the first e-Stewards Enterprise, LG will give preference to e-waste recyclers worldwide that meet the "e-Stewards Standard for Responsible Recycling and Reuse of Electronic Equipment." The international standard, developed by the non-profit Basel Action Network (BAN), with the advice of industry leaders and health and environmental specialists, is the world's most rigorous certification programme for electronics recyclers. It prevents the export to and dumping of toxic e-waste in developing countries. The standard also calls for strict protection of private data and occupational health safeguards to ensure workers in e-waste recycling plants.

At present, there are e-Stewards Enterprises in the United States, Mexico and the United Kingdom, and several are moving through the certification process in Canada. Currently, most e-waste in the United States get exported to developing countries by companies that claim to be recyclers, but the e-waste is bashed, burned, flushed with acids and melted down in unsafe conditions in these countries.

Source: www.eco-business.com

Waste management in Viet Nam's leather and textile industries

Assist Asia, the Philippines-based non-profit organization, has launched the Conversation Project on Environmental Resources in Viet Nam (Conserv), a public-private partnership (PPP) project co-financed by sport and lifestyle company Puma and Deg, a member of the German KfW Group, and implemented by Assist Asia. The main work of the 17-month project is to contribute to Viet Nam's sustainable development by increasing efficient resource utilization and waste management in textile, garment and leather industries through awareness raising and capacity building. Public awareness campaign will be initiated through stakeholder forums, which will also present an overview of the project benefits to participating companies. The project is expected to help factories reduce greenhouse gas emissions, secure availability of natural resources and minimize risks from waste and pollution. Top executives from the textile, garment and leather (TGL) sector and industry experts are expected to participate in the forums.

Industrial activity in Viet Nam has grown by 14 per cent per year, with as much as 100 per cent in some sectors, in recent years. Viet Nam's opportunities for economic efficiency and environmental protection in these sectors include industrial modernization, improvement of productivity, replacement of obsolete technology and improved work practices. Major industry sectors that contribute to environmental degradation and greenhouse gas emissions in Viet Nam include TGL industries. TGL sector has a great potential to conserve resources such as water and energy and to optimize the use of these resources through the implementation of efficient resource utilization practices, benchmarking international standards (like ISO 50000), among others. Through the PPP project between Puma and Deg, TGL manufacturers (including Puma's suppliers) will be supported to achieve the objectives of sustainability: production efficiency, environmental management as well as human resources development. Assist Asia has declared that the developmental goal of the PPP project is to improve the country's alignment with international standards and practices on environmentally sound production of TGL industries in Viet Nam.

Source: en.baomoi.com

New technology for recycling old tyres

In Australia, researchers at Deakin University's Institute for Technology Research and Innovation worked with industry partner VR TEK Global and Advanced Manufacturing Cooperative Research Centre to develop a cost-effective and environmentally friendly solution for turning old tyres into high-quality ingredients for the manufacture of new rubber products. The new process does not rely on chemicals and needs less power, making it environmentally friendly. It also yields high-quality ingredients that can replace synthetic and virgin rubbers in the manufacture of products such as new tyres, car parts, insulation materials, conveyor belts and asphalt additive for roads.

The Deakin researchers, led by Prof. Qipeng Guo, set up a small-scale facility at the University's Waurn Ponds Campus to test and refine the recycling technology patented by VR TEK Global. "We now have a technology that is far better than any other tyre recycling processes," said Deakin Research Engineer Mr. Chris Skourtis. First, the tyres are segmented in a way that allows for each part to be treated differently, which eliminates impurities and results in a higher quality end product. Then another process devulcanizes and activates the tyres into rubber powders for recycling into rubber products. The new process uses a mechanical method for devulcanization, which is normally done using environmentally harmful chemicals. The researchers also developed a way of using ozone gas to activate the rubber powder, which makes it more compatible with other materials. This enables the powder to be used for producing a wider range of rubber and plastic products.

Sources: www.physorg.com & www.myfen.com.au

X-ray transmission separation process

Mitsubishi Electric Corp., Japan, has developed a patent-pending X-ray transmission separation technology to remove bromine-containing flake from polypropylene, polystyrene and acrylonitrile butadiene styrene. The technology complies with the European Union's RoHS Directive, which restricts content of bromine, chiefly polybrominated diphenyl ether flame retardant, to below 1,000 ppm in new electrical appliances and electronic products. The line-scanning and rapid screening system, which uses the X-ray transmittance difference of bromine content, "can screen and separate plastic flakes 100 times faster than the florescent X-ray method," reports Mr. Koji Hamano, Eco-Materials Manager at Mitsubishi Electric's advanced technology R&D centre. The separated flakes pass on a conveyor at 100 m/min between an X-ray transmitter over the conveyor and an X-ray line sensor under it. Brominated flakes that transmit less radiation than unbrominated flakes appear darker. A data processor instructs an array of 124 individually controlled air jets to remove brominated flakes.

Source: plasticsengineeringblog.com

A new concept in recycling fibreglass

Two German companies – Zajons Zerkleinerungs GmbH and Holcim (Deutschland) AG – have launched CompoCycle, a new concept in processing redundant fibreglass. The concept uses a patented process to convert fibreglass waste into a raw material for cement manufacture. The European composites industry has backed the scheme and has described cement manufacture as the most sustainable recycling solution for fibreglass. CompoCycle meets the criteria of the European Waste Directive by fully utilizing the material and its energy content.

CompoCycle – fibreglass recycling plant

Fibreglass-reinforced plastic (FRP) composite, commonly referred to as fibreglass, consists of glass fibres embedded in thermoset plastic. The manufacture of cement is dependent on large quantities of sand – the primary constituent of glass and fibreglass. The thermoset plastic can also be used as an energy source in cement production and thereby replace the use of fossil fuels. The fibreglass enters a giant grinder in which the fibreglass' calorific value is adjusted by the addition of other types of recycling materials in a patented process. The mix is fed into production kilns that make cement. Recycling 1,000 t of redundant fibreglass profiles in cement production saves around 450 t of coal, 200 t of chalk, 200 t of sand and 150 t of aluminium oxide. No by-products are formed in the process. *Contact: Zajons Zerkleinerungs GmbH, Am Alten Werk 52, D-21406 Melbeck, Germany. Tel: +49 (41) 34-9077-0; Fax: +49 (41) 34-9077-10; E-mail: info@compocycle.com.*

Source: www.protecwindows.com

Award-winning recycling process

Stora Enso, Finland, recently inaugurated its new, award-winning recycling process at its Barcelona mill in Spain. The mill processes used milk and juice cartons from countries such as France, the United Kingdom, Portugal and Spain. The new recycling process enables full recovery of all the materials used in the beverage cartons, including the fibre, plastic and aluminium.

