PRELIMINARY PROGRAM

---Monday, October 4, 2010---

08:30
Room: Regency C (Conv-3rd Floor)
Stream: LEAD-ZINC
Session: Plenary I (MONAM1)

Paper Start Time: 08:30
Paper No.: 5500
Paper Title: **PLENARY: Changing Economics in the Zinc Supply Chain**
Graham Deller; CRU Group;
Above-equilibrium prices and the completion of outstanding plans mean that a significant excess of production capacity has been established in the world zinc market. Mine output currently exceeds metal demand. Smelter capacity is higher still. However, as relative costs change, old patterns of revenue sharing may not be enough to address both imbalances even if prices are low. How have relative costs and profitability changed, and what will be the key drivers for the future? How will this affect the interplay between miners and smelters and between metal producers and consumers?

Paper Start Time: 09:00
Paper No.: 5405
Paper Title: **PLENARY: Worldwide Lead Supply and Demand**
Huw Roberts; CHR Metals Limited; Claire Hassall, CHR Metals Limited;
This paper focuses on three key issues. First, it examines prospects for global lead mine supply and primary and secondary output. Secondly, it considers how lead demand may evolve in the light of technical developments in the auto industry, especially relating to hybrid/electric vehicles, and as a result of opportunities in the renewable energy sector. Finally, it discusses Chinas role in the global lead market with particular attention paid to its current export tax regime and how this creates obstacles to free trade and distorts normal market forces.

Paper Start Time: 09:30
Paper No.: 5803
Paper Title: **PLENARY: Lead & Zinc - Does the Past Help Us with the Outlook for the Future?**
Andy Roebuck; Teck Metals Ltd.;
We believe the outlook for the future was laid in the recent past. We believe the future of zinc and lead is similar to how the copper market has played and is playing out. Issues for the industry are many&we have had equipment supply issues, people supply issues and all of this when coupled with price issues and now credit issues has put a slowdown on new supply. In spite of this the demand for mine product has accelerated as smelter capacity grows seemingly unabated. So the groundwork for future was laid in the past.

10:30
Room: Regency C (Conv-3rd Floor)
Stream: LEAD-ZINC
Session: Secondary Lead Processing I (MONAM2)

Paper Start Time: 10:30
Paper No.: 5617
Paper Title: **Lead in the 21st Century: The Era of the Lead-acid Battery**
David Wilson; International Lead Association;
Lead has been used in many important applications over time but most of these have virtually disappeared and in the early years of the 21st Century the lead-acid battery has emerged as the dominant end-use, accounting for 82% of all lead used (>7 million tonnes per annum). The paper will explore the various uses of lead-acid batteries and the factors driving demand. It will examine how the emergence of a dominant, recyclable application has influenced the structure of the lead-producing industry and resulted in exceptional recycling rates that underpin Leads status as a sustainable commodity.

Paper Start Time: 10:55
Paper No.: 5476
Paper Title: **Global Secondary Market - International Trends In Lead Recycling and Battery Collection**
Naveen Prakash Sharma; Gravita Exim Ltd.;
Lead is one of man's most valuable commodities occurring naturally in the environment, the metal is mined and processed in some 60 countries. The usage continues to increase and will rise from 6 million Tons worldwide in 1990s to about 9 million tons in this current year. The collection and distribution system of Scrap Batteries in regions works on the Rules and Regulation implemented by the

Government bodies. We should be open for making efforts in defining a hassle free and clean system of battery collection and under go a pollution free Lead Recycling. With time most of the Government along with local representative bodies have emerged in order to curb the ill-effects of Unconventional Recycling System & to promote Eco Friendly Recycling Policies. Lead Recycling is practiced using highly efficient technology for optimal and effective Pollution Control making the concept of Green Recycling. Batteries are processed using Automated Crushers /Hydro separation System. In todays scenario to meet out the competition a constant R&D is necessary and the use of Oxy Burner for Reduction Process is an example. Various other technologies are also used based on the criteria and development, like Hydrometallurgical process for Lead Refining. Thus Lead Acid Battery Recycling Process Technology is an art just because it has to be done with ease and organized making the Environment feel good. Environment friendly Recycling is Essential for mankind.

Paper Start Time: 11:20
Paper No.: 5185
Paper Title: **Novel Lead Acid Battery Paste Recycling Process**
M. Seref Sonmez; Istanbul Technical University; Vega Petrova Kotzeva, Istanbul Technical University; Vasant Ramachandran Kumar, University of Cambridge;
In this study experimental conditions were expressed for a new process of recycling lead paste at relatively lower temperatures. Lead acid battery paste was reacted with the mixture of citric acid, sodium citrate and hydrogen peroxide solution in this process. The solution mixture provided the removal of sulphur content of the paste as well as the decomposition of lead dioxide. Complete transformation to lead citrate was achieved by experimenting hydrometallurgical conditions of leaching-crystallisation step. Then thermal behaviour of lead citrate was investigated accordingly. Lead citrate crystals were decomposed to lead oxide at around 300C without any addition. Direct reduction of lead from lead citrate was also possible under specific conditions. Experimental results reflected the efficient recovery of spent lead acid battery pastes without the use of high temperature pyrometallurgy or energy intensive electrolysis techniques.

10:30
Room: Regency A (Conv-3rd Floor)
Stream: LEAD-ZINC
Session: Environmental Practices Zinc (MONAM2)

Paper Start Time: 10:30
Paper No.: 5049
Paper Title: **Evaluation of Selenium Bearing Weak Acid Solutions**
Nicolas Geoffroy; McGill University; George P. Demopoulos, McGill University;
Zinc roasters often generate a dilute sulphuric acid stream that is used to bleed off impurities like selenium. However, it is generally difficult to perform laboratory experiments using the industrial weak acid itself because of its rapid decomposition rate. Fortunately, in order to perform research and development work, synthetic solutions and thermodynamic software packages can be used alternatively. In this work, pH-potential equilibrium calculations made with two thermodynamic software packages (FactSage and OLI) showed that satisfactory results can be obtained when combining their databases. Furthermore, experimental results involving reductive precipitation of Se(IV) from synthetic solutions were found to be similar in trend to those obtained for industrial solutions but not necessarily the same.

Paper Start Time: 10:55
Paper No.: 5117
Paper Title: **Upgrading the Selenium Removal Process at CEZinc**
Elyse Benguerel; Xstratazinc Canada; Alexandre Le Regent, Xstratazinc Canada; Nicolas Geoffroy, McGill University; Sylvain Seyer, Seneca Experts Conseils Inc.;
CEZinc has been operating a selenium removal process for its acid plant effluents since the late 1990s. Increased selenium levels in the feed combined with reduced manpower led to the review of the operating performance of this process. A project was started, following design for six sigma (DFSS) methodology, to select the optimal process improvements as well as the required equipment to ensure 100% environmental compliance without modification to the staffing levels. Concurrent with this project, a fundamental study of the underlying chemistry of the process was undertaken at McGill University. This paper describes the resultant upgrade of the selenium removal process and describes the steps taken to get from lab test results and lessons learnt from past operating performance reviews to the full scale operation of the upgraded plant.

Paper Start Time: 11:20
Paper No.: 5278
Paper Title: **Heavy Metal Pollution Potential of Zinc Leach Residues Discarded in IZMDC**
Behzad Sedaghat; RECo; Davood Moradkhani, RECo; Ali Rashtchi, RECo; Ahmad Khodadadi, TMU;

In this paper, results of the study on heavy metals solubility behavior of Co filter cakes from purification of Co in Iranian Zinc Mine Development Company (IZMDC) plants are given. The effect of pH, temperature, liquid/solid ratio and contact time on the releasing of heavy metals (Zn, Cd, Ni and Pb) into water was examined. To statistically analyze the experimental results SPSS14 software were employed. The results of SPSS 14 indicated that for the Zn, Cd, Ni and Pb dissolution, pH and L/S were found respectively, the effective parameters for the pollution in zinc leach residues.

10:30
Room: Regency B (Conv-3rd Floor)
Stream: LEAD-ZINC
Session: Secondary Zinc Processing I (MONAM2)

Paper Start Time: 10:30
Paper No.: 5294
Paper Title: **Characterization of Zinc Containing Residues From Nonferrous Industry**
Juergen Antrekowitsch; University of Leoben; Stefan Steinlechner, University of Leoben;
The efficiency of recycling processes and the quality of the products often depend on the characteristics of the charged materials. In case of zinc recycling, beside scrap also complex materials like filter dusts and leaching residues have to be taken into consideration. In most cases only limited information is available concerning meltability and reduction behaviour of such residues. In this paper a detailed characterization of neutral leaching residues and dusts from secondary copper smelters is described. By means of scanning electron microscopy, microprobe and special melting trials the behaviour of such materials with regard to recycling processes has been investigated.

Paper Start Time: 10:55
Paper No.: 5142
Paper Title: **Zinc Recovery From Secondaries and Wastes**
Jonathan Nielsen, Engitec Technologies USA, Massimo Maccagni; Engitec Technologies S.P.A.;
While underground mines continue to extract ores with lower and lower zinc concentrations, a great deal of high zinc containing wastes and secondaries are not being treated and nobody knows their end of life. Until now, wastes that were recovered have been treated in a Waelz Kiln to concentrate the zinc in C.Z.O. that was then fed to sulphate E.W. or to the ISP for final metal production. However, these two processes require the C.Z.O. to be pre-treated with at least a wash to meet the requirements of the processes. In the mid nineties, Engitec developed the EZINEX Process to convert zinc oxide bearing materials directly to metallic zinc cathodes. In conjunction with EZINEX, Engitec also studied the IDUTEC Process, a pyro technology competitive to the Wealz Kiln. In this paper, we will talk about the integrated process as a possible way of treating many different zinc bearing materials.

Paper Start Time: 11:20
Paper No.: 5497
Paper Title: **Processing of Spent Zinc-carbon and Alkaline Portable Batteries**
Zdenek Kunicky; Kovohute Pribram Nastupnicka, A.S.; Jitka Jandova, Institute of Chemical Technology Prague, Czech Republic; Petr Dvorak, Institute of Chemical Technology Prague, Czech Republic;
Kovohute Pribram has developed technology of portable zinc carbon and alkaline batteries treatment. Technology consists of their crushing, sorting components and their utilization. To comply with new goals for recycling efficiency at minimum 50% set by Directive 2006/66/EU VSCHT Praha has developed hydrometallurgical method to utilize the electrode material, which is the key factor to fill the goal. Presentation describes method of spent Zn/MnO2 batteries treatment and method of active mass leaching after batteries dismantling. The active mass is leached in sulphuric acid originated from scrapped lead acid batteries; zinc is recovered from the refined leach liquors as basic zinc carbonate precipitate, suitable intermediate for ZnO production.

14:00
Room: Regency A (Conv-3rd Floor)
Stream: LEAD-ZINC
Session: Mineral Processing Zinc I (MONPM1)

Paper Start Time: 14:00
Paper No.: 5235
Paper Title: **Lead and Zinc Mining in Southeast Missouri**
Gregory Sutton; The Doe Run Company;
The Doe Run Company operates six underground room and pillar mines in Southeastern Missouri. The primary product mined is lead with byproducts of zinc and copper. These metals occur in the forms of galena, sphalerite, and chalcopyrite. These are highly productive, safe mines with a long history of mechanization and technology accomplishments. This presentation will discuss the history

of the operations, present operating status and the future outlook.

Paper Start Time: 14:25
Paper No.: 5806
Paper Title: **McArthur River Pb-Zn Sulphide Tailings Potential Treatment Options**
Pat Bowen; Xstrata; Phillip Mackey, P.J. Technology Inc., J.E. Dutrizac, CANMET-MMSL, E. Peek, Xstrata Process Support;
The McArthur River Mines (MRM) facility of Xstrata Zinc, which began operations in 1995, includes a 2.5 million tpy open cut mine, a concentrator handling ~ 350,000 tpy of bulk Zn-Pb concentrate, a tailings handling and storage area, along with concentrate handling and shipping facilities. During the life of the operation, some 17 million tonnes of tailings analyzing about 3.8% Zn and 3.5% Pb have been accumulated. This paper describes a laboratory investigation carried out by MRM and Xstrata Process Support to investigate on-site treatment options for the potential recovery of metal values from these tailings. One of the options examined included atmospheric acid leaching of the tailings along with the precipitation of a zinc intermediate product. This method showed some technical promise, but further work is required to address the economic impact of relatively high acid consumption.

Paper Start Time: 14:50
Paper No.: 5307
Paper Title: **An Update on the Application of MRT to Separations of Interest in the Zinc Industry**
Neil Izatt; IBC Advanced Technologies, Inc.; John Dale, IBC Advanced Technologies, Inc; Ron Bruening, IBC Advanced Technologies, Inc.;
IBC Advanced Technologies Molecular Recognition Technology (MRT) product, SuperLig®, selectively and rapidly binds with target metal ions to remove them from solution. The MRT process can produce a high purity separation product of maximum added value at low cost. This paper provides a review of some examples of applications for Molecular Recognition Technology (MRT) related to zinc processing streams containing valuable metals such as In and Ge as well as contaminants such as Cl and F.

15:35
Room: Regency A (Conv-3rd Floor)
Stream: LEAD-ZINC
Session: Mineral Processing Zinc I (MONPM2)

Paper Start Time: 15:35
Paper No.: 5437
Paper Title: **Cost Effective Solid-liquid Separation for Lead and Zinc Concentrate Dewatering**
Patrick Costelloe; FLSmidth;
Cost effective solid-liquid separation technology is essential to the economical dewatering of mineral concentrates such as lead and zinc. The selected technology must achieve the desired process parameters, operate reliably in harsh environments, and provide low installation, operating, and maintenance costs. Unfortunately, much of the conventional filtration technology available today does not satisfy all of these requirements and a misguided decision may result in significant operating difficulties, high operating and maintenance costs, and a poor return on investment. This paper introduces the Pneumapress® technology that addresses these requirements and discusses the mechanical operation and process data for lead and zinc dewatering.