The plastic-aluminium laminate from recovered beverage cartons is separated by the new technology, thus enabling both fibre and aluminium to be fully reused and the plastic to be utilized to generate energy in the mill. The process is based on pyrolysis, making the long chains of polyethylene divide into gases and light oils, while the aluminium remains unoxidized and can be recycled and remelted without any problem. The recovered fibre is used for producing white-lined chipboard at Stora Enso's mill in Barcelona. *Contact: Mr. Paivi Harju-Eloranta, Director, Sustainability, Stora Enso Packaging, Kanavaranta 1, P.O. Box 309, FI-00101 Helsinki, Finland. Tel. +358 2046 22520.*

Source: www.storaenso.com

Recycling waste plastic containers and packaging

PRTEC, Japan, is recycling waste plastic containers and packaging from households and waste plastics from industries. The recycling process consists mainly of a pre-treatment process, separation process, crushing/shredding/washing process, and production process. In the pre-treatment process, foreign matter is removed from waste plastics by manual and magnetic separation. Waste plastics suitable for recycling are manually separated, based on the sorting criteria stipulated in the Containers and Packaging Recycling Law of Japan. This is followed by a separation process, in which solids and dust are removed first using a rotary drum screen. Then, wood, paper, aluminium, fibre, dirty plastics, etc. are removed manually. Waste plastics are then separated into three types – polypropylene/polyethylene (PP/PE), polyethylene terephthalate/polystyrene (PET/PS), and others – through optical separation using near-infrared spectroscopy.

The sorted plastics are shredded in a crusher/shredder and contaminants are removed in the washer/dehydrator. PET/PS are accurately separated from PP/PE using gravity separation. The materials are fed into the washer/dehydrator again to remove moisture. The dried plastics are separated into fluff and flakes by air separation. Fluff is heated in a pelletizer and turned into pellets before shipping, whereas flakes are shipped without processing. Both pellets and flakes are sold as raw plastic material for recycled plastic products (including bags, sheets and containers). PRTEC recovers and processes 50 per cent of waste plastics (PP/PE: 35-40 per cent, PET/PS: 10-15 per cent). The remaining 50 per cent is processed into solid fuel by another company.

Source: nett21.gec.jp

Recycling of waste wood and plastics into "plywood"

Tokyo Mokkosho Co. Ltd., Japan, offers a process for recycling wood and plastic wastes into plywood. In the first step, all large metallic components are removed from waste or recycled wood. The waste wood or recycled plywood is then crushed into wood chips 30-50 mm in size. Through magnetic separation and metal detection, nails, staples, aluminium foil and other foreign matter are removed. Wood chips are further crushed into smaller chips, while recycled plywood is processed by a defibrator into wood fibre.

In the following step, foreign matter is manually removed from waste plastics. Soft waste plastics (polypropylene) is separated from hard waste plastics, and crushed into plastic flakes of around 3 mm size. Then, metallic contaminants are removed from the soft plastic flakes, and the flakes are melted and processed into polypropylene fibres.

In the final step, the centre layer of plywood is formed from a mixture of wood chips and plastic flakes. Then, using a mixture of wood fibres originating from recycled plywood and plastic fibres, surface layers of plywood are formed, covering the central core. This assembly of wood and plastic materials is hot-pressed under pressure to form plywood, which is then cooled and cut to specified sizes.

Source: nett21.gec.jp

Integrated and Sustainable Waste Management

The ISSOWAMA Coordination Action aims to raise awareness of the Integrated and Sustainable Waste Management (ISWM) approach, focusing on all aspects, from generation to final disposal, to ensure effective implementation of a sustainable system. The consortium gathered for ISSOWAMA comprises leader organisations from European and Asian countries with years of proven experience in ISWM, universities, NGOs, municipalities, industry associations and SMEs.

For more information, access:

http://www.issowama.net

Plasma for recovery of precious metals

Tetronics Ltd., the United Kingdom, has formed a partnership with Solar Applied Materials Technology Corp., Taiwan Province of China, to investigate the potential to use plasma technology for extracting valuable metals from waste electrical and electronic equipment (WEEE). Tetronics, a supplier of direct current (DC) plasma waste recovery plants for the treatment of hazardous waste and metal recovery, has entered into a partnership with Applied Materials Technology Corp. – a specialist in precious metal and rare material refining – in order to recover precious metals, including platinum group metals (PGMs). While PGMs are found as naturally occurring ores, these metals may also be obtained by recycling PGM-bearing wastes, such as WEEE. Tetronics reports that the supply of the first plasma plant to the Taiwan company is now under way.

According to Tetronics, the recycled waste streams are typically many orders of magnitude richer in PGMs than their natural ore equivalents. The technology will extract valuable precious metals including gold, silver and platinum from WEEE as well as industrial and automotive catalysts. The plasma technology is reported to also destroy hazardous organic materials such as dioxins that the waste material may contain. The process chemistry in plasma technology is designed to separate and recover the valuable material in electronic waste symbiotically and preferentially, while destroying hazardous components, if any. The remaining non-valuable material is vitrified into an inert, safe and disposable non-hazardous material, called Plasmarok, in a single processing step.

Source: www.eco-business.com

Turning CRT glass into insulation

Panasonic Corporation, the multinational consumer electronics company based in Japan, has developed a technology that converts glass from cathode ray tube (CRT) television sets into a vacuum insulation material for products such as refrigerators. The company has created dedicated facilities at a white goods factory in Kusatsu, Shiga Prefecture, where glass reclaimed from CRTs is crushed, melted and then processed into a thermal insulating material known as glass wool. The glass wool will be used in Panasonic's own refrigerators at first, but might sell it to other companies in the future. Panasonic has been selling some of the glass retrieved from CRT televisions to glass-makers in and beyond Japan. However, the company has decided to recycle the glass on its own because of an inventory pile-up.

With the switch to LCD televisions, roughly 100,000 t of CRTs are expected to be discarded in the near future in Japan. Heat insulation for around 300,000 refrigerators can be produced from some 130,000 glass tubes, Panasonic estimates. In addition to home appliances like refrigerators, the glass wool can be used for other cold containers and houses also.

Source: www.recyclinginternational.com

New processes for efficient battery recycling

A process flowsheet has been developed in Australia for the recovery of cobalt and lithium from spent battery leach solution. The new solvent extraction (SX) processes have been developed by Parker Cooperative Research Centre (CRC) for Integrated Hydrometallurgy Solutions through Commonwealth Scientific and Industrial Research Organization (CSIRO) Minerals. According to CSIRO Minerals researcher Dr. Chu Yong Cheng, although it is possible to recover cobalt and lithium from spent battery leach solutions, separating them from impurities – such as iron, aluminium and copper – is complicated and difficult. Through SX process development, Dr. Cheng has found that synergistic or mixed SX systems have the greatest potential to separate and recover lithium and cobalt from spent battery leach solutions.

The Parker Centre SX Technology Group has developed a number of processes to recover metals using synergistic or mixed SX systems, including systems for the recovery and processing of pure cobalt and lithium from spent lithium-ion battery leach solutions. The Group is looking for industrial sponsors to develop the technology further, Dr. Cheng said. *Contact: Dr. Chu Yong Cheng, Research Team Leader, Process Science & Engineering, Commonwealth Scientific and Industrial Research Organization (CSIRO), Conlon Street, Waterford, WA 6152, Australia. Tel: +61 (8) 9334 8916, 9334 8000; E-mail: Chu.Cheng@csiro.au.*

Source: www.csiro.au

Process flowsheet for recovering valuable materials from PCBs

Researchers at China University of Mining and Technology, China, have reported a novel flowsheet for the recovery of valuable constituents from waste printed circuit boards (WPCBs) using physical beneficiation. For recycling WPCBs, it is important to separate precious metals and non-metallic constituents using

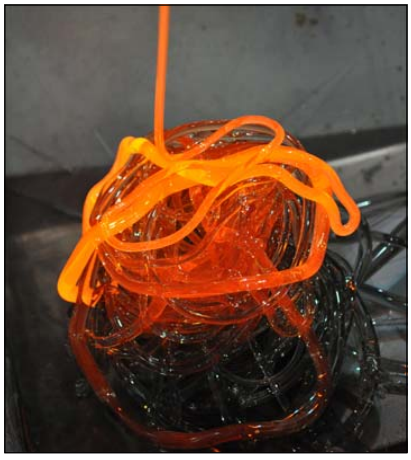
suitable methods for resource recycling and environment protection.

WPCBs are first disassembled into substrates and slots. The substrates are then crushed to below 1 mm size through wet impact crushing and separated using a tapered column separation bed. Results show an integrated separation efficiency of 93.9 per cent and metal recovery of 93.7 per cent in primary separation with 5.5 m^3/h water discharge and 250 g/min feed rate (at 35° inclination). WPCB slot components are crushed to 0.5-5 mm size by impact crushing and separated with an active pulsing air classifier. The separation results showed an integrated separation efficiency of 92.4 per cent and metal recovery of 96.2 per cent, using an airflow velocity of 2.90 m/s and pulsing frequency of 2.33 Hz. Precious metals could be obtained by further separation and purification of the metal components. The non-metal components could be used as refuse derived fuel.

Source: www.irma-international.org

New process and furnace technologies for CRT recycling

SWEEEP Kuusakoski, one of the largest electronic waste processors in the United Kingdom, is installing a plant to recycle lead-containing glass originating from cathode ray tube (CRT) screens. The plant has been devised by Nulife Glass, from the United Kingdom. Both companies have been working with Sheffield University of the United Kingdom and Aalto University of Finland for almost two years to perfect the process. SWEEEP Kuusakoski will collaborating with its partner company Kuusakoski Oy, Finland, and Nulife Glass on refining features and tailoring the furnace to address its exact needs. The Nulife furnace will



De-leaded glass from melted CRTs

melt CRT glass and, through a combination of heat and chemistry, the toxic lead content of the glass will be separated to leave a clean glass and metallic lead. The de-leaded glass has already been successfully used in construction products, counter-tops and other applications. The United Kingdom Environment Agency has already granted end-of-waste status to an added-value product created from the de-leaded CRT glass.

Source: www.recyclinginternational.com

High-speed vortex dissociating technology

Total Union PCB Recycle Ltd., Hong Kong, China, has developed and patented an advanced, high-speed vortex dissociating technology for the total recycling of waste printed circuit boards (WPCBs). Roughly pre-crushed printed circuit boards are directed into a high-speed vortex where a specially designed metal cavity enables metal and non-metal materials to collide and separate into a resin powder and a metal concentrate. The fully closed production cycle doesn't cause any secondary pollution. The metal concentrate has a copper content above 96 per cent and the resin powder has a metal content below 0.5 per cent. *Contact: Total Union Pcb-Recycle Ltd., DD 134, Lot 260, Lung Kwu Sheung Tan Tuen Mun, NT, Hong Kong, China. Tel: +852 2613 8339; Fax: +852 2613 8332; E-mail: mail@PCB-Recycle.com.*

Source: www.turecycle.com

Recycling of waste printed circuit boards

Researchers at Shandong University, China, report that the combination of microwave-induced pyrolysis and mechanical processing holds promise for recycling waste printed circuit boards (WPCBs). In pyrolysis, WPCBs yield an average of 78.6 wt. per cent solid residues, 15.7 wt. per cent oil and 5.7 wt. per cent gas. The solid residues are rich in metals, and the oil is abundant in phenol and substituted phenols that can be reclaimed as chemicals or fuels. The gas is combustible and has a caloric value of 4,504 kcal/m^3.

The mechanical process including crushing and specially designed sink-float separation is suitable for metal reclamation from pyrolysis residues. Over 99 wt. per cent of metals can be dissociated by the crushing step; the final recycling rate and grade of metals in the separation step can amount to 95 wt. per cent and 96.5 per cent, respectively. Economic assessment reveals that the combined treatment is highly profitable, and shows promise to tackle the challenges posed by e-waste. *Contact: Mr. Wenlong Wang, National Engineering Laboratory for Coal-fired Pollutants Emission Reduction, Energy and Power Engineering School, Shandong University, 17923 Jingshi Road, Jinan 250061, China.*

Source: pubs.acs.org

Cleaning up textile industry's most dangerous chemicals

Textile dyeing is one of the most environmentally hazardous aspects of the textile industry. During dyeing, harmful chemicals that are difficult to break down are released, often into waterbodies and agricultural land. At Lund University, Sweden, a doctoral student in biotechnology has developed an environmentally friendly dyeing wastewater purification process that leaves only clean water. Ms. Maria Jonstrup investigated fungal enzymes and bacteria from the drains of textile production centres and municipal wastewater treatment plants. However, it was only when two different types of purification process, one biological and the other chemical, were combined that a breakthrough came.