Paper Start Time: 16:00
Paper No.: 5238
Paper Title: **Sulfide Precipitation of Copper and Zinc from Dilute Acidic Solution Using Biologically Produced Diluted H2s Gas**
Hamid Hatami; Barrick Gold Corp; Niels Verbaan, SGS Minerals Services, Lakefield site; Henk Dijkman, PAQUES B.V.; Benoit Bissonnette, Barrick Gold Corporation; Yeonuk Choi, Barrick Gold Corporation;
A process was developed at Barrick Technology Centre to recover copper and zinc from dilute concentrations in a low pH solution using sulfide precipitation. Dilute H2S gas was used to precipitate both metals separately as copper and zinc sulfides, to simulate the process which uses biologically produced H2S gas. The highlights of this process include zinc precipitation from a solution of pH 1.8 and the ability to avoid the use of scrubbers for the un-reacted H2S in the off-gas stream. This paper reviews the process, selected results of the batch tests and the continuous pilot plant trials performed at SGS Minerals.

Paper Start Time: 16:25
Paper No.: 5477
Paper Title: **When is a Gold Mine Not a Gold Mine - When it Contains Zinc**
Larry Southwick; L.M. Southwick & Associates;
Many early mines in the American West contained significant copper and gold. Unfortunately, technology of that era based on copper oxide smelting were notably unsuccessful in extracting the gold. Many blamed outside financial interests, but in reality the problems were metallurgical brought on by the presence of zinc oxides and carbonates. Using the primitive electro-static and electro-magnetic

methods available at the time, zinc could be extracted, which contributed significantly to the Tri-State zinc industry. However, the mills and smelters were still unable to recover paying amounts of copper and gold. This paper will discuss the metallurgical issues and processes involved.

Paper Start Time: 16:50
Paper No.: 5229
Paper Title: **Hydrothermal Sulphidation of Zinc Oxide Ore**
Cunxiong Li; Kunming University of Science and Technology; Hongsheng Xu, Kunming University of Science and Technology; Chang Wei, Kunming University of Science and Technology; Zhigan Deng, Kunming University of Science and Technology; Gang Fan, Kunming University of Science and Technology; Minting Li, Kunming University of Science and Technology; Xingbin Li, Kunming University of Science and Technology;
Direct flotation of zinc oxide ore is characterized by recovery of only around 60% of zinc. The hydrothermal sulphidation of zinc oxide ore with sulfur has been studied in the present paper. The variables considered in the study were particle size, amount of sulfur, pH value of solution, temperature, and time. The experimental data indicated that under the conditions employed up to 70% zinc in zinc oxides forms were conversed into zinc sulphide. Flotation of sulphide from this residue gave 80% recovery of the zinc into concentrate.

14:00
Room: Cypress (Perspct-34th Floor)
Stream: LEAD-ZINC
Session: Zinc Operations (MONPM1)

Paper Start Time: 14:00
Paper No.: 5163
Paper Title: **Primary Zinc Smelter Operating Data Survey**
Michael Moats; University of Utah; Jens Manthey, Recylex GmbH, Deutschland; Eduard Guerra, Laurentian University; Andreas Sigmund, LanMetCon;
A worldwide survey of zinc primary smelters was conducted to update similar data collected in 2000 and 2005. The survey provides high level data from responding operations regarding plant capacity, feed, roasting, smelting, acid plants, leaching, solution purification, electrolysis, casting, by-products and labor. The data was complied into a database and examined for correlations between operating variables. A comparison with 2000 and 2005 smelter survey data was also conducted to provide insight in the evolution of primary zinc operations over the past ten years.

Paper Start Time: 14:25
Paper No.: 5137
Paper Title: **The Ideal Zinc Refinery Flow Sheet**
Ross Cooper; Hatch Associates; Brian Krysa, Hatch Associates; Scott Poulter, Hatch Associates;
In the development of a new zinc refinery or the expansion of an existing refinery, the designer is faced with the challenge of determining the best possible refinery flow sheet. This begs the question What is the ideal zinc refinery flow sheet? The answer of course is It depends. There are numerous factors that influence the decision as to which individual unit processes are combined to form the ideal zinc refinery flow sheet brownfield or greenfield. In this paper we describe these factors and also the process used at Hatch to determine the optimum zinc refinery flow sheet.

Paper Start Time: 14:50
Paper No.: 5581
Paper Title: **Feed Materials and Process Options**
Monica Nasmyth; SNC-Lavalin; G. Cooper, SNC-Lavalin; R. Beaulieu, SNC-Lavalin; G. Gagne, SNC-Lavalin;
Technologies favored for plant design change in response to outside factors. Environmental issues rank high on the list of outside factors. Zinc plants are trying to solve their iron problems and steel plants are trying to solve their zinc problems. A new challenge also faces both: finding feedstock of acceptable quality in locations that are economic to develop. Zinc plant feedstock already includes zinc fume from treatment of steel secondaries in some cases. Falling iron ore grades begin to make zinc leach residues more attractive as a steelmaking feedstock. This paper looks at potential zinc plant steel plant synergies that could result from the right combination of feedstocks and technologies. SNC-Lavalin's experience in the zinc and iron ore sectors provides a unique perspective from which to present this topic.

15:35
Room: Cypress (Perspct-34th Floor)
Stream: LEAD-ZINC
Session: Zinc Operations (MONPM2)

Paper Start Time: 15:35
Paper No.: 5381
Paper Title: **Designing for Various Stages of a Furnace Campaign**
Allan MacRae; MacRae Technologies, Inc.; Sanjay Pal, Hindustan Zinc Limited;
Metallurgical furnaces continue to be designed with critical design flaws, such as sealing between coolers and refractory, differential thermal expansion between furnace components, and basic cooler design. Further attention also needs to be paid to the various stages of the life of a furnace, from construction through heat-up, operation, then outages for maintenance. Various examples will be used to illustrate each of these points. As an example, Hindustan Zinc requested a new roof which had to be assembled on the ground, lifted into place, and be sealed from day one. High maintenance parts also needed to be replaced in-situ. All of these design requirements had to be addressed, in light of the items listed above.

Paper Start Time: 16:00
Paper No.: 5580
Paper Title: **Recent Modifications in Roaster and Acid Plant of Binani Zinc Limited, for Enhanced Throughput and Higher Uptime**
Roy Kurian; Binani Zinc Ltd; Suresh Kumar, Binani Zinc Ltd; Ranjit Mathew Paul, Binani Zinc Ltd;
Binani Zinc Ltd has been in operation since 1967 at a capacity of 14 kmt Zn. In the 1980s the smelter was modernized, and in 1986 a Lurgi roaster of 25.4 m2 area with a double absorption acid plant were built. The original capacity was for 135 tpd of zinc concentrate with a design margin of 20%. The plant was normally operated at a throughput of 160-165 tpd of zinc concentrate. Through the years, the production capacity was increased to 210-220 tpd of zinc concentrate by debottlenecking and improving the performance. This paper will discuss the major changes incorporated to achieve higher throughput without increasing the hearth`s area of the furnace.

Paper Start Time: 16:25
Paper No.: 5656
Paper Title: **Granulation in the Fluidized Roaster of the Zinc Concentrates**
Shuhei Yamashita; Toho Zinc Co., Ltd, Annaka Refinery; Shinei Kikuchi, Toho Zinc Co., Ltd.; Daisuke Fujiwara, Toho Zinc Co., Ltd.;
At the Annaka refinery, we do oxidation roasting of zinc concentrates in a fluidized roaster and produce zinc metal by electrolytic process. Recently, it became difficult to obtain zinc concentrates, and due to diversification of raw materials, we come to use those that contain a lot of impurities. Meanwhile, a granulation of calcine started to occur in a fluidized roaster, and influence from impurities has been turning up its operation. This report describes research about outbreak mechanism of the granulation in a fluidized roaster.

Paper Start Time: 16:50
Paper No.: 5685
Paper Title: **Overcoming Challenges of Running Jumbo Size Zinc Roasters with Finer Zinc Concentrate**
Ashish Kumar; Hindustan Zinc; Duncan Hodder, Hindustan Zinc Ltd.;
Zinc concentrate roasters of 123m2 hearth area are largest roasters operating in hydrometallurgical extraction of zinc.Operating such roasters with finer concentrates poses a major challenge as problems such as wall accretions, potential for bed fusion,high off take temperatures, roaster & boiler accretions are more prominent. Hindustan zinc limited has been operating four such roasters at various locations in India for the last four years. As the concentrate became finer due to the changing nature of mineral deposits and development of milling and floation at the Companys own mines, roasting has become increasing difficult. Increasing level of silica in concentrate has also added to operational difficulties. To improve roaster performance, various developments such as roaster feed conditioning, reorientation and resizing of cooling coils, changing the angle feed enters the roaster has solved the problem to a large extent.With these developments and improved process discipline roasters are able to run at required throughput and availability

14:00
Room: Regency C (Conv-3rd Floor)
Stream: LEAD-ZINC
Session: Lead Operations I (MONPM1)

Paper Start Time: 14:00
Paper No.: 5199
Paper Title: **Lead Smelting and Refining Survey**
Peter C. Hayes; University of Queensland; Hans-Ulrich Steil , Berzelius Metall GmbH; Andreas Siegmund, LanMetCon; Mark Schlesinger, Missouri University of Science and Technology;
Continuing the series of surveys undertaken at approximately 5-yearly intervals, a global survey of primary and secondary lead production and refining will be presented. The aim is to provide information on technology and production trends for the benefit of all involved in the industry. There have been significant changes to the world market in recent years with the introduction of new

technologies and new producers, and the impact of the recent global financial crisis. Summaries of production statistics and technologies used will help the lead industry to benchmark its operations.

Paper Start Time: 14:25
Paper No.: 5481
Paper Title: **Recylex Pb Production in Nordenham with Bath Smelting Technology - An Update**
Ulrich Kerney; Weser-Metall GmbH;
For more than 100 years Pb and Zn production is established at the estuary mouth of the Weser river in North Lower Saxony of Germany. As a two step process the wide-spread standard technology for Pb smelting (sinter-roasting and shaft furnace sinter reduction) suffered under environmental pressure and economic feasibility. Thus, Recylex (former Metaleurop) decided to install an Ausmelt bath smelter (BSF) to combine sulphur oxidation and Pb oxide reduction in one process. Since 1996 this technology is applied successfully for lead recovery from about 200.000 t/a of concentrates and secondary materials. Continuous improvement of equipment and operation lead to a steady increase of capacity and plant availability. The main feed source for the furnace is automotive battery recycling, which offers oxide paste and metallics to be molten under oxidizing conditions in the lance fired furnace. The lead bullion is decopperized during cooling in kettles at the smelter and then transferred to the refinery, where copper, silver and other impurities are removed. Silver is recovered as doré quality. Loopings are recycled to the BSF. Some drosses and the oxidized primary slag (metallurgical concentrate) being high in Pb are sold. The off-gas is treated with a combination of flux-flow system, electrostatic dust precipitator and washing and cooling plant. SO2 is oxidized and converted to sulphuric acid. The presentation will give an overview about the actual process and highlight recent developments regarding feed handling, off-gas treatment and process air supply. Aspects of lance life-time will be outlined, and an outlook will describe the possible future.

Paper Start Time: 14:50
Paper No.: 5480
Paper Title: **Primary Lead Production with the QSL Process - An Ecological and Economical Advanced Technology**
Urban Meurer; Berzelius Stolbgerg GmbH;
The BERZELIUS Bleihütte (BBH), Stolberg operates a lead smelting plant based on the QSL process. Though already classified as a top process both ecologically and economically, this technology has been submitted to ongoing improvement. From 2004 up until today, the lead output has been boosted to 150,000 tons/year. In addition, productivity was increased by operating the furnace during a successful 4-year campaign. Moreover, the flexibility of the QSL process has been improved with respect to the tolerable sulfur content in the feed mix. In cooperation with BERZELIUS, the company Bayer Technology Services has developed the new BAYQIK process. It enables the SO2 content in the off-gas from the QSL reactor to be raised up to 18 % (vol.) while maintaining the gas stream constant at about 25,000 m³ n/h. A further asset is the new water treatment plant which in combination with a reversal osmosis unit saves water and protects the environment. These benefits and other energy savings are described in this paper.

15:35
Room: Regency C (Conv-3rd Floor)
Stream: LEAD-ZINC
Session: Lead Operations I (MONPM2)

Paper Start Time: 15:35
Paper No.: 5314
Paper Title: **The Versatility of Ausmelt TSL Technology in Lead Production**
Robert Matusewicz; Ausmelt Limited; Stefanie J. Creedy, Ausmelt Limited; Markus A. Reuter, Ausmelt Limited;
Ausmelt Top Submerged Lancing (TSL) Technology is well suited to applications where existing technologies are unable to meet the high standards set by today's energy and eco-conscious world. With the depletion of high grade lead concentrates, lead producers are looking for new technologies to process low grade concentrates and secondary (post-consumer) materials, usually within the same vessel to save on capital and operating costs. This paper will discuss the development and options available with Ausmelts TSL technology for lead smelting including the new Small Scale Lead projects by providing low-cost, automated and environmentally responsible smelting solutions.

Paper Start Time: 16:00
Paper No.: 5555
Paper Title: **Status and Progress of Lead Smelting Technology in China**
Wei-Feng Li; Henan Yuguang Gold & Lead Co. Ltd.; Xiao-Guo Zhang, Henan Yuguang Gold & Lead Co.; Xue-Yi Guo, Central South University ; Chuan-Fu Zhang, Central South University ;
This paper briefly describes the status of China's lead smelting, the progress of China's lead smelting technology is introduced in the traditional sintering process, a new pool-smelting process, reborn-Lead smelting process, the liquid rich-lead slag direct reducing technology, and Pointed out the new technology of waste batteries auto-separation - bottom-blowing Smelting reborn-Lead should

become the mainstream of reborn-Lead Smelting process ,and actively promoting the use of liquid rich-lead slag reducing technology.

Paper Start Time: 16:25
Paper No.: 5597
Paper Title: **Role of the Raw Material Grade at the Lead Smelting Process Selecting**
N. N. Ushakov; SA Vniitsvetmet; Victor Aleksandrovich Shumskiy, VNIItsvetmet;
A number of modern lead smelting technologies have been commercialized to modernize old and construct new lead smelters. The smelter feed lead concentration is a key factor in selecting the appropriate smelting technology. In this paper, a comparative analysis of modern lead smelting technologies is presented from the point of view of the smelter feed lead concentration

Paper Start Time: 16:50
Paper No.: 5144
Paper Title: **The Importance of Slag Engineering in Freeze Lining Applications**
Mieke Campforts; Umicore Group Research & Development; Frederik Verhaeghe, Umicore Group Research & Development; Bart Blanpain, Department of Metallurgy and Materials Engineering, KULeuven; Patrick Wollants, Department of Metallurgy and Materials Engineering, KULeuven;
As metal producing industries move towards process intensification, the need for furnace protection via freeze linings becomes obvious. This paper shows how slag engineering can greatly improve lining stability. Lab-scale freeze linings are produced for six synthetic lead slags using a cooled probe technique. Microstructural investigation reveals the major impact of slag engineering on the operative freeze lining formation mechanisms through viscosity, the properties of the relevant phases and the crystallization behavior. Stable operation demands can be achieved via the growth of an initial layer of interlocking crystals combined with the formation of a high-melting crystalline layer with selected properties at the interface.

14:00
Room: Regency B (Conv-3rd Floor)
Stream: LEAD-ZINC
Session: Zinc Concentrate Leaching I (MONPM1)

Paper Start Time: 14:00
Paper No.: 5393
Paper Title: **The Parker Centre - Transformational Advances in Base Metal Hydrometallurgy Technology**
Steve Rogers; Parker Centre;
Recent Parker Centre advances in base metal hydrometallurgy include: development of a multi-step neutralisation scheme to remove iron(III) from pregnant liquor in Ni/Zn leach systems; the use of ion-exchange resins as reagents for the simultaneous controlled addition of acid to leach processes and adsorption of dissolved metal ions; modelling to predict extraction rates under heap leach systems; bioleaching of low grade deposits in heap systems; improved understanding of mechanisms involved in the leaching of sphalerite; fundamental understanding of the chemical properties of synergistic solvent extraction (SSX) systems utilising oxime extractant; and based on role of silver as an alloying element in anodes for the electrowinning of zinc, potential for more efficient, alternative anode design.

Paper Start Time: 14:25
Paper No.: 5014
Paper Title: **The Sherritt Zinc Pressure Leach Process: Integration Applications and Opportunities**
Ian M. Masters; Sherritt International Corporation; Leslie Ann Barta, Sherritt International Corporation;
The direct pressure oxidation of zinc sulphide concentrates to produce zinc sulphate solutions suitable for recovery of zinc by electrowinning, while oxidizing the sulphide sulphur only as far as its elemental form, has been promoted by Sherritt for over 40 years, and has been in commercial operation since 1981. The Sherritt Zinc Pressure Leach (ZPL) Process is readily integrated into existing zinc refineries using roast-leach-electrowin technology, enabling such plants to increase zinc production or replace old or outdated equipment without the requirement for increasing sulphuric acid production. In accordance with the method of iron rejection, the pressure leach step can be modified to meet the requirements of each facility. The first part of this paper reviews the commercial integrations of the ZPL process with existing zinc refineries. The second part outlines opportunities for additional brownfields integration projects and integration with other process technologies, e.g., Kivcet, Ausmelt, and ISP processes, for residue treatment.

Paper Start Time: 14:50
Paper No.: 5086
Paper Title: **Use of Pressure Leach Additives at the HBMS Zinc Plant**
Susan Shairp, Hudson Bay Mining and Smelting Co. Ltd., Mike Collins, Sherritt Technologies;
The Sherritt Zinc Pressure Leach Process, which has been applied successfully at the HBMS zinc plant in Flin Flon, Manitoba since

1993, relies on the use of sulphur-dispersing agents in the leach reactors. Lignosulphonate and sulphited quebracho are added to the autoclaves at HBMS to disperse liquid sulphur from the surface of mineral particles, enabling further reaction and controlling the agglomeration of sulphur in the leach residue. Several types of lignosulphonate have been used by HBMS since the start-up of the zinc pressure leach plant. Experience in the laboratory, pilot plant and commercial plant has shown that the origin and the refining history of lignosulphonates influence the sulphur-dispersing ability of these additives under zinc pressure leaching conditions.

15:35
Room: Regency B (Conv-3rd Floor)
Stream: LEAD-ZINC
Session: Zinc Concentrate Leaching I (MONPM2)

Paper Start Time: 15:35
Paper No.: 5310
Paper Title: **Crystallization Behaviour of Zinc And Iron (II, III) Sulphates Under Zinc Pressure Leach Conditions**
Levente Becze; Department of Mining and Materials Engineering, McGill University; George P. Demopoulos, McGill University; Vera Gella, McGill University;
The increase of throughput in an industrial zinc pressure leach autoclave resulted in formation of massive scale which consisted of gunningite ($ZnSO_4 \cdot H_2O$), natrojarosite, hematite, elemental sulphur and szomolnokite ($FeSO_4 \cdot H_2O$). This unexpected scaling issue required frequent shut down of the autoclave with the consequence of valuable production capacity losses. Aimed at revealing the cause of formation of this massive scale, the crystallization of zinc and iron (II, III) sulphate salts was investigated in a laboratory glass autoclave. In this paper the obtained results reported and correlated to thermodynamic estimates with the aid of OLI and to mass balance calculations involving an industrial ZPL autoclave.

Paper Start Time: 16:00
Paper No.: 4770
Paper Title: **Effect of Various Seed Materials on the Rate of Precipitation of Sodium Jarosite and Ammonium Jarosite**
John Dutrizac; CANMET-MMSL; Tzong Chen, CANMET-MMSL;
The beneficial effect of sodium jarosite seed on the rate of precipitation of sodium jarosite at 98oC was confirmed, and the initial rate of precipitation increased linearly with the amount of jarosite seed present. Zinc plant hot acid leach residue, which contained a major fraction of sodium jarosite, was almost as effective as sodium jarosite seed itself. Lead sulphate, which may react superficially to form lead jarosite, also had a significant positive effect on the rate of sodium jarosite precipitation. The presence of a number of other materials, including zinc plant manganese cell sludge, zinc ferrite, gypsum, anhydrite and quartz, had a positive effect on the rate of precipitation of sodium jarosite and ammonium jarosite. However, these materials were less effective than jarosite seed additions for accelerating the rate of precipitation of jarosite-type compounds. Mineralogical examination of the precipitates made in the presence of the above seed materials consistently found that the jarosite precipitated preferentially on, and rimmed, the seed particles. In contrast, additions of hematite, elemental sulphur and Pyrex glass had little effect on the rate of jarosite precipitation. Mineralogical study of these latter precipitates revealed intergrown masses of jarosite with the seed material but little systematic rimming of the seed particles. All materials wetted by the synthesis solution seemed to promote the rate of precipitation of jarosite-type compounds, but some of the materials were more effective than others.

Paper Start Time: 16:25
Paper No.: 5127
Paper Title: **Leaching of Cu-Zn-Pb Sulphides: Trends, Opportunities and Challenges**
Sarveswara Rao Katragadda; Institute of Minerals and Materials Technology (CSIR);
Many mineral deposits with complex nature have difficulties in separation of copper, zinc and lead concentrates by flotation, and at best a bulk concentrate could be produced. This paper discusses the importance of interdisciplinary approach for characterization of reactants and products during leaching of multimineral sulphides. Hydrometallurgy will have an important role in processing of complex sulphide ores. An overview is outlined on process intensification as relevant to novel phase contacting devices and their challenges/limitations in hydrometallurgical applications. Energy conservation and environmental compliance are the global aspects and issues like zero-waste processing and sulfur removing efficiency briefly highlighted.

Paper Start Time: 16:50
Paper No.: 5154
Paper Title: **Selective Alkaline Leaching of Zinc from Iranian Zinc Plants Residue**
Maryam Rasouli; Iran Zinc Mines Development Company (IZMDC); Pedram Ashtari, Iran Zinc Mines Development Company (IZMDC); Davod Moradkhani, Zangan University;
Annually, a great number of three types of residues are produced in Iran zinc plants, that one of them contains about 45-55 % Zn, 10-16 % Cd, 2.5-4 % Ni, 0.2-0.5 % Cu and other elements such as Pb and Fe.In this study, recovery of zinc from Iranian Zinc Plants by

causitic leaching was investigated. The effects of different parameters was determined and used to optimize the process. The mentioned parameters were temperature (°C), leachant concentration (M), S/L (w/v), reaction time (h), H2O2 as oxidizing agent (cc) and mixing rate (rpm). In optimized condition, 95% of zinc was leached. Therefore, the efficiency of selective leaching of zinc was very high.

---Tuesday October 5, 2010---

08:30
Room: Regency C (Conv-3rd Floor)
Stream: LEAD-ZINC
Session: Plenary II (TUESAM1)

Paper Start Time: 08:30
Paper No.: 5081
Paper Title: **PLENARY: Latest Developments in Zinc Processing**
Kurt Svens; Outotec Oyj; Björn Saxén, Outotec Research Oy; Mikko Ruonala, Outotec Oyj, Base Metals; Eero Tuuppa, Outotec Oyj, Base Metals; Jörg Hammerschmidt, Outotec GmbH;
The development of the zinc processing methods has been surveyed. Most of the zinc processes developed from the very beginning were based on pyrometallurgical methods. When looking at the history of Outotec most of the basic development actions have already started in late 1960s. Since then Outotec has rapidly broadened and developed its technology packages in processing zinc concentrates into zinc cathodes. Especially in 1990s big development leaps have been taken in roasting, leaching, solution purification and electrowinning areas. The main aim for all these developments to be described has been to provide as economical and environmentally sound solutions as possible for the customers.

Paper Start Time: 09:00
Paper No.: 5563
Paper Title: **PLENARY: Meeting the Needs of Tomorrow: A Breakthrough Technology for Producing Lead Metal**
Jerry Pyatt; Doe Run Company;
In partnership with Engitec, The Doe Run Company has developed a proprietary new technology thats expected to revolutionize the lead industry. The breakthrough technology will not only improve lead processing efficiency, but it will also dramatically reduce air, land and water emissions. Essentially, the technology takes lead metal production from fire to water in a process that replaces high-temperature furnace lead smelting with a contained, wet chemical process that recovers up to 99 percent of the lead contained in mined concentrates. Combined with emerging battery and electric vehicle technologies and other energy storage applications, this hydrometallurgical technology can help achieve the shared goals of a cleaner environment, economic vitality, smaller carbon footprints and reduced dependence on foreign sources of metal. This presentation/paper provides a brief overview of the new process and discusses the expected benefits. It also illustrates how the lead industry can take a dramatic step forward with the application of this promising technology.

Paper Start Time: 09:30
Paper No.: 5608
Paper Title: **PLENARY: The Historical Step of 40 Years in DOWA's Zinc Smelting Business and the Role that the Zinc Smelting Industry in Japan Should Have**
N. Yamazaki; DOWA Metals & Mining Co., Ltd.;
Iijima Zinc Refinery will reach 40th year in 2010 since the operation began in 1971 as the large-sized seaside plant, jointly owned by DOWA and other five non-ferrous companies. The economic environmental situation surrounding Japanese zinc industry had been changed dramatically in the last 40 years through the first & second oil crisis, the yens appreciation by the Plaza Accord, the tariff reduction for metals and the lowering T/C & metal price. As the result of it, all domestic non-ferrous mines and two zinc refineries in Japan were obliged to shut down. In this fairly severe period, reviewed what Iijima struggled to survive and described the future role of the zinc refining industry in Japan.

10:30
Room: Regency C (Conv-3rd Floor)
Stream: LEAD-ZINC
Session: Lead Operations II (TUESAM2)

Paper Start Time: 10:30
Paper No.: 5290
Paper Title: **Increasing Non-Concentrate Feed to Brunswick Smelter's Updraft Sinter Machine**

Ted Shannon, Brunswick Smelter, Xstrata Zinc;
In 2000, Xstrata Zinc - Brunswick Smelter began to feel the impact of a changing feed market in the lead processing industry. Global demand for lead concentrate was increasing in part due to China's growing consumption of externally produced concentrates. As a result of the tightening concentrate market, the Smelter adopted a strategy in 2003 to increase its proportion of non concentrate feed. This presentation will describe the technical challenges and developments undertaken to increase the proportion of non concentrate feed to Brunswicks updraught sinter machine. This development has allowed the Smelter to remain competitive over a diverse feed base.

Paper Start Time: 10:55
Paper No.: 5370
Paper Title: **Phase Equilibria Studies in Zinc-Containing System and Applications to Lead and Zinc Blast Furnace Slags**
Baojun Zhao; Pyrometallurgy Research Centre, University of Queensland, Australia; Peter C. Hayes, University of Queensland; Eugene Jak, University of Queensland;
Phase equilibria studies have been experimentally carried out in the ZnO-FeO-Al2O3-CaO-SiO2 system in equilibrium with metallic iron using high temperature equilibration, quenching and electron probe X-ray microanalysis technique. Effects of Al2O3 (up to 16 wt%) and CaO/SiO2 ratio (0.55 to 0.93) on the liquidus temperature have been systematically investigated in the composition range relevant to lead and zinc blast furnace slags. Partitioning of ZnO has been determined between liquid and solid phases. Applications of the results to lead and zinc blast furnace slags on prediction of liquidus temperature and proportion of the solid phase have been discussed.