"Micro-organisms break down the dyes in a reactor. This biological step is the most important," Ms. Jonstrup said. To make sure that the water is completely purified, she also used some chemicals. "Small amounts of iron and hydrogen peroxide in combination with UV light break down even the most difficult structures," she explained. Though a combination of biological and chemical purification is used in some places, these methods are rarely effective.

Source: www.physorg.com

Microbial waste treatment system

Pro-Act Biotech, the United States, has introduced the Pro-Act microbial waste treatment system (WTS) that reduces solids accumulation and odour in storage tanks, thereby enabling pumpers and haulers to more easily dispose of waste and increase revenue from hauling operations. Further, Pro-Act WTS increases the nutrient value of treated waste, making the waste more appealing for disposal outlets such as farms. Waste handlers accepting food waste often find oil floating on top. By lowering the sulphur content of the brown oil in these wastes, the oil becomes a saleable commodity to biodiesel companies that buy waste oil. In addition, the low odour waste is more acceptable for disposal in locations previously off-limits due to the associated high odour.

Source: www.waterandwastewater.com

Treatment of tannery wastewater

Tanneries are one of the industrial sectors with the highest levels of water consumption. Up to 60 m^3 of water is required to produce good quality leather from 1 t of raw material. The volume of wastewater too is correspondingly high. Because of the specific production methods, tannery wastewater has high alkaline levels (pH value 10), high level of organic substances, and contamination with chemicals such as sulphites and chrome. This means that tannery wastewater cannot be discharged directly into public drains or municipal wastewater treatment plants. To address these problems, Germany's GEA Westfalia Separator offers decanters.

After the wastewater has been collected from the tanning process and polymer has been added, the decanters continuously separate all organic solids such as hair from the thickened sludge. The separated solids can be composted and find application, for example, in horticulture or forestry. The liquid phase is then subjected to biological treatment. The resultant sludge is recycled into the dewatering process, while the wastewater can be sent safely to conventional municipal wastewater treatment plants. The advantages of decanters provide optimum dewatering capacity and use only very little rinsing water. The closed system also prevents aerosols from escaping. *Contact: GEA Westfalia Separator Group GmbH, Werner-Habig-Straße 1, 59302 Oelde, Germany. Tel: +49 (2522) 770; Fax: +49 (2522) 772488.*

Source: www.westfalia-separator.com

Bioremediation and detoxification of synthetic wastewater

Remediation of dye-contaminated wastewater from various industries requires bio-friendly and economical approaches. Researchers at the Aristotle University of Thessaloniki, Greece, have isolated a novel bacterial strain capable of decolourizing triarylmethane dyes from a textile wastewater treatment plant. The bacterial isolate identified as *Aeromonas hydrophila* was shown to decolourize three triarylmethane dyes, with colour removal in the range of 72 per cent to 96 per cent.

Decolourization efficiency of the bacterium is a function of operational parameters (aeration, dye concentration, temperature and pH) and the optimal operational conditions obtained for decolourization of the dyes were pH 7-8, 35°C and culture agitation. Effective colour removal within 24 hours was obtained at a maximum dye concentration of 50 mg/L. Monitoring of dye decolourization using a scanning UV/visible spectrophotometer indicated that the decolourization was due to the degradation of dyes into colourless intermediates.

Phytotoxicity studies carried out using *Triticum aestivum*, *Hordeum vulgare* and *Lens esculenta* showed that the triarylmethane dyes exerted

toxic effects on plant growth parameters monitored. However, notable reduction in toxicity was obtained with the decolourized dye metabolites, indicating detoxification of the dyes following degradation by *A. hydrophila*. *Contact: Mr. Chimezie J. Ogugbue/Mr. Thomas Sawidis, School of Biology, Aristotle University of Thessaloniki, Thessaloniki 54124, Macedonia, Greece.*

Source: www.hindawi.com

Controlled wastewater treatment using ultraviolet rays

Industrial wastewaters contain organic pollutants that are difficult to treat in municipal wastewater treatment plants. At the Fraunhofer Institute for Interfacial Engineering and Biotechnology (IGB), Germany, researchers have been developing, in cooperation with European partners, an automated treatment system to break down these organic pollutants. The cost-effective solution eliminates organic pollutants by oxidation and without the addition of any harmful chemical. The research team has built a prototype that combines the oxidative ultraviolet (UV) treatment with continuous analysis (measurement) of total organic carbon (TOC), used as an indicator of treatment success and for automatic control.

A medium pressure or vacuum UV lamp shines high-energy UV light into the wastewater in the reaction tank. The powerful rays of 172 nm wavelength hit the water molecules and produce highly reactive hydroxyl radicals. These hydroxyl radicals set off a chain reaction that forms even more radicals. "These radicals transform organic pollutants into smaller and more biodegradable compounds such as short-chain organic acids", Process Engineer Mr. Christiane Chaumette explains. To make sure that only clean water

The prototype of wastewater treatment unit built at Fraunhofer

leaves the system, samples are continuously analysed for TOC content. Once the pre-set TOC limit is reached, the treated water is drained and new wastewater is pumped into the reaction tank. The prototype can treat 100 l/h of wastewater. In a laboratory test run, methylene blue was completely removed in just minutes. TOC of even highly polluted wastewater from the paper industry was reduced to the required limit. *Contact: Dipl.-Ing. Mr. Christiane Chaumette, Fraunhofer Institute for Interfacial Engineering and Biotechnology (IGB), Nobelstr. 12, 70569 Stuttgart, Germany. Tel: +49 (711) 9704 131; Fax: +49 (711) 9704 200.*

Source: www.igb.fraunhofer.de

Removal of dissolved metals from industrial wastewater

Many industrial wastewaters contain dissolved metals, such as mercury, lead, cadmium, iron, aluminium and copper. As a result of inadequate treatment prior to discharge, these dissolved metals end up in harmful concentrations in groundwater that is a source for potable water. Siemens Water Technologies offers a wide range of treatment technologies for reducing dissolved heavy metals. Siemens' ion exchange is a proven technology with effective treatment results for the removal of dissolved metals. The permanent, hard-piped ion exchange treatment systems work using contaminant-specific treatment resins. The service ion exchange approach integrates equipment and service option combinations, thereby minimizing the plant's capital investment and reducing overall space requirements. Service ion exchange provides the ultimate flexibility to add or remove treatment capacity as the business grows or compliance limits change.