Paper Start Time: 11:20
Paper No.: 5684
Paper Title: **Zinc and Lead Smelting at Hachinohe Smelter**
Hideaki Noguchi; Hachinohe Smelting Company Limited;
Hachinohe Smelting Company Limited operates a zinc-lead smelter based on the Imperial Smelting Process at Hachinohe, producing 112,000t/y of Zinc and 45,000t/y of lead. In recent years, the ratio of secondary oxidic raw materials has been increased up to 40%. The slag fuming plant has been operating in the smelter since 1993 for the recovery of zinc and lead from ISF slag. In November 2001 the second slag fumer was commissioned in series with the first unit to improve the slag quality for use in the cement manufacture and to increase zinc and lead recovery in the fume. In 2008 the gas offtake of the No.2 slag fumer was modified to raise the plant utilization. In 2008 a second reboiling column was added to the zinc refinery to increase the production of SHG zinc by 11,500t/y.

10:30
Room: Regency B (Conv-3rd Floor)
Stream: LEAD-ZINC
Session: Zinc Solvent Extraction (TUESAM2)

Paper Start Time: 10:30
Paper No.: 5295
Paper Title: **The Recovery of Zinc, Cobalt and Manganese from Baja Mining Corp's El Boleo Orebody**
David Dreisinger; University of British Columbia; Thomas Gluck, ; Kyle Marte, ; Ron Hamm, Baja Mining; Ron Molnar, SGS Lakefield; Jianming Lu, University of British Columbia; Feng Xie, University of British Columbia;
The recovery of zinc, cobalt and manganese from the Boleo orebody of Baja Mining Corp. is accomplished by a series of solvent extraction separations from a bleed solution arising from copper SX-EW processing of primary leach solution. Zinc and cobalt are co-extracted using the CSIRO DSX solvent extraction system (mixed Versatic 10-LIX 63 organic) followed by bulk stripping and further separation using Cyanex 272 solvent extraction. The purified zinc strip solution is used to manufacture high purity zinc sulphate monohydrate crystals for the agricultural market. Cobalt is recovered as electrowon cathode. Manganese is recovered as high purity manganese carbonate from the DSX raffinate by precipitation with soda ash. Manganese carbonate may be used as a feedstock for manganese metal production by conventional leach-purification-electrowinning. The results of bench and pilot plant testing for zinc, cobalt and manganese recovery are reported.

Paper Start Time: 10:55
Paper No.: 5270
Paper Title: **Improving Zinc Smelter Profitability. Is Secondary Zinc the Solution? Use Zincex Solvent Extraction**
Gustavo Diaz Nogueira, Tecnicas Reunidas, S.A.; Carlos Frias Gomez, Tecnicas Reunidas, S.A.; Daniel Martin San Lorenzo, Tecnicas Reunidas, S.A.; Francisco Sanchez Ruiz, Tecnicas Reunidas, S.A.; Ana Mejias Cordero, Tecnicas Reunidas, S.A.;
Secondary zinc oxides are a growing zinc resource mainly due to the continuous increase in galvanised scrap recycling. Feeding secondary zinc to primary refineries represents an advantageous alternative to conventional concentrates; however, there are process limitations due to some detrimental impurities in the cell-house. These limitations are fully overcome when purification by solvent extraction ZINCEX technology is used. Treating up to 100% secondary zinc in existing zinc refineries is a profitable investment. This

paper describes the implementation of a ZINCEX plant annexed to the largest zinc refinery in Japan aiming to produce 20000 t/y SHG Zn from secondary zinc.

Paper Start Time: 11:20
Paper No.: 5239
Paper Title: **Optimizing Effective Parameter of D2EHPA/ZnSO4 Phase in Peresence of Iron and Manganese Ions**
Mohammad Reza Bolurforush; ACECR; Manuchehr Oliazadeh , Hatch; Ali Amirarjmand, ACECR;
Solvent extraction was applied for purification of a zinc solution obtained from acid leaching of a zinc silicate ore, containing manganese and iron ions. D2EHPA Kerosene were used as organic solvent and diluent respectively. At the initial stages, the most important parameters such as the pH of aqueous phase and D2EHPA concentration were studied. Then the required stages for optimum extraction were calculated by means of McCabe Thiele diagram. D2EHPA at low pH (2.5) and 30% concentration was able to extract 87% of zinc from aqueous phase by three stages in the presence of Mn ions. The applied system did not show any selectivity towards Fe ions. At the end of process stripping was performed by fresh sulfuric acid solution. At this stage, about 98% Zn ion was stripped.

10:30
Room: Regency A (Conv-3rd Floor)
Stream: LEAD-ZINC
Session: Zinc Electrowinning I (TUESAM2)

Paper Start Time: 10:30
Paper No.: 5423
Paper Title: **Zinc Electrowinning by Using Leaching Solution of Secondary ZnO**
Kenji Haiki; Mitsui Mining & Smelting Co., Ltd.; Masatami Sakata, Kamioka Mining & Smelting Co., Ltd.; Hata Hiroshi, Mitsui Mining & Smelting Co., Ltd.;
Most of the secondary ZnO contains fluorine (F) in large quantities. Serious troubles at the zinc electrowinning are occurred by the cathode corrosion caused by F, therefore we developed iron compounds as F-adsorbents used in zinc sulfate solution. The iron compounds can be reused repeatedly as F-adsorbents because they can adsorb/desorb F alternatively depending on the pH. Moreover, if the adsorptive capacity decreases, we can dissolve and re-synthesize them easily. In this paper, results of the experimental process which consists of five steps (leaching, F removal, Cl removal, purification and electrowinning) to produce high purity electrolytic zinc from the secondary ZnO are reported.

Paper Start Time: 10:55
Paper No.: 5539
Paper Title: **Cellhouse Rehabilitation at Canadian Electrolytic Zinc Limited**
Sylvain Seyer; Seneca; François Dionne, Seneca; Serge Maheu, Canadian Electrolytic Zinc Limited; Martin Malservisi, Canadian Electrolytic Zinc Limited;
Canadian Electrolytic Zinc Limited (CEZinc) operates a Roast-Leach-Electrowin process at its zinc smelter in Valleyfield, Quebec. Over the years, the facility has undergone several upgrades to increase throughput, performance or reliability, including a Vieille-Montagne Jumbo Cellhouse in 1990. Today, after 20 years of reliable service, this Cellhouse requires a major rehabilitation. As an Income Fund, CEZinc has considered several alternatives to restore the Cellhouse integrity while minimising the impact on plant throughput. Through innovative techniques, concerted efforts and a systematic approach, the Cellhouse Rehabilitation team of CEZinc has developed a novel methodology leading to an alternate cell repair technique that minimizes disruption of production. This paper will explore the major challenges the project team had to overcome, the various alternatives considered and the changes to the cell design and the Cellhouse infrastructure that had to be implemented before proceeding with the rehabilitation program.

Paper Start Time: 11:20
Paper No.: 5011
Paper Title: **Zinc Electrowinning From Acidic Chloride Solutions**
David Dreisinger; University of British Columbia; Huajun Guo, Central South University, China; Jiaming Lu, University of British Columbia;
The effects of catholyte flow velocity, temperature, current density, concentrations of zinc, HCl, NaCl and TBACl additive have been investigated. The morphology of the deposit, cell voltage, current efficiency and energy consumption at different electrowinning conditions were determined. The energy consumption decreased with increasing catholyte flow velocity, zinc concentration, HCl concentration and NaCl concentration; while it rose with increasing temperature and current density. Electrowinning conditions were optimized as follows: with an acidic chloride solution of 20 g/L Zn, 9 g/L HCl, 1 mol/L NaCl and 50 mg/L TBACl, cycling the catholyte at a flow velocity of 100 cm/min and electrowinning at a current density of 300 A/m2 at 35-40 .

14:00
Room: Regency C (Conv-3rd Floor)
Stream: LEAD-ZINC
Session: Secondary Lead Processing II (TUESPM1)

Paper Start Time: 14:00
Paper No.: 5328
Paper Title: **Integrated Battery Recycling at BERZELIUS Metall GmbH, Germany - A Closed Loop!**
Reinhard Pullenberg; BERZELIUS Metall Gmbh;
A presentation is given on the worldwide unique closed battery recycling loop that the German company group BERZELIUS METALL GmbH characterises. BERZELIUS treats and recycles automotive and industrial batteries, scraps and lead containing waste in a very efficient way. The group is leader in processing lead, lead alloys, silver, sulphuric acid, sodium sulphate and polypropylene-compounds (Seculene®). The processes and management of the three modern smelters one primary and two secondaries - as well as three logistic companies are described. Utmost attention is given to their state-of-the-art technologies, starting with the secondary smelters BSB and MRU. The treatment of the different components of old batteries is illustrated - i. e. plastics in the BSB compounding plant with the registered Polypropylene quality Seculene®, paste and grid metals etc amongst secondary lead which is available in more than 100 qualities according to customers specifications. The integration of an incinerator for hazardous wastes at MRU - enabling the recovery of the energy content of toxic wastes - in the allied subsidiaries, provides the closing link for the exemplary recycling of materials and wastes during the production of lead, plastics, and sulphuric acid. Technological leadership in the production of primary lead and sulphuric acid assures the most modern QSL process at the BBH smelter. The range of products includes high purity lead, silver, copper/lead matte and BERZELIT® slag. Foreward-looking was the latest expansion of the sulphuric acid plant with a significant capacity increase. Responsibility for the environment is a matter of principle at BERZELIUS Metall: The production subsidiaries were among the first of this industrial sector to be certified as users of an integrated management system of quality, workplace safety and environmental protection. The application of environmentally sound processes, an intelligent management and control of materials, and the encapsulation and hooding of plants and warehouses, leads to a closed-circuit recycling of resources, which the efficiency of the measures employed. The reduction of waste releases, the continuing decrease of emissions and the steady reduction of the blood lead levels and lost time accidents are impressive proofs of this strategy.

Paper Start Time: 14:25
Paper No.: 5146
Paper Title: **ISASMELT for Lead Recycling**
Bill Errington; Xstrata Technology;
ISASMELT™ is a well established technology for the smelting of primary copper and lead concentrates. Less well known is its application for the recycling of lead battery scrap. Two ISASMELT plants have been constructed to date for recycling lead batteries, producing a low-antimony soft lead plus a low lead, iron silicate based slag. Sulphur capture is achieved by the use of a lime scrubber in one plant, while the other was designed to use paste desulphurization prior to smelting. The secondary lead ISASMELT™ plants described here are small compared with ISASMELT™ primary copper smelting operations (up to 1.400,000 tpa feed). However, by using oxygen enrichment, large throughputs are achievable in relatively small, single furnace operations. An example of an operation capable of producing 200,000 tpa of refined lead is shown. One advantage of such a large scale operation is that the sulphur can be captured using a conventional acid plant.

Paper Start Time: 14:50
Paper No.: 5682
Paper Title: **Intensive Recycling of Lead-bearing Materials**
Keiichi Hayashi; Hosokura Metal Mining Co.,Ltd.; Michio Nishiwaki, Hosokura Metal Mining Co.,Ltd.; Takeshi Harada, Hosokura Metal Mining Co.,Ltd.; Fumito Tanaka, Hosokura Metal Mining Co.,Ltd.;
Hosokura Metal Mining Co., LTD. produces electrolytic lead from secondary materials including over 30,000 metric tons per year of spent lead-acid battery. Various lead-bearing materials, including residues from copper smelters, have also been processed successfully utilizing proven technology to operate the blast furnace. Moreover, the oxygen-enriched blast has improved the bullion production in the recent operations. This improvement seems to ensure further processing of secondary materials, such as powdery residues and scraps of cathode ray tube (CRT) glass. The present paper will provide a process description of Hosokura smelter, the effect of oxygen-enriched blast on the blast furnace operation, and an analysis of CRT-glass recycling in the blast furnace.

15:35
Room: Regency C (Conv-3rd Floor)
Stream: LEAD-ZINC
Session: Secondary Lead Processing II (TUESPM2)

Paper Start Time: 15:35
Paper No.: 5591
Paper Title: **25 Years of Recycling of Lead Bearing Materials at Hydrometal (Belgium)**
Philippe Henry; SA Hydrometal;
Hydrometal is using adequate technology to reintroduce lost metal units into the industrial cycle, thereby saving resources and energy, while keeping the environment cleaner. Case studies of recycling of Pb materials for 25 years in our integrated hydrometallurgical recycling facility (Hydrometal) in Belgium are discussed : (I) Recycling of Pb-Sn materials from the copper industry;. (II) Recycling of Pb salts from battery recycling industry ; (III) Recycling of minor metals from the lead industry;

Paper Start Time: 16:00
Paper No.: 4930
Paper Title: **Ten Years Experience with a RTO in a Secondary Lead Smelter**
Ulf Buggelsheim; EcoBat Technologies Ltd;
At the Lead Zinc 2000 conference in Pittsburgh BMG and CTP published information about the installation of a Regenerative Thermo Oxydizer (RTO) to treat the hydrocarbons in the off gases from a Short Rotary Furnace (SRF) in the BMG secondary lead smelter. The RTO has been in operation for 10 years. The RTO has worked very well to reduce the hydrocarbons and dioxins to very low levels. This paper will discuss the advantages and disadvantages of operation of the RTO in a secondary lead smelter which recycles scrap batteries. The operating parameters of the RTO will be discussed as well as how the furnace and RTO have been operated to optimize and reduce energy consumption. The major operating problem has been the fouling of the ceramic heat exchanging elements caused by the deposit of Ammoniumbisulfate. This compound has been produced by a small amount of residual SO2 in the furnace gases combining with ammonia generated from the combustion of the oil with oxyfuel air burners.