Microfiltration technology too offers a cost-effective as well as sustainable solution for removal of heavy metals in wastewater and for water reuse applications. The membrane provides an absolute barrier to the passage of solids and therefore is capable of reducing metals (and other contaminants) to their solubility limits. Memtek® microfiltration system from Siemens incorporates proprietary cross-flow tubular membranes that eliminate precipitated contaminants and produce a high-quality filtrate that could be directly discharged or for fed into a reverse osmosis or other such systems.

Source: www.water.siemens.com

Salt recovery from dye bath

EuroMec, Italy, offers technology that helps recover pure brine (salt) straight from the dye-bath, a process that holds many advantages. The technology, Brine Rec, offers simplified wastewater treatment and recovery with substantial reduction of total dissolved solids (TDS) and colour in wastewater. In addition, it provides a tremendous reduction in both capital and operational costs, totally removing evaporator costs. Brine Rec facilitates heat recovery and temperature reduction in wastewater and may be installed on single and multiple dyeing machine. Brine Rec well adapted to the needs of the textile industry, particularly with zero discharge plants.

Source: www.euromec.net

Enzyme product removes pesticides from water

Scientists with the Commonwealth Scientific and Industrial Research Organization (CSIRO), Australia, have developed a powerful technology that eliminates pesticide and herbicide residues from soil, water and crops. CSIRO's enzyme-based product can rapidly degrade pesticide residues in soil and water. This bioremediation solution reduced organophosphate levels in cotton irrigation wastewater by 90 per cent within 10 minutes and in used sheep dip by 99 per cent in 30 minutes.

The product, Landguard, was developed jointly by CSIRO Entomology and Orica Watercare, Australia. Similar products in the research pipeline include enzymes that degrade carbaryl, synthetic pyrethroids and herbicides. *Contact: Dr. Robyn Russell, Programme Leader, Environmental Biotechnology & Genomics, CSIRO Ecosystem Sciences, Australia. Tel: +61 (2) 6246 4160; E-mail: Robyn.Russell@csiro.au.*

Source: www.csiro.au

Biodegradation of sub-surface contaminants

PHA Environmental Restoration, the United States, has obtained a patent for an invention enabling *in situ* biodegradation of sub-surface contaminants by injection of phosphate nutrients and hydrogen. The invention provides a method and gaseous composition for the *in situ* bioremediation of soil and groundwater contaminated with organic compounds, including halogenated hydrocarbons. The gaseous composition, which readily permeates a sub-surface region, consists of hydrogen and one or more volatile phosphates, such as triethylphosphate (TEP) and tributylphosphate (TBP). These volatile phosphates serve as nutrients that stimulate the growth and activity of indigenous microbes that are capable of degrading the pollutants. The addition of hydrogen facilitates the direct reductive dehalogenation of highly halogenated contaminants. The gaseous composition may optionally contain at least one volatile alkane and nitrous oxide as additional supports for microbial growth. It may also contain carbon dioxide to lower the pH of remediation sites that are highly alkaline.

An advantage of the present invention over conventional remediation techniques is that it does not require the removal of groundwater or soil for treatment and subsequent disposal. Instead, the biodegradation of pollutants occurs entirely *in situ* within a sub-surface region. The invention thus presents very little risk of pollutants being released into the atmosphere. Another advantage of the invention is that it is not complicated to implement; the equipment is simple and the materials employed are readily obtained. In addition, remediation occurs during much shorter time-frames than with traditional remediation technologies.

Source: www.freepatentsonline.com

Rapid process for bioremediation

Source Area *in situ* BioREmediation (SABRE), a collaborative R&D project undertaken by an international, multi-disciplinary team, ran from 2004 to 2008. The project involved pilot-scale development, in laboratory and on field, of an accelerated anaerobic bioremediation process for free-phase chlorinated solvent contamination in groundwater. Quantitative performance validation of the SABRE field study to assess remediation efficiency entailed detailed monitoring, numerical modelling and statistical analysis.

A test site in the United Kingdom contaminated with trichloroethene (TCE) was used to undertake the project, which was supported through the UK Bioremediation LINK programme. In anaerobic conditions, the dehalorespiration process carried out by specific bacteria can totally degrade many specific chlorinated solvents to innocuous end products. Treatment is by the controlled addition of growth substrates to support dehalorespiring bacteria under conditions that ensure maximum rate of reductive dechlorination. The process has the potential to be a technically and economically effective *in situ* remediation option for soil and groundwater contaminated with chlorinated solvents. Dehalorespiration brings about a step-wise removal of chlorine atoms from the chlorinated solvent molecule to yield a fully dechlorinated product; for example, TCE is converted through cis-1,2-dichloroethene (DCE) and vinyl chloride to ethene.

Source: www.claire.co.uk

Mobile technology for soil decontamination

BREM Group, Serbia, focuses on developing bioremediation methods for the optimal removal of petroleum hydrocarbon pollutants from soil. BREM Group has been developing new approaches to a bioremediation method that uses a bioreactor for the growth and strengthening of micro-organisms in the process of purification. The bioreactor could multiply the consortium of micro-organisms, isolated from their indigenous habitat and capable of quick and efficient decomposition of petroleum hydrocarbons, at the actual location of the pollution.

BREM Group' team isolating bacteria in contaminated site

Micro-organisms are isolated and then selected, adapted and multiplied, thus forming a consortium that is applied to the contaminated site. This approach allows the process of natural purification, with minimal impact on the surrounding environment. The BREM Group employs a mobile bioreactor in the bioremediation process to facilitate on site strengthening of the isolated micro-organisms. This approach offers many advantages and results in a rapid and cost-effective cleaning of the environment. The mobility of the bioreactor allows a higher degree of efficiency because of its ability to respond as quickly as possible to the possible changes in the field and in case of incidents.