Paper Start Time: 16:25
Paper No.: 5204
Paper Title: **Polypropylene Recycling in Technology of Lead-acid Batteries Smelting in Blast Furnace**
Zdenek Kunicky; Kovohute Pribram Nastupnicka, A.S.;
Kovohute Pribram operates technology of whole batteries smelting in blast furnace built in 1997 according to know how Varta, Germany. Worth of polypropylene, new Directive on Batteries and Accumulators setting obligation for minimal recycling efficiency 65% and much increased lead production forced Kovohute to implement technology of polypropylene from batteries separation prior their smelting in blast furnace. Presentation describes the procedure how has been implemented known separation method for conditions of lead batteries smelting in the blast furnace. Technology is simple, products are in form suitable for smelting in blast furnace. Solution is economic, effective and contributes to green gas emissions reduction in the process of lead acid batteries recycling.

Paper Start Time: 16:50
Paper No.: 5069
Paper Title: **Piloting Amine Battery Paste Desulphurisation Process**
Andrzej Chmielarz; Instytut Metali Niezelaznych; Zbigniew Szolomicki, Instytut Metali Niezelaznych; Jan Mrozowski, Instytut Metali Niezelaznych; Ryszard Prajsnar, Instytut Metali Niezelaznych; Józef Wolarek, Orzel Bialy S.A.; Leszek Skawinski, Orzel Bialy S.A.;
Pilot of capacity 2 tons/day was used for testing battery paste desulphurisation technology, consisting of PbSO4 leaching in aqueous triethylenetetramine solution, carbonization with gaseous CO2, desulphurized paste filtration, gypsum precipitation from solution cleaned from lead and carbonate ions excess, precipitation of calcium before recycling of solution to desulphurization. Pilot operation fully confirmed potential for production of desulphurized paste with sulphur content below 0.5% and gypsum useful in cement binding. Precise process conditions were defined and possibilities for significant reduction of additives consumption and slag mass produced, increase in direct lead recovery, and almost complete elimination of SO2 emission were established.

14:00
Room: Regency A (Conv-3rd Floor)
Stream: LEAD-ZINC
Session: Zinc Electrowinning II (TUESPM1)

Paper Start Time: 14:00
Paper No.: 5114
Paper Title: **The Role of Silver in Enhancing the Electrochemical Activity of Lead and Lead-silver Alloy Anodes**
Justin McGinnity; Murdoch University; Michael J. Nicol, Murdoch University;
The role of silver as an additive to reduce the rate of corrosion of lead anodes used in the electrowinning of zinc has not previously been established. This paper will summarize the results of a detailed study of the mechanism of the action of silver both as an additive to the alloy and in solution. The enhanced electrochemical activity of PbAg alloy anodes over Pb is attributed to the presence of Ag2O2 in the corrosion layer. Potentiostatic tests on PbAg alloys showed a positive correlation between the concentration of Ag2O2 in the

corrosion layer and the current density.

Paper Start Time: 14:25
Paper No.: 4771
Paper Title: **Characterization of the Manganese Oxide Scales Formed on Pb-Ag Anodes in Commercial Zinc Electrowinning Operations**
Tzong Chen; CANMET-MMSL; John Dutrizac, CANMET-MMSL;
Smooth cast Pb-Ag anodes are dendritic to granular in texture, and consist of Pb crystals surrounded by Pb-Ag eutectic containing abundant Ag particles. During electrolysis, corrosion starts at the Pb grain boundaries, but the corrosion is uneven. This results in the entrapment of residual anode grains in the PbO2+PbSO4 layer which forms directly on the anode surface. Manganese oxide scale forms on the PbO2+PbSO4 layer, and the scale shows significant variations in thickness and morphology. On grooved cast anodes, anode corrosion is more regular, resulting in a uniform PbO2+PbSO4 layer which is essentially free of fractures. Deposition of Mn oxide initially follows the contours of the anode surface, but the grooves eventually become filled with Mn oxide and gypsum. In rolled Pb-Ag anodes, the silver particles are not concentrated at the Pb grain boundaries but form sub-parallel stringers embedded in the Pb matrix; the Pb shows extensive recrystallization and occurs as equiaxed grains. During electrolysis, corrosion starts indiscriminately at the Pb grains, but the oxidation process is sufficiently uniform that residual anode particles are essentially absent in the PbO2+PbSO4 layer. Furthermore, the Mn oxide scale forms uniformly on the PbO2+PbSO4 layer. On all types of anode, the Mn oxide scales characteristically have rhythmically banded colloform structures and consist mainly of MnO2. However, hydrated or hydrous Mn oxide and amorphous Mn oxide are also present. Trace amounts of Pb, SO4, Zn, Ca, K, Sr, Ag and silica are present in the Mn oxide phases; occasionally, lead-rich, silica-rich and gypsum-rich bands, indicative of variable electrolysis conditions, are detected in the Mn oxide scale. Tiny crystals of gypsum, PbSO4, SrSO4, AgCl and micro-cavities are also present.

Paper Start Time: 14:50
Paper No.: 5461
Paper Title: **Anodic Behaviors of the Beta-PbO2 Oxide Layer Formed on the Pb-Ag Electrode in the Sulfuric Acid Electrolyte for Zinc Electrowinning**
Yasushi Takasaki; Akita University; Keita Imamura, Akita University; Akira Hosoi, Akita University; Atsushi Shibayama, Akita University; Rie Saito, Akita Zinc Limited Company; Taro Aichi, Akita Zinc Limited Company;
In the zinc electrowinning process, decrease of the bath voltage is an important problem for energy saving. In the previous study, it was considered that the formation of thick oxide layer and/or the beta-PbO2 oxide layer were one of reasons for the decrease of the bath voltage. In this study, the anodic behaviors of the beta-PbO2 oxide layer formed on the Pb-Ag electrode in the sulfuric acid electrolyte by intermittent anodically polarized were investigated. As a result, the anode potential of the beta-PbO2-formed anode was decreased compared to the alpha-PbO2-formed anode which obtained continuously anodically polarized.

15:35
Room: Regency A (Conv-3rd Floor)
Stream: LEAD-ZINC
Session: Zinc Electrowinning II (TUESPM2)

Paper Start Time: 15:35
Paper No.: 5194
Paper Title: **The Distribution of Silver and Other Elements in Pb-Ag Anodes Used for Zinc Electrowinning**
Sophie Boisvert, BPR-Bechtel; François Janelle, General Smelting of Canada; Qingxian Jiao, Xstrata Zinc Canada; Luc St-Arnaud, General Smelting of Canada;
The content and distribution of silver in laminated lead alloy anodes has a significant impact on the cost and performance of zinc electrowinning processes. Typical Ag contents in anodes used by zinc producers are known to vary between 0.25 to 1.0% wt Ag. Although lowering Ag content can represent significant operational cost savings, it increases the requirement for uniformity of micro-scale Ag distribution. Quantitative metallographic methods have been developed to improve the replicability and reproducibility of micro-scale Ag distribution measurements. The results are being used to assess and optimize laminated anode manufacturing procedures.

Paper Start Time: 16:00
Paper No.: 5113
Paper Title: **Amorphous Oxide Coated Anode for Energy Saving of Zinc Electrowinning**
Masatsugu Morimitsu; Doshisha University; Naoyuki Oshiumi, Doshisha University; Tomohiro Yamaguchi, Doshisha University;
This paper introduces an amorphous oxide coated anode consisting of iridium oxide-based coating formed on a titanium substrate prepared by thermal decomposition. The anode can reduce oxygen evolution potential in the electrolyte of zinc electrowinning compared to lead alloy electrodes or other oxide coated titanium electrodes and can suppress unwanted side reactions on the anode such as manganese oxide deposition, resulting in a large decrease in the electric power consumption of zinc electrowinning.

Paper Start Time: 16:25
Paper No.: 5124
Paper Title: **Six Years Operating Experience with Rolled Lead Calcium Silver Anodes**
David Prengaman; RSR Technologies; Abbas Mirza, RSR Technologies; Timothy Ellis, RSR Technologies;
RSR Technologies has developed a new anode for zinc electro winning. This anode contains calcium and significantly less silver than traditional zinc electro winning anodes which increases the mechanical properties of the anode which makes it more resistant to deformation. The anodes are rolled to produce a uniform grain structure and even dispersion of calcium and silver. The anodes condition in several days. The anodes have been tested in Japan, North America, and Europe. Anodes have been in service for up to 6 years with little corrosion or thinning. The anodes have remained straight and resist warping during MnO2 removal. The anodes yield over a 1% improvement in current efficiency when compared to normal zinc anodes. The paper will describe experience with rolled lead calcium silver anodes, the manufacturing process, anode handling in the plant, and will compare the performance to conventional lead silver anodes.

Paper Start Time: 16:50
Paper No.: 5178
Paper Title: **Comments on the Viscous Polymerization Mechanism of Lead Corrosion During Zinc Electro-winning**
Mahmoud/R. Reda; CanadElecrochim;
Palipho et al. (Padaeng Industry Public Co. Ltd., Thailand) studied Pb-0.5wt%Ag anodes plates (pretreated by acidic potassium permanganate) after using for 10-15 days in the electro-winning cells, it was found that unknown products were formed as flaking layers on the surface (scattered pits analyzed by SEM-EDS and XRD). Cleaning was needed every 10-15 days. They did not give the mechanism of pits formation. It is the purpose of this publication to give a mechanism based on loss of conductivity inside the pits. This mechanism will suggest an additive to the anode which may prevent flaking and pits formation.

14:00
Room: Regency B (Conv-3rd Floor)
Stream: LEAD-ZINC
Session: Secondary Lead Processing II (TUESPM1)

Paper Start Time: 14:00
Paper No.: 5057
Paper Title: **Different Ways of Using Waelz Oxide - Overview and Evaluation**
Juergen Ruetten; ValoRes GmbH;
80 % of the treated EAF dust is processed in Waelz kilns generating first a crude Waelz oxide which needs further upgrading before it can be used. The paper gives a world-wide overview about the applied techniques and the different forms of final usage. They are compared under technical, economic and environmental aspects. The technical aspects high-lighten the utilized equipment units and the required consumables. The economic aspects concentrate on OPEX, the environmental on eventual release of hazardous wastewater and gases.

Paper Start Time: 14:25
Paper No.: 5285
Paper Title: **Evaluation and Recycling Potential of Different Zinc Containing Residues from Metallurgical Industry**
Juergen Antrekowitsch; University of Leoben; Stefan Steinlechner, Department of Nonferrous Metallurgy, University of Leoben;
Zinc can be found in various residues from metallurgical industry especially in slags and dusts. While such materials were only a minor source for zinc recycling in the past, they have become more and more interesting during the last years, especially in industrialized countries, where a dumping is ecologically and economically difficult. The paper describes possible sources for a zinc recovery by a rough evaluation of the technical and economical feasibility. Especially the arising quantities as well as influencing impurities are taken into account. The potential for an increase of the zinc recycling rate by such residues is discussed.

Paper Start Time: 14:50
Paper No.: 5249
Paper Title: **SDHL Waelz Technology: State-of-the-art Recycling of Zinc Containing Secondary Raw Materials**
Klaus Mager; Befesa Zinc S.L.U.; Michael J. Gamroth, Befesa Zinc S.L.U.;
In Europe the most appropriate technology for EAF dust recycling is the SDHL Waelz Process with a market share of more than 60 %. This proprietary recycling technology of Befesa Zinc S.L.U. is presented in details. The process description covers the delivery, blending and mixing of secondary raw materials, the pyrometallurgical treatment and basic chemical reactions as well as the post-treatment of products. The high energy efficiency of the SDHL Waelz Process is explained by the detailed characterization of the

different oxidation- and reduction-zones of the pyrometallurgical process stage.

15:35
Room: Regency B (Conv-3rd Floor)
Stream: LEAD-ZINC
Session: Secondary Lead Processing II (TUESPM2)

Paper Start Time: 15:35
Paper No.: 5499
Paper Title: **The ArcFume Slag Reduction Process at ERAS Metal AS**
Bror Magnus Heegaard; Scanac ASA; Matej Imris, Scanarc ASA;
The ScanArc unique ArcFume slag reduction process is utilizing electric energy through plasma generators to heat and smelt the materials in a simple water-cooled furnace. Coke or any other carbon containing material is only used as reduction agent. This gives complete control of the reduction and oxidation process within one simple furnace. Depending on the feed material one may collect the ZnO, PbO, Ge, In and similar elements in the fumes, the precious metals (Au, Ag, &) in a matte or speiss phase, or produce hot metals directly. ERAS Metal AS is a 50 000 tons a year facility in Norway utilizing the ScanArc ArcFume slag reduction furnace as a direct process for producing ZnO from Electric Arc Furnace dust.

Paper Start Time: 16:00
Paper No.: 5056
Paper Title: **The Topical Waelz Process for Recycling of EAF Dust - State-of-the-art and Future Challenges**
Juergen Ruetten; ValoRes GmbH;
The paper gives an overview about the most applied recycling techniques for steel mill dust. They are compared under technical, economic and environmental aspects. The topical Waelz Process is set into relation of RHF, MHF and Shaft Furnace for showing the state-of-the-art and the challenges for the future. The technical aspects high-lighten the raw materials and their preparation, the consumables and the different products. The economic aspects concentrate on OPEX, but give also indication for CAPEX. Finally, requested developments are shown like better Fe recovery , improved product quality and economic down-scaling of unit capacity.