Source: www.innovationfund.rs

Scrubbing nitrate the natural way

New research in the United States has demonstrated that the addition of more species of beneficial algae to a freshwater stream linearly increases the ecosystem's ability to clean nitrates. Nitrate, being one of the key by-product of chemical fertilizers, is one of the greatest pollutant of water. Controlling nitrate levels in fresh water has been one of the aspects reinforced in environmental policies throughout the world. Researchers at the University of Michigan demonstrated that algal biodiversity can help control the problem associated with pollution of water bodies with nitrates. Based on 150 different open artificial water channels to mimic different water habitats, the researchers identified that those channels with more kinds of algae were better as sponges in sopping up higher proportion of nitrates. A waterway with an eight-algal species mix removed nitrate 4.5 times faster than a single species. Each algae used were from minutely different habitat and together they created an ecological niche, thereby effecting better and consistent biofiltration. The study demonstrated that a high biodiversity will result in an efficient ecosystem. Promoting biodiversity is ideal and less expensive than setting up big water treatment plants.

Source: www.oilgae.com

Copper-contaminated soil remediation

High concentrations of copper in soil lead to plant phytotoxicity, in turn facilitating lateral dispersion of metal particles through wind erosion. Scientists at the Chinese Academy of Sciences (CAS), China, isolated an indigenous calcite-precipitating bacterium *Kocuria flava* and investigated its ability to remediate soil contaminated with copper. Fourier transform-infrared (FTIR) and X-ray (XRD diffraction) analyses were carried for bioremediation mechanism based on microbially induced calcite precipitation (MICP) process. The indigenous calcifying bacterial strain, *K. flava* CR1, was isolated from soil of a mining area.

It was found that *K. flava* CR1 removed 97 per cent of copper when initial copper concentration was 1,000 mg/l. The isolate produced significant amount of urease, an enzyme that leads to calcite precipitation. The isolate removed 95 per cent of copper from the soil. The MICP process in bioremediation was further confirmed by FTIR and XRD analyses. FTIR analysis has shown two different forms of calcium carbonate (i.e. calcite and aragonite), and the results were well supported by XRD. For the first time, the ability of *K. flava* has been documented in the bioremediation of polluted soil. This study showed that MICP-based bioremediation by *K. flava* is a viable and environmental friendly technology for cleaning up sites that are contaminated with copper. *Contact: Chinese Academy of Sciences, 52 Sanlihe Road, Beijing, China 100864. Tel: +86 (10) 6859 7289; Fax: +86 (10) 6851 2458; E-mail: cas_en@stimes.cn.*

Source: english.cas.ac.cn

Faster bioremediation using supplements

Bionutratech Inc., the United States, has patented an accelerated bioremediation technology that employs supplement compositions and oxygenated water. This method comprises contacting a contaminant with composite particles including at least one microbial nutrient species and at least one fatty acid species as well as with oxygenated water with 4 ppm dissolved oxygen. Water may be oxygenated on-site using various oxygenating devices, such as an aspirator, aerator, impeller or diffuser. The method may be used to maintain a dissolved oxygen concentration of greater than a setpoint concentration. A preferred oxygenated water stream or source has a dissolved oxygen concentration of greater than 50 ppm. Where the contaminant is in wastewater, the dissolved oxygen concentration in the remediation zone or the oxygenated water stream may be measured with a dissolved oxygen sensor.

Source: www.freepatentsonline.com

Bioremediation of agro-based pulp mill effluent

Small-scale agro-based pulp and paper mills are characterized as highly polluting industries. These mills use Kraft pulping process for paper manufacturing, which releases toxic lignified chemicals into the environment. The chemical oxygen demand (COD) of the emanating stream is quite high. For solving this problem, researchers in India have isolated four bacteria from the premises of agro-based pulp and paper mills, identified as belonging to the genera of *Pseudomonas, Bacillus, Pannonibacter* and *Ochrobacterium*.

The researchers from the Institute of Genomics and Integrative Biology and the National Institute of Immunology found these bacteria to be capable of reducing COD up to 85-86.5 per cent in case of back water and 65-66 per cent in case of back water:black liquor (60:40), respectively, after acclimatization under optimized conditions (pH 6.8, temperature 35°C, and shaking at 200 rpm) when the wastewater was supplemented with nitrogen and phosphorus as trace elements.

Results have shown that autochthonous bacteria isolated from the mill site have the ability to use lignin, tannic acid, xylan, and cellulose as carbon source to reduce the COD value of the pulp and paper mill effluent within 20 hours of incubation under optimized conditions. The time taken for COD reduction process was found to be very less on comparing with previous studies. *Contact: Mr. Virendra Kumar, Environmental Biotechnology Division, Institute of Genomics and Integrative Biology, Mall Road, Delhi 110 007, India. Tel: +91 (11) 2766 2133; E-mail: virendramicro@gmail.com.*

Source: www.tswj.com

Bioremediation of toxic metals and radionuclides

The fact that toxic metals and radionuclides can naturally be precipitated by bacterial reduction has been regarded as a promising approach for inexpensive bioremediation in areas surrounding old nuclear waste repository sites. This reaction can be catalysed in envelope-located electron transport chain of iron- or sulphate-respiring bacteria. However, the process can be inhibited by nitrate and oxygen, and reduced species can be back-oxidized after release in the extracellular environment. In parallel, metal reduction by cytosolic enzymes often involves one-electron transfer mechanisms that generate reactive oxygen species, which poison the cells and hinder remediation.

Efforts by scientists at the Commissariat a l'Energie Atomique (CEA) in France were focused on strengthening an alternative 'safe' pathway based on the widely distributed ChrR enzyme family of nicotinamide adenine dinucleotide phosphate (NADPH)-dependant flavin mononucleotide (FMN) reductases, which catalyse two-electron transfers that lessen metal toxicity and increase bacterial remediation capacity with minimum oxidative stress. These reductases have a non-covalently bound FMN as prosthetic group, through which electrons are transferred from NADPH to a wide spectrum of substrates, including metal ions, like chromate and uranyl, and nitroaromatic anticancer prodrugs.