Paper Start Time: 16:25
Paper No.: 5590
Paper Title: **25 Years of Recycling of Zinc Bearing Materials at Hydrometal (Belgium)**
Philippe Henry; SA Hydrometal;
Hydrometal is using adequate technology to reintroduce lost metal units into the industrial cycle, thereby saving resources and energy, while keeping the environment cleaner. Case studies of recycling of Zn materials in our integrated hydrometallurgical recycling facility (Hydrométal) in Belgium are discussed: (I) Recycling of Cu-Co cement generated at the second purification step of zinc sulfate solution. (II) Recycling of EAF dust and complex Zn oxide to produce zinc sulphate and/or Zn concentrate; (III) Recycling of minor metals from the zinc industry;

Paper Start Time: 16:50
Paper No.: 5678
Paper Title: **Modernization of EAFD Processing Technology at Boleslaw Recycling Ltd. Poland**
D. Krupka, Silesian University of Technology; P.M. Kapias, Silesian University of Technology; J. Czekaj, Silesian University of Technology; J. Galicki, Silesian University of Technology; J. Jakubowski, Silesian University of Technology;
Electric Arc Furnace Dust (EAFD) coming from electric steel scrap melting plants in Poland is processed in Waelz process at BOLESLAW RECYCLING Ltd.. The plant was established in 1952 and later modernized and adapted for furnace dust processing between 2003 and 2008. BOLESLAW RECYCLING Ltd. equipped in six 40 m long Waelz kilns with the diameter of 3 m has the capacity of processing 100,000 tonnes of Electric Arc Furnace Dust (EADF) per annum. Currently the Waelz plant is undertaking modernization of the technology of charge preparation for the Waelz kilns. The new technology consists in the removal of impurities, primarily chlorides and lead from furnace dust by rinsing them out in Ca(OH)2-NaOH solution - suspension with the consecutive release of lead from rinsing suspensions in the form of rich carbonate lead concentrates with lead content from 65 to 75%. Waelz oxides cleaned from chlorine and lead containing a calcium compound, as the slag-forming component constitutes an appropriate charge for the Waelz kilns.

14:00
Room: Cypress (Perspct-34th Floor)
Stream: LEAD-ZINC
Session: Environmental Practices Lead - Smelting (TUESPM1)

Paper Start Time: 14:00
Paper No.: 5392
Paper Title: **Tenby10 - A Partnership Approach to Reducing Childrens Blood Lead Levels in Port Pirie**
Paul Brewer; Nyrstar Port Pirie Smelter;
The tenby10 project is a unique partnership approach to addressing the elevated blood lead levels found in children living in Port Pirie, South Australia. The aim of the project is to ensure that the Port Pirie community meets the Australian Governments National Health Goal of at least 95% of all children aged 0 to 4 years of age having a blood lead level of less than 10?g/dL. The project aims to achieve this goal by the end of 2010, however through a range of targeted and specific initiatives to date, a significant and sustained reduction in childrens blood lead levels has been achieved. Port Pirie is located on the eastern side of Spencer Gulf 225kms north of Adelaide. Lead Smelting has been carried out in Port Pirie since the late 19th century and since its formation in April 2004 Nyrstar has been the operator of the citys 240,000 tonne capacity lead smelter. The project was launched in February 2006 and has four key partners - Nyrstar, the Port Pirie Regional Council, the South Australian Department of Health and the South Australian Environment Protection Authority. The principal strategy of the partners is to work co-operatively in an integrated whole of government, local government, and industry approach to reduce blood levels in children in the Port Pirie community. The strategic goals of the project are to minimise emissions from the Smelter to the community, minimise exposure to children and ensure best practice monitoring of blood lead and lead in air levels. Nyrstar has committed extensive funding to the project directed at minimising fugitive emissions from all operational areas Blast Furnace, Sinter Plant, Refinery, Slag Fumer, Kilns and raw materials storage facilities. There is significant focus on monitoring emission levels and rapidly responding to improve operational performance. The South Australian Department of Health via Country Health SA and the Environmental Health Service (EHS) is focussed on minimising exposure. The mission of the EHS is to improve childrens health and wellbeing by focussing on primary prevention, detection and intervention to reduce the impact of lead. The tenby10 partners have identified that leadership within the local community to raise awareness of the lead issue and to provide direction and action is important for a successful outcome. Communication with and the engagement of the community is a priority.

Paper Start Time: 14:25
Paper No.: 5592
Paper Title: **Environmental and Health Performance At Met-Mex Peñoles in the Last Four Years**
Alberto Ross; Met-Mex Penoles; Mayela Barraza, Met-Mex Penoles; Rafael Rebollar, Met-Mex Penoles;
Lead in air at our smelter and refinery as well as in the neighborhoods near met-mex peñoles dropped significatly between 1999 and 2001 and remained steady until 2005. In 2006 new measurments of emissiones were carried out that generated a strategic plan (2007-2011) designed to reduce these in order to improve the results achived in the last years. The plan focused on reducing emissions generated from materials handling, process buildings and process equipments controling key environmental variables. This plan helped reduce blood lead level averages in the population near met-mex as well as in our plant workers. Met-mex peñoles strategy is to sustain its business by being a leader in environmental protection, socially responsible towards the community as well as the best employment option where we operate.

Paper Start Time: 14:50
Paper No.: 5305
Paper Title: **Characterization of the Heavy Metals Contamination Due to a Lead Smelter in Bahia, Brazil**
Luiz R.P. de Andrade Lima; Federal University of Bahia; Leticia A. Bernardez, Ingenium Consoltoria em Engenharia Ltda;
From 1960 to 1993 a primary lead smelter operated in Brazil, close to the Todos os Santos Bay. Several studies since the 1970s have indicated the high blood values of lead and cadmium in the population living less than one kilometre from the plant. A recent survey with children indicated that the lead and cadmium contamination is still found in this region, after the plant closed down. The disposed lead slag has been appointed as the main source of this contamination, despite the fact that the heaps are protected from rainwater by a large impervious clay layer. The state government, geotechnical specialists and some private companies proposed the re-mobilization and treatment of slag heaps by hydrochloric acid leaching followed by solvent extraction as a possible solution for this serious heavy metals pollution problem. The main objective of this paper is demonstrate that the primary disposed lead slag is relatively stable in normal environmental conditions, and the main source of the heavy metals contamination in Bahia is due to the lead smelter dust emissions from the roasting-smelting processes, rich in lead, zinc, cadmium and arsenic oxides. This material remains in the top of the clay rich soil that characterizes this region, and the lead content is about 10800 ppm (exceeds 20000 ppm in some places), the zinc content is about 682 ppm and the arsenic is about 397 ppm. This paper presents a characterization of the slag, soil, and the chimney flue dust, which indicated alternatives to the soil decontamination based on the anglesite leaching.

15:35
Room: Cypress (Perspct-34th Floor)
Stream: LEAD-ZINC
Session: Environmental Practices Lead - Smelting (TUESPM2)

Paper Start Time: 15:35

Paper No.: 5122
Paper Title: **Maximum Control of Air Emissions from a Large Secondary Lead Smelter in an Urban Environment**
Tim Ellis; RSR Technologies; Scott Bevans, Quemetco;
Quemetco, a battery recycling plant of the Eco-Bat group, located in the City of Industry California has long maintained emissions control technology at the state of the art. The plant produces about 110,000 metric tons of lead and lead alloys primarily from spent lead acid batteries. The Quemetco plant uses high efficiency bag filters to control the emission streams of the furnace feed dryer, reverbatory furnace, electric arc furnace, and pyro-metallurgical refinery. The emissions stream from the reverberatory furnace passes through a NOX scrubber and a two stage SO2 scrubber before exiting through the stack. The emissions stream from the electric submerged arc furnace passes through a bag filter and single stage SO2 scrubber prior to exiting through a separate stack. The dryer and refinery pass through bag filters prior to exiting another stack. Quemetco also uses high efficiency bag filters combined with HEPA filters to remove emissions from nine building sanitary exhaust streams. In 2008 Quemetco introduced the most advanced air emissions treatment system of any secondary smelter to significantly reduce the already low emissions. Quemetco installed a regenerative thermal oxidizer (RTO) to oxidize hydrocarbon emissions from its feed dryer installation. The plant also installed a a wet electrostatic precipitator (WESP) through which all process gas streams pass prior to being released through one common stack. The WESP has lowered the emissions of lead, arsenic, cadmium, and nickel by typically 90%. The RTO has lowered the emission of hydrocarbons by 95% typically. Quemetco believes that the achievement has demonstrated a new maximum available control technology (MACT) for secondary smelters.

Paper Start Time: 16:00
Paper No.: 5198
Paper Title: **A Possibility of CRT Recycling in a Lead Smelter from an Environmental Point of View**
Takashi Nakamura; Tohoku University; Etsuro Shibata, Tohoku University; Toshikazu Shiratori, Tohoku UNiversity;
Both landfill and recycling of used cathode ray tubes(CRT) have been done in the world and which way was selected in each country depends on environmental policy of each country. Almost 100% of material recycling was achieved in Japan past decade. However, recycling of CRT has recently faced a strong difficulty to continue because a demand of CRT TV has drastically decreased due to wide spreading liquid crystal display(LCD) TV in the world. Material flow of CRT culets all over the world was investigated and problems of recycling CRT culets were pointed out in the present paper. A possibility and contribution of lead smelter to CRT recycling have been discussed especially in Japan. Key technologies have been also pointed out to progress CRT culet in lead smelter.

Paper Start Time: 16:25
Paper No.: 5329
Paper Title: **The CO2-Story - A Fairy-Tale - (or a Nightmare?!)**
Karl F. Lamm; Zweifall; Gunther Woelk, Vaals;
This contribution to the actual discussion about climate change, or more precisely to the impact of CO2 on the atmosphere, i.e. its absorption behaviour in the troposphere, is not in line with the mainstream research, but based on reliable scientific results from the late sixties, when CO2 did not yet exist in the vocabulary of ecologists, journalists and politicians. Correlations are shown between CO2 content of the atmosphere, global average temperature, vegetation and human population. The best and cheapest fertilizer is the CO2 content of the atmosphere! The impact of gravitation in our planetary system and of the solar spot activity on climate changes in the past are shown, especially during the Ice Age or the different glacial periods. A global balance of CO2 distribution between atmosphere, biosphere, soil and water is given including the exchange and/or transfer from one phase into another. Comparing the effectiveness of CO2 and other Green House gases, in particular with the role of the water vapour content in the atmosphere, results at least in the suspicion that we have saddled the wrong horse or killed the wrong sow. The commercialisation of industrial CO2 emissions including air bound and automotive traffic makes an objective dialogue nearly impossible. The reason behind is quite simple: A penalty on H2O vapour is difficult!

Paper Start Time: 16:50
Paper No.: 5595
Paper Title: **Status and General Directions of Air Medium Protection**
N. N. Ushakov; SA Vniitsvetmet; Andrey Michailovich Bogatyryov, VNIItsvetmet; Michael Fedorovich Bogatyryov, VNIItsvetmet;
In order to protect air medium against contaminating agents pollution and recover valuable components from gases, considerable volumes of the process and vent gases undergo cleaning in various-type systems. Improvement of the methods and devices applied for gas cleaning process allows to decrease contaminating agents emissions into atmosphere to some extent. However, for principal improvement of the ambient air condition in the enterprise operation activity zone, development of the technologies providing minimal volumes of the generating gases is necessary. As for the lead industry, KIVCET technology to process lead-containing raw materials refers to the processes and devices of this kind. Completed with electric filter designed for high-dusty sulfurous gases cleaning installed directly after gas cooler without units for preliminary rough cleaning, the technology provides minimal air emissions of lead (0.06 kg/t of lead) and sulphur dioxide (4.7 kg/t of lead). Considering technical and economic parameters, gas cleaning technology in the system

Waste heat boiler special electric filter for high-dusty sulfurous gases cleaning is the most reasonable.

---Wednesday October 6, 2010---

08:30
Room: Regency C (Conv-3rd Floor)
Stream: LEAD-ZINC
Session: Plenary III (WEDAM1)

Paper Start Time: 08:30
Paper No.: 5475
Paper Title: **PLENARY: Non-technical Issues Challenging the Non-ferrous Metals Industry: and Possible Ways to Meet these Challenges**
R. Westphal; Recylex GmbH;
Today the non-ferrous metals industry is experiencing a number of major challenges. Specific issues were identified such as the availability of raw material and thus the increasing meaning of recycling as well as the costs of energy and the need to reduce CO2 emissions. Also in the context of the feared climate change, the metals industry has to cope with the call for the use of renewable energies and the trend towards cars powered by electric power. Metals prices are defined by the LME trading system. This fact contributes to financing issues related to the global economic and financial crisis. Within the frame of the worldwide free cash, there is room enough for speculation and the link between production and demand for our metals is not the key for the prices. The urgent need for innovations within metals production as well as regarding metals products thus is dragged by restrictions due to the above issues. A still negative public image, as the so-called smokestack industry in this specific situation, increases the pressure even more. Even though we are living in times of globalization, these challenges might vary from region to region in intensity and in country-specific details. But a number of aspects are quite global and need to be tackled by the non-ferrous metals industry as a whole. The metals industry needs to stand together and it needs allies. Our industry including the recycling technology is the motor for the modern life today. The nonferrous metallurgy is the basic industry for a lot of other industries within the subsequent production chain. In order to support actions for the benefit of the worldwide non-ferrous metals industry, this presentation summarizes how the German non-ferrous metals industry four years ago took the initiative to organize the Day of Metallurgy. The Day of Metallurgy is a biennial two-day Germany-based Symposium, in which the major challenges are outlined and the actions being taken are highlighted by international leaders from industry, the political scene and professionals from the academic society. Whereas on the one hand this is a unique opportunity for decision makers from industry and for politicians to exchange views on neutral grounds, at the same time innovations and the most recent developments are publicized and those news find their way into the media and subsequently into the general public to secure our industry in western countries and to further promote the non-ferrous metals industry.