Escherichia coli chromate reductase ChrR has been widely studied for its remediation properties, and improved for metal reduction in variants obtained by random mutagenesis or predictions inferred from statistical models. To investigate the molecular basis of ChrR activity modulation, researchers solved the crystal structure of the wild-type protein, determined the kinetic parameters of ChrR variants and carried out an extended structure-function analysis, using Fourier-transform infrared (FTIR) spectroscopy, electrochemical titration of oxidation-reduction potentials associated to FMN in ChrR enzymes, and size-exclusion chromatography experiments. Results have showed that while the enzyme smallest functional unit is dimeric, ChrR proteins form tetramers under different experimental conditions including substrate concentrations historically applied to characterize the reduction kinetics of ChrR variants.

The most effective amino acid substitution was Y128N, which is centrally localized in a complex hydrogen-bonding network established at the tetramer interface between FMN centres of two distinct dimers. The central role of this network on ChrR activity modulation was confirmed by determining the kinetic properties of new mutants tailored to that goal. The structure-function analysis suggested that some ChrR mutations specifically modify the affinity and docking sites for chromate and NADPH, while others directly influence the electron transfer mechanism and associated protonation reactions. Thus, the study provides new insights in the development of a novel biological tool for bioremediation of metals and radionuclides. *Contact: Ms. Catherine Berthomieu, Researcher, Head of the LIPM Laboratory, Commissariat a l'energie Atomique (CEA), Laboratoire des Interactions Proteine-Metal (LIPM), Bat. 185, DSV/IBEB/SBVME CEA Cadarache, 13108 Saint-Paul-Lez-Durance, France. Tel: +33 (4) 4225 4384; Fax: +33 (4) 4225 2625; E-mail: catherine.berthomieu@cea.fr.*

Source: cordis.europa.eu

Low-emission biofuel boiler system

Researchers at Osaka Prefecture University, Japan, have investigated a pilot-scale low-emission boiler system comprising a biofuel boiler and a hybrid plasma-chemical nitrogen oxides (NOx) removal system. As the biofuel boiler uses waste vegetable oil (WVO) as one of the fuels, this system can achieve carbon neutrality. The hybrid NOx removal system has two processes: nitric oxide (NO) oxidation by ozone produced from plasma ozonizers and nitrogen dioxide (NO_2) removal using a sodium sulphite (Na_2SO_3) chemical scrubber.

A stable combustion was achieved for the mixed oil (mixture of heavy oil and 20-50 per cent WVO). The properties of flue gas – containing NOx, oxygen and carbon dioxide (CO_2) – when firing mixed oils were almost the same as those when firing heavy oil for an average flue gas flow rate of 1,000 Nm^3/h. The NOx concentrations at the boiler outlet were 90-95 ppm. In addition, during a 300 minute continuous operation when firing 20 per cent mixed oil, a NOx removal efficiency of more than 90 per cent was confirmed. This is equivalent to less than 10 ppm at the scrubber outlet when the flue gas flow rate was 870 Nm^3/h. In addition, CO_2 reduction when heavy oil was replaced with WVO was also estimated. *Contact: Mr. Fujishima, H., Osaka Prefecture University, Sakai, Japan.*

Source: ieeexplore.ieee.org

Removal of nitrogen oxides

ThyssenKrupp Uhde GmbH, Germany, offers envinox® process to remove environmentally hazardous nitrogen oxides (NOx) and nitrous oxide (N_2O) from waste gases produced by industrial processes. The technology uses a new type of catalyst to convert N_2O and NOx into the harmless compounds nitrogen, oxygen and water in a two-stage reactor. The process is particularly suited to treating tailgas from nitric acid plants, currently the biggest industrial emitters of N_2O. The process was put into commercial operation for the first time in 2003, and has achieved record rates of N_2O and NO_x reduction since then. *Contact: ThyssenKrupp Uhde GmbH, Friedrich-Uhde-Strasse 15, 44141 Dortmund, Germany. Tel: +49 (231) 547-0; Fax: +49 (231) 5473 032; E-mail: info.uhde@thyssenkrupp.com; Website: www.uhde.eu.*

Source: www.uhde.eu

Ammonia scrubber for multi-pollutant control

Powerspan, the United States, offers ECO® technology that incorporates an advanced ammonia scrubber in a multi-pollutant control system. In applications where additional nitrogen oxide (NOx) removal is not required, the ECO technology can be installed without the NOx control component. The resultant scrubber installation, called the ECO-SO_2 process, achieves major reductions in emissions of sulphur dioxide (SO_2), fine particulate matter (PM) and oxidized mercury (Hg). Key advantages of the ECO-SO_2 solution are:

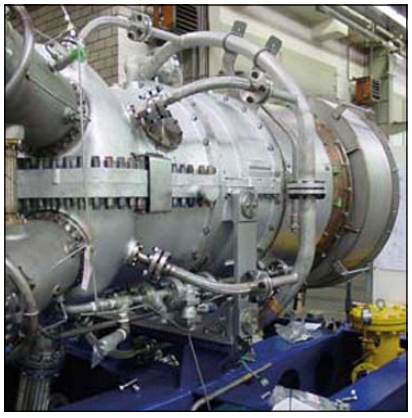
- Reduced cost Compared with a solution with high SO_2 and fine PM reduction – a combination of wet flue gas desulphurization (FGD) for SO_2 control and a wet electrostatic precipitator for fine PM reduction;
- Reduced water usage and no wastewater;
- Captured mercury is isolated from fertilizer co-product for separate disposal;
- Valuable fertilizer co-product that is sold in agricultural markets, instead of flue gas desulphurization waste that requires landfill disposal; and
- Carbon dioxide (CO_2) capture readiness, meaning that the multi-pollutant control solutions require no enhancement in emissions reductions performance (SO_2 control) to accommodate a CO_2 capture process, saving capital and operating costs when adding on CO_2 capture capability.

Contact: Powerspan Corporation, 100, International Drive, Suite 200, Portsmouth, New Hampshire, NH 03801, United States of America. Tel: +1 (603) 570 3000; Fax: +1 (603) 570 3100; E-mail: info@powerspan.com.

Source: www.powerspan.com

Gas turbine combustor records lowest NOx emissions

Kawasaki Heavy Industries Ltd. in Japan has announced that it has brought nitrogen oxide (NOx) emissions from gas turbines to a new low. The guaranteed maximum NOx emissions level of the dry low emission (DLE) combustion system used in Kawasaki's 7 MW-class M7A-03 gas turbines has been reduced from 15 ppm to 9.9 ppm (converted at 15 per cent oxygen). Kawasaki is the first in the world to achieve a single-digit guaranteed maximum NOx emission level in DLE combustion systems of this class. DLE combustors utilize a premixed combustion method to generate the very hot gas needed for high-speed turbine operation. While NOx is generated during the gas turbine fuel combustion process, the amount produced largely depends on the combustion temperature. The premixed combustion technique minimizes combus-



A gas turbine built by Kawasaki

tion temperature without the use of injected water or steam by premixing the fuel with air to significantly reduce NOx emissions.