Paper Start Time: 09:00
Paper No.: 5103
Paper Title: **PLENARY: The Zinc Industry in Perspective: Changes, Challenges and Opportunities**
Stephen Wilkinson; International Zinc Association;
Since the 2005 Lead-Zinc conference, huge changes in the industry structure, markets, challenges and opportunities have occurred. This paper will review the recent industry developments, their impact on the zinc markets and the supply and demand trends. Consolidation within the zinc concentrate and metal industry continues to occur and the influence of China continues to be dominant. New product and market opportunities including new alloys, geographical markets, end-use markets, including the use of zinc in fertilizers will be highlighted. On the regulatory side, the industry keeps facing new challenges. Proactive communications programs have been developed which are targeted at key stakeholder groups. Programs such as Zinc Saves Kids, Zinc and Nutrition Initiative will be illustrated. The Industry response to the European requirements (REACH and new energy consumption regulations) will be covered. This paper will highlight some of the key programs of Zinc Industry Associations in capitalizing on market opportunities and meeting market threats.

Paper Start Time: 09:30
Paper No.: 5655
Paper Title: **PLENARY: Chinese Lead and Zinc Industry Development**
Jin Xiangyun, Antaike Information Development Co.;
Driving by energetic demand, Chinese lead and zinc output has been increasing at annual growth rates of 14% and 9.3% respectively in the past decade (2000-2009). In 2009, the country's lead output was 3.7mlnt, and zinc was 4.37mlnt. Meantime, the two metals' consumption swelled apparently with annual growth rate of 21% for lead and 13.8% for zinc. In 2009, Chinese consumption for lead was 3.33mlnt, and zinc consumption was 4.1mlnt. The dominant lead and zinc consumption sectors are batteries and galvanizing steels. With the vivid development of auto mobiles, construction and infrastructure sectors, it is envisaged that Chinese lead and zinc

consumptions would maintain the growing trend at appropriate pace. Not only Chinese lead and zinc production scales been expanded, but also the smelting technique has been advancing evidently. Especially for lead smelting, the SKS smelting method is developing quickly and has been introduced to outside China.

10:30
Room: Regency C (Conv-3rd Floor)
Stream: LEAD-ZINC
Session: New Technologies Zinc (WEDAM2)

Paper Start Time: 10:30
Paper No.: 5696
Paper Title: **Research and Development of Complex Technology for Zinc and Indium Recovery from Oxidized Raw Material and Waste Utilization**
Pavel Alexandrovich Kozlov; JSC ; Andrey Mikhailovich Panshin, JSC ;
JSC "CZP" has developed the project and is implementing the technology of Waelz fumes calcination in large-sized tube kilns and leaching of calcined products for zinc, indium and lead recovery. While thermal treating of fumes, solid-phase reactions of oxides with various metals take place, organic compounds, carbon, sulphide sulphur are removed. Halides are removed into secondary fumes. Waelz-oxide undergoes calcination in a tube kiln of L=40 m and ?,5 m. Optimal modes for calcination process are determined, at which impurities are removed efficiently and high zinc, cadmium and indium recovery is provided. The mastering of the calcination process will take place in April July 2010.

Paper Start Time: 10:55
Paper No.: 5140
Paper Title: **Methods for Improving Recovery of Zinc and Indium from Indium-contained Zinc Concentrate**
Tiechui Yuan; Central South University; Zheng-xiu Tao, Guangxi Huaxi Group Corporation; Kechao Zhou, Central South University;
The traditional process to extract zinc and indium from indium-contained zinc ore have long periods and low indium recovery rates.To solve these problems, the traditional process has been improved. First, the roasting materials were neutrally leached, then the reductant was added to the neutralized residues after filtering the slurry, finally roast pellets were palletized, dried and volatilized in the rotary kiln. The optimized conditions are as follows: mass fraction of reductant of 15%-20%, reduced temperature of 1250? and pellets flow velocity of 5 kg/h. The volatilizing rates of indium and zinc reach 97% and 95%, respectively. The acidic leaching rates of zinc and indium are 98.53% and 93.38%, respectively, showing that the recovery rates of zinc and indium are greatly improved.

Paper Start Time: 11:20
Paper No.: 5230
Paper Title: **Vaccum Carbothermal Reduction of Sphalerite for Zinc Metal: Thermodynamic Analysis and Experimental Investigation**
Chang Wei; Kunming University of Science and Technology; Zhigan Deng, Kunming University of Science and Technology; Gang Fan, Kunming University of Science and Technology; Xingbin LI, ; Minting Li, Kunming University of Science and Technology; Cunxiong Li, Kunming University of Science and Technology; Hongsheng Xu, Kunming University of Science and Technology;
Zinc metal was prepared by reduction of the sphalerite with simultaneous condensation of the volatile zinc in the present paper. The thermodynamic calculation shows that the reaction between sphalerite and carbon occurrs easily, and is favored in the presence of lime. Experiment data indicated that when the molar ratio of ZnS,C and CaO was 1:3:1.5, systerm pressure of 10Pa, and with temperature of 900?,99%zinc recovery was achieved.

10:30
Room: Regency B (Conv-3rd Floor)
Stream: LEAD-ZINC
Session: Zinc By Products (WEDAM2)

Paper Start Time: 10:30
Paper No.: 5098
Paper Title: **Hydrometallurgical Treatment for Separation, Concentration, Recovery or Fixation of Rare Metals from Zinc and Lead Bearing Materials**
Corby G. Anderson; Colorado School of Mines;
This paper will outline and summarize the use of several industrial hydrometallurgical techniques for the selective separation, conventration, and recovery or fixation of arsenic, antimony, tin, mercury, indium, gallium, germanium, copper, nickel, cobalt, gold and silver from lead and zinc bearing materials. The application to complex concentrates and smelting wastes will be highlighted. Where

appropriate, flowsheets and the associated capital and operating costs estimates will be presented.

Paper Start Time: 10:55
Paper No.: 5594
Paper Title: **Researches in Recovery of Precious Metals from Kazakhstan Zinc Plants Residues**
N. N. Ushakov; SA Vniitsvetmet; Larissa Borisovna Kushakova, VNIItsvetmet;
In order to recover zinc, zinc residues forming in the process of roasted product leaching and containing up to 10 g/t of gold and 200-250 g/t of silver are directed to the processing via various methods. At that gold and silver are lost with copper and ferrous middlings. Gold and silver in free from are presented in zinc residue on 13-15 and 12-20% rel. respectively. Basic amount of noble metals is concentrated in intergrowths of minerals with rock. While flotation benefication of zinc residue, maximum recovery of silver to silver-containing float concentrate was equal to 70-80, of gold 16-20%. As for hydrometallurgical processing of zinc residue, gold recovery to cathode deposit obtained upon electrolytic processing of thiocarbamide leaching solutions was equal to 85-90%, silver recovery 75-80%.

Paper Start Time: 11:20
Paper No.: 5156
Paper Title: **Extraction of Scattered Elements in Lead-Zinc Production**
Elena Voskresenskaya; Institute of Chemistry & Chemical Technology SB RAS; Gennady Pashkov, Institute of Chemistry & Chemical Technology SB RAS; Igor Flejtlikh, Institute of Chemistry & Chemical Technology SB RAS;
New technologies for extracting scattering elements such as In, Cd, Tl were developed for lead-zinc production. Improvement of indicators for extraction of indium is caused by application of mixture from alkyl-phosphorus and mono-carboxylic acids. At high value of coefficient of indium distribution at a extraction stage, it is possible to effectively carry out indium stripping by a sulfuric acid solution of concentration 300 g/l with the additive of 50 g/l ammonium chloride. Rational method of extraction for thallium and cadmium from zinc sulphate solutions was developed on base of leach - 3-butylphosphate, containing 50-60 g/l of iodine. At joint extraction on a stripping stage it is possible to produce In and Cd re-extracts. In particular, concentration of metals is in Cd re-extract: Cd 150-200, Tl 0,005, Zn 5-10 g/l, in thallium re-extract: Tl 20-30, Cd 2-5, Zn 3-7 g/l.

10:30
Room: Regency A (Conv-3rd Floor)
Stream: LEAD-ZINC
Session: Mineral Processing Zinc II (WEDAM2)

Paper Start Time: 10:30
Paper No.: 5492
Paper Title: **Recovery Options for Lead and Zinc Minerals from a Highly Flotable Sulphide Ore**
S. Kelebek; Queen's University;
Flotation investigations were undertaken to evaluate processing characteristics of a lead-zinc sulphide ore originating from the Biga Peninsula. The ore is highly floatable even without using any collector, thus triggering persistently a bulk-flotation-behaviour for both lead and zinc. The current study focuses on challenges and opportunities of selective flotation for production of two selective concentrates for lead and zinc. Following a general literature review, comparative results on natural tendencies of the samples for bulk flotation and options involving application of selective reagents, which include zinc sulphate, sodium metabisulphate, sodium sulphide and sodium cyanide will be presented and discussed.

Paper Start Time: 10:55
Paper No.: 5067
Paper Title: **Adsorption Mixing Requirements Mixing Requirements for Resin in Pulp and Resin in Leach**
Bill Baguley; Mixtec Australia;
The interest in Resin in Pulp with agitated tanks can traced back to the 1950s, when it was pioneered by National Lead in USA, through to more recent activity by Barrick at Goldstrike in Nevada. In addition the poly metals plant at Navoi and the Uranium plant at Krasnokamensk in Russia, as well as the Gold plant at Penjom in Malaysia, also indicate that Resin in Pulp if far from a novelty when it comes to practical plant operation. Further large mechanically agitated vessel containing high resin inventory used in the ORICA MEIX water treatment process have also given valuable data on resin loss and the required degree of mechanical agitation. However there are still a number of unanswered questions regarding the best type of agitation, the friability of the resin, screening techniques and operating costs that this paper will address. There are available today many various types of mixing systems, tank types and process liquors confronting the process designer of a Resin in pulp and Resin in leach adsorption circuits. This short paper is to give the process designer an insight into the special mixing requirements for a RIP/RIL and the advantages and disadvantages of the various mixing systems that are available to agitate the required tank shape.

Paper Start Time: 11:20
Paper No.: 5221
Paper Title: **The Effect of C.A.A.A. (Armac C) Collector Concentration on the Flotation of Zinc Non-sulfide Ore in the Presence of KAX Collector**
Behrooz Hajisolimani, RECo; Davood Moradkhani, RECo; Mohammad Noaparast, RECo;
In this study, determination of the cationic collector (coco-alcyl-amine-acetate) concentration, to achieve the optimum Zn recovery in flotation by mixed (Kax-Armac C) or catanionic collectors, have been investigated. In the view of above, orthogonal array design L18 (21×37) in Taguchi quality engineering method that comprises one parameter at two levels and seven parameters at three levels was chosen. The parameters were as sodium silicate, starch, sodium sulfide, xanthate (in two stage) and Armac C concentrations, pH and flotation time. The sample was obtained from Angouran mine and its XRD analysis showed that the ore contains Calcite (40.1%), Calamine (24.5%), Magnesite (17.1%), Smithsonite (14.8%) and Quartz (3.5%). Statistical analysis, ANOVA, and S/N evaluation methods were also employed to determine the relationship between experimental conditions and yield levels. According to the results, Armac C concentration has maximum effect on the Zn recovery and Zn grade responses in concentration. Under optimum conditions that were determined in the experiments, Zn recovery, Zn grade and Ca recovery in concentration were 81.87%, 38.24% and 13.09%, respectively.

14:00
Room: Regency C (Conv-3rd Floor)
Stream: LEAD-ZINC
Session: Lead Operation III (WEDPM1)

Paper Start Time: 14:00
Paper No.: 5596
Paper Title: **Lead and Zinc Raw Material Complex Processing**
Victor Aleksandrovich Shumskiy, VNIItsvetmet; Nikolay Nikolayevich Ushakov, VNIItsvetmet;
Traditionally, separate lead, zinc, and copper concentrates have been produced using mineral processing techniques. As a result, it is often not economic to recover the low levels of secondary elements in the concentrates such as, for example, fuming of zinc from lead smelter slags. However, the integration of metallurgical processes that combine lead, zinc, and copper production steps can allow the commercialization of complex deposits and improve recovery of base and precious metals compared with traditional separate production steps. Flowsheets of several integrated lead-zinc smelters are reviewed and the lead smelting technologies applied in each flowsheet is discussed.

Paper Start Time: 14:25
Paper No.: 5514
Paper Title: **Process Efficiency Improvements through Bullion and Slag Inventory Management**
Kris Heale; Teck Metals Ltd.; Greg Richards, Teck Metals Ltd.; D. Rioux, Teck Metals Ltd.;
The lead smelter at Tecks Trail Operations consists of three major furnaces: the KIVCETTM furnace (lead and slag), the Continuous Drossing Furnace (lead bullion) and the #3 Slag Fuming Furnace (slag). Management of bullion and slag inventories in this system is an important factor in maintaining process stability and maximizing metal recovery. A key goal in improving operational efficiencies has been to maximize charge size in the fuming furnace in order to extend the residence time giving improved metals recoveries from slag. To achieve this, a bath level sensor was required to provide real time information on the slag and bullion levels for control of the tapping processes. A time of flight sensor was successfully tested which reliably reports the bath surface elevation, and has been used as the basis for a set of inventory management tools: slag tap time predictor, slag charge size estimator and a soft sensor for bullion level. Together, these have been used to implement a level control strategy for all three furnaces. The impact of this strategy on overall smelting efficiency and metals recoveries is discussed.

Paper Start Time: 14:50
Paper No.: 5515
Paper Title: **The Management of Continuous Drossing Furnace Accretions**
Greg Richards; Teck Comminco Metals Ltd.; G. Aiken, Teck Metals Ltd.; D. Rioux, Teck Metals Ltd.;
A continuous drossing furnace is used in the lead smelter at Tecks Trail Operations to remove copper from KIVCETTM lead bullion. A copper-lead matte is produced in the furnace through the reaction of bullion with elemental sulphur and low temperature ex-solution. The matte is largely a Cu2S-PbS binary solution containing about 45% Cu, and contains a range of impurities including Sb, As and Sn. Different types of bath accretions are known to form and can disrupt furnace operation, compromising matte quality and furnace capacity. Accretions form through the oxidation of critical impurities, an imbalance between sulphur and copper inputs, the use of thermic (Fe-Al) lances, and issues with burner operation. This paper reviews the formation of the different accretion types and the methods that can be used to control them to ensure furnace stability and maintain throughput capacity.