Stability has been a big problem with premixed combustion, particularly when used to lower NOx emissions. Now Kawasaki has overcome this technological stumbling block to lower DLE combustor NOx emissions by using an innovative proprietary combustion mechanism. Kawasaki's combustion mechanism features a multi-stage burner process employing a pilot burner as well as main and supplemental burners. Kawasaki has leveraged the technological expertise it has gained over the years to replace all its burners with low-emission premix burners. Since stationary gas turbines emit NOx gases that result in photochemical smog and acid rain, they are subject to strict regulations across the globe. *Contact: Kawasaki Heavy Industries Ltd., World Trade Centre Building, 4-1, Hamamatsu-cho 2-chome, Minato-ku, Tokyo 105-6116, Japan. Tel: +81 (3) 3435 2111.*

Source: www.khi.co.jp

Selective catalytic reduction of NOx

Alstom, France, offers tailored solution for controlling nitrogen oxide (NOx) emissions. NOx formed in all combustion processes can contribute to the formation of acid rain and photochemical oxidants, proving that the need to control emissions is more crucial than ever. Alstom provides two main configurations for selective catalytic reduction (SCR) solutions – high dust SCR (typically for power plants and combined heat and power applications) and tail-end SCR (more compact designs for waste incineration or glass furnaces). The SCRs have proprietary injection and mixing systems, and allow optimal placement in the process chain. *Contact: Ms. Stephane Farhi, Press Relations Manager, Alstom, 3, Avenue André Malraux, 92309 Levallois-Perret Cedex, France. Tel: +33 (1) 4149 3308; E-mail: press@chq.alstom.com.*

Source: www.alstom.com

De-NOx system using powdery catalyst

At the Institute of Daewoo E&C Co. Ltd., Republic of Korea, researchers report a new de-NOx system that uses powdery catalyst for controlling incineration flue gas. The new de-NOx system overcomes hurdles faced with selective catalytic reduction (SCR) technology by using of ammonia (NH_3). A filter bag system including powder catalysts at low temperature (less than 200°C) has been under investigation in recent years. The catalyst particles applied for SCR could be recovered by a dual bag filter system.

The experiments were performed with 300 mesh size manganese oxides (MnOx) and vanadium pentoxide/titanium dioxide (V_2O_5/TiO_2) at 130° and 250°C. The effect of sulphur dioxide (SO_2) and water (H_2O) on nitric oxide (NO) conversion was also investigated under test conditions. X-ray photoelectron spectrum (XPS) for measuring the state of oxygen on the catalyst surface and X-ray diffraction (XRD) were used for characterizing the catalyst. It was observed that NO conversion by the powder type V_2O_5/TiO_2 catalyst was 85 per cent at 200°C in the presence of oxygen, and MnOx showed 50 per cent at the same condition. From the experiment results, it could be concluded that the powder type V_2O_5/TiO_2 catalyst could achieve excellent performance in the filter type reactor due to its high catalytic activity.

Source: www.chemeca2011.com

New catalysts series

BASF, based in Germany, provides solutions to help the power industry deliver cost-efficient and reliable power generation, while meeting environmental regulations. BASF's innovative family of ammonia destruction catalysts includes patented catalysts for controlling ammonia emissions from natural gas-fired turbines and stationary engines, as well as coal-fired power plants. The NOxCAT AD Series catalysts offer reliable ammonia emissions control and are designed for fluctuating emissions and demanding injection schemes.

BASF has successfully used these ammonia destruction catalysts at two separate facilities, where ammonia emissions were controlled to less than 10 mg/Nm^3 (99 per cent destruction removal efficiency) with no net impact on nitrogen oxides. The NOxCAT AD catalyst enabled stable control of the existing selective catalytic reduction (SCR) systems while utilizing the earlier catalyst footprint for minimal pressure drop penalty. *Contact: Mr. Joseph M. Jones, Catalysts, BASF Corp., United States of America. Tel: +1 (732) 2055 557; E-mail: joseph.jones@basf.com.*

Source: www.catalysts.basf.com

Non-Conventional Textile Wastewater Treatment

Environmental pollution is known as any deterioration in the physical, chemical and biological quality of the environment. Environmental pollutants fall under the broad category of xenobiotic compounds, and are released into the environment by human actions and occur at concentrations higher than "natural levels". All types of environmental pollution may affect directly or indirectly the living organisms and particularly human health. The textile industry is among the major contributors to environmental pollution but it is very important for the economy. This book provides detailed information on textile pollutants, besides throwing light on the latest research on a non-conventional method effective in the treatment of textile wastewater.

Contact: Nova Science Publishers Inc., 400 Oser Ave Suite 1600, Hauppauge NY 11788-3619, United States of America. Tel: +1 (631) 2317 269; Fax: +1 (631) 2318 175; E-mail: main@novapublishers.com.

Bioremediation and Sustainability: Research and Applications

Sustainable development requires the development and promotion of environmental management and a constant search for green technologies to treat a wide range of aquatic and terrestrial habitats contaminated by increasing anthropogenic activities with the main sources of contaminants being the chemical industries. Bioremediation is a technique that uses living organisms in order to degrade or transform contaminants into their less toxic forms. It is based on the existence of micro-organisms with capacity to attack the compounds on the enzymatic level. The strategies covered in this volume can be applied *in situ* or *ex situ,* depending on the site in which they will be applied. *In situ* is the treatment done in the site of the contamination and *ex situ* involves the removal of soil or water to subsequent treatment. There are a wide variety of techniques that have been developed in the past and are covered in this volume, such as natural attenuation, bioaugmentation, biostimulation, biosorption, composting, phytoremediation, rhizoremediation and bioleaching.

Contact: John Wiley & Sons Singapore Pte. Ltd., 1 Fusionopolis Walk, # 07-01 Solaris South Tower, Singapore 138628. Tel: +65 6511 8000; E-mail: cs-journals@wiley.com.

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