15:35
Room: Regency C (Conv-3rd Floor)
Stream: LEAD-ZINC
Session: Lead Operation III (WEDPM2)

Paper Start Time: 15:35
Paper No.: 5657
Paper Title: **Improvements of Secondery Lead Raw Material Processing at Chigirishima Refinery**
Tatsuya Suzuki; Toho Zinc Co., Ltd.; Kazuma Morino, Toho Zinc Co., Ltd.; Takafumi Kawamura, Toho Zinc Co., Ltd.;
Toho Zinc Chigirishima Refinery started up lead metal production in 1951. The production capacity of electrolytic lead is 90,000t/y by the method of sintering - blast furnace electrolysis process. Our process is intended for lead concetrates mainly, but we have improved to use various and many secondery lead raw materials. By solving various problems that occur along with the raw materials conversion, the processing ratio of secondary lead raw materials has been increased up to approximately 50% currently. We report about various problems which occur in the processing of secondary lead raw materials and the measures taken with their result.

Paper Start Time: 16:00
Paper No.: 5513
Paper Title: **Value Added Slag Fuming at Teck Trail Operations**
O. Bot, Teck Metals Ltd.; K. Klimchuk, Teck Metals Ltd.; D. Rioux, Teck Metals Ltd.; Kris Heale, Teck Metals Ltd.;
The #2 Slag Fuming Furnace operated at Tecks Trail Operations from 1947 to 1997 for the recovery of zinc from lead blast furnace slag. Following shutdown of the blast furnaces it was recommissioned for the treatment of a wide variety of recycle materials. The furnace operating strategy has been modified to efficiently process a fully cold slag charge along with controlled quantities of other inputs. To achieve this, modified management of operating parameters during the melting and fuming stages of the process, as well as charge composition, is required to ensure effective operation. A number of modifications have been made to adapt the furnace to the new role, including a Trona injection system for sulphur dioxide abatement. The details and challenges of this operation are reviewed.

Paper Start Time: 16:25
Paper No.: 5549
Paper Title: **Waste Heat Recovery Systems Downstream Pyro-metallurgical Processes for Lead and Zinc**
Stefan Köster; Oschatz GmbH;
This article sets out the recent technologies for the off gas cooling with waste heat boilers downstream pyro metallurgical processes for lead and zinc on the basis of conducted industrial applications. One objective is a modi-fied furnace designed as an integrated part of the waste heat boiler system. Different heating surface designs which are adapted to the process conditions are described. The cleaning system to control the fouling on the heating surfaces and to adjust the cooling efficiency is introduced. Another objective is the thermal expansion of waste heat boilers. Further-more possible developments and improvements for waste heat boiler systems are shown.

Paper Start Time: 16:50
Paper No.: 5589
Paper Title: **TSL-Furnance Wall Cooling by Boiler Tubes**
Rauno Peippo; Foster Wheeler Energia OY; Heikki Lankinen, Foster Wheeler Energia Oy;
TSL furnaces are widely used for treatment of primary and secondary feed materials. Growing unit sizes and aim to extend campaign life require furnaces to be built with cooled walls. Foster Wheeler has built furnace sidewalls and/or roof for several TSL furnaces, using membrane boiler tube wall. Splashing, accretions as well as static and dynamic loads must be considered. Ports for lance, feed, burner, sampling, maintenance etc. must be allowed for. Geometry and needed connection provisions to the WHB uptake sets challenge for design and manufacturing. The experience from the operating furnaces with Foster Wheeler boiler tube walls have indicated better than expected availability and decreased maintenance needs, along with the extended campaign life.

14:00
Room: Cypress (Perspct-34th Floor)
Stream: LEAD-ZINC
Session: New Lead Technologies (WEDPM1)

Paper Start Time: 14:00
Paper No.: 5141
Paper Title: **The CX® Process: New Approaches for Making the Process Even More Environmentally Friendly**
Massimo Maccagni; Engitec Technologies S.P.A.; Jonathan Nielsen, Engitec Technoloiges USA;
Lead is quite an unusual metal because most of its production comes from secondary materials. The recycling is quite important and

the development of environmentally friendly processes is welcome because the regulations in most countries are becoming more and more strict. The control of emissions is becoming the key issue of the process and, for this reason, the control of the furnace feed is very important. Desulphurization is currently the best technology to control emissions while reducing the chemical and the fuel/energy requirement. Through desulphurization, the furnace productivity can also be increased. We also shouldnt forget that all the hydrometallurgical approaches studied till now require an efficient desulphurization process. Engitec Technologies S.p.A., proposing to the market desulphurization for many years, has developed a new approach to desulphurization as well as a desulphurization based on ammonia salts. We are also working on a new electrolytic approach to the production of Pb from desulphurized paste. In this paper we will describe all these innovations.

Paper Start Time: 14:25
Paper No.: 5271
Paper Title: **Pilot Plant Demonstration of the Primalead Process Confirms the Viability to get Green Lead Product from Mine Lead**
Carlos Frias Gomez; Tecnicas Reunidas, S.A.; Emilio Pecharroman Mercado, Tecnicas Reunidas, S.A.; Gustavo Diaz Nogueira, Tecnicas Reunidas, S.A.; Maria Frades Tapia, Tecnicas Reunidas, S.A.;
World lead consumption is continuously increasing due to lead-acid batteries uses, and about 40% lead demand is supplied as galena concentrates, which require large and complex factories to be processed, including an acid capture plant. Tecnicas Reunidas Primalead process easily converts galena concentrates to a lead oxide/carbonate product, able to be processed in either primary or secondary lead smelters with no generation of slag or sulphurous gases. This paper presents the successful results of a pilot plant operation showing the viability of the Primalead process to get a marketable green lead product, including recovery of lead, silver, and other metals.

Paper Start Time: 14:50
Paper No.: 5790
Paper Title: **Vanukov Furnace Technology. Application Experience for Processing Different Types of Raw Materials and General Development Trends**
Anton Vernigora; National University of Science and Technology ; Valentin Petrovich Bystrov, National University of Science and Technology "MISIS"; Valeriy Mihailovich Paretsky, State Research Center of Russia Federation Gintsvetme Insitute; Rostislav Igorevich Kamkin, National University of Science and Technology "MISIS"; Alexander Yuryevich Mamaev, National University of Science and Technology "MISIS"; Alexander Vladimirovich Kuznetsov, National University of Science and Technology "MISIS";
Vanukov furnace technology is an efficient proven pyrometallurgical injection technology extensively used in Russia and Kazakhstan for a number of different applications. Developed in the 1970s at the Moscow State Institute of Steel and Alloys in close collaboration with other research institutes, its basic principle is in injection of highly enriched blow (up to 90% of oxygen) through tuyeres via the side walls into the melt. Vigorous agitation of the melt and injection of fuel oxidizing reagent provides efficient heat and significant intensification of chemical reactions and formation of products. The shaft of the furnace is rectangular, and constructed from water-cooled copper elements without any refractory lining in front of them. Technology was most widely adopted for processing copper sulfide concentrates for matte in smelters of Norilsk, Revda (Russia) and Balkhash (Kazakhstan). The following technologies were also developed and tested in industrial scale with application of the Vanukov furnace: treatment of sulfide lead and lead-zinc concentrates for the production of black lead and zinc-containing sublimates, laterite nickel ore treatment for matte or ferronickel, production of cast iron, treatment of antimony gold-containing ores for antimony oxide sublimates and gold-containing metallic antimony and municipal solid waste treatment. In this paper, current experience with Vanukov furnace application to these technologies is described with a number of general development trends and the following new types of applications,: prolongation of furnace continuous campaign up to 4-5 years, design modernizations for optimization and improvement of current operating conditions (decreasing of matte bath depth, redistribution of feed ports, installation of vertical tuyere for easier return from repairs), and making technology more energy-efficient (installation of evaporating cooling elements). New developing applications include: continuous converting and reducing of slag in copper production (with production of copper-containing cast iron) and high-temperature cement clinker production (crystallization of clinker from the melt).

15:35
Room: Cypress (Perspct-34th Floor)
Stream: LEAD-ZINC
Session: New Lead Technologies (WEDPM2)

Paper Start Time: 15:35
Paper No.: 5126 (Part 1)
Paper Title: **Phase Chemistry of Lead Smelting Slags**
Eugene Jak; Pyrosearch, University of Queensland; Peter C. Hayes, University of Queensland;
Recent advances in understanding of the phase chemistry and phase equilibria in primary lead smelting slags are presented. The slag

chemistry in primary lead smelting slags, as described by the system ZnO-FeO-Fe2O3-PbO-CaO-SiO2, is systematically examined and presented so as to reflect the various process conditions encountered at different stages of the smelting operation, from sintering and direct smelting to zinc fuming. The commentary is illustrated with examples from both experimental and thermodynamic modelling studies. These fundamental studies have been used to assist in process developments and improvements, and have the advantage that they are applicable to a range of process technologies.

Paper Start Time: 16:00
Paper No.: 5126 (Part 2)
Paper Title: **Phase Chemistry of Lead Smelting Slags**
Eugene Jak; Pyrosearch, University of Queensland; Peter C. Hayes, University of Queensland;
Recent advances in understanding of the phase chemistry and phase equilibria in primary lead smelting slags are presented. The slag chemistry in primary lead smelting slags, as described by the system ZnO-FeO-Fe2O3-PbO-CaO-SiO2, is systematically examined and presented so as to reflect the various process conditions encountered at different stages of the smelting operation, from sintering and direct smelting to zinc fuming. The commentary is illustrated with examples from both experimental and thermodynamic modelling studies. These fundamental studies have been used to assist in process developments and improvements, and have the advantage that they are applicable to a range of process technologies.

Paper Start Time: 16:25
Paper No.: 5439
Paper Title: **Research on Indium and Germanium Distributions Between Lead Bullion and Slag at Selected Process Conditions**
Hector M. Henao Zapata; University of Queensland, PYROSEARCH Centre; Greg Richards, Teck Metals Ltd., Trail Metallurgical Operation; Evgueni Jak, University of Queensland, PYROSEARCH Centre; Peter Charles Hayes, University of Queensland, PYROSEARCH Centre;
The recovery of indium and germanium during lead metal extraction processes has the potential to add value to existing pyrometallurgical operations. Few experimental data are available that describe the partitioning of these species between major phases at the industrial process conditions. In addition, the bulk chemical analysis techniques used in previous studies have limited accuracy since the solid phases and their proportions in slag are not identified. A novel methodology was developed for the high temperature equilibration and quenching technique where the composition of the quenched liquid slag phase was analysed by electron probe X-Ray microanalysis (EPMA) and the metallic lead phase by inductively coupled plasma (ICP). The improved methodology developed in the present study provides the opportunity to resolve differences between the data presented in the literature, and accurate description of the systems. Results of the study show that at the selected experimental conditions, indium is predominantly present in the slag as In3+, and germanium as Ge4+. Germanium partitions preferentially to the slag phase between PO2 of 10-8 to 10-12 atm. Indium partitions preferentially to the metal under low PO2 and to the slag at high PO2. Additions of copper, arsenic or antimony at levels below 5 wt% in the lead metal phase do not affect the partitions of indium or germanium. Increasing the temperature from 1150 0C to 1300 0C increases the partition of indium. Over the experimental temperatures in the range of 1150 0C to 1200 0C no significant change in the partition ratio of germanium was observed.

Paper Start Time: 16:50
Paper No.: 5180
Paper Title: **Complex Processing of Bismuth - and Lead-containing Raw Materials**
Elena Voskresenskaya; Institute of Chemistry & Chemical Technology SB RAS; Igor Fleitlikh, Institute of Chemistry & Chemical Technology SB RAS; Olga Logutenko, Institute of Chemistry of Solids and Mechano-Chemistry SB RAS; Gennady Leonidovich Pashkov, Institute of Chemistry & Chemical Technology SB RAS; Yuri Yukhin, Institute of Chemistry of Solids and Mechano-Chemistry SB RAS;
During the production of lead by the scheme: agglomeration-shaft fusion-refinement, bismuth is concentrated in the lead. At the stage of recovery of bismuth, lead bismuthite is produced which is the main intermediate product used for production of bismuth metal and its compounds. During the leaching of bismuth- and lead-containing materials with nitric acid lead nitrate and carbonate as well as bismuth metal and its oxide of high purity were produced. Bismuth and silver extraction with di(2-ethylhexyl)phosphoric and di(2-ethylhexyl)dithiophosphoric acids, respectively, allows effective recovery of the metals from waste solutions.

14:00
Room: Regency B (Conv-3rd Floor)
Stream: LEAD-ZINC
Session: Secondary Zinc Processing III (WEDPM1)

Paper Start Time: 14:00
Paper No.: 5266
Paper Title: **Simultaneous Recovery of Various Metals from Zinc Containing Residues on a Reducing Metal Bath**

Stefan Steinlechner; University Leoben; Jürgen Antrekowitsch, University Leoben;
Based on a stricter environmental legislation and rising metal prices an effective treatment of zinc containing residues from metallurgical industry has become more important. For decades the recovery of only zinc has been state of the art, while others like iron, copper, etc. remain in huge amounts in the residues. The treatment on a reducing metal bath as single step process or combined with halogen-removal or melting steps shows a promising option meeting the requirements for a simultaneous recovery of different metals. The recycling of residues from copper-, zinc- and steel industry is described and balanced for such a process.

Paper Start Time: 14:25
Paper No.: 5267
Paper Title: **Recovery of Recycled Zinc by Fuming at the Rönnskär Smelter**
Robert Hansson; Boliden Mineral AB; Hannes Holmgren, Boliden Mineral AB; Theo Lehner, Boliden Mineral AB;
Fayalite slag from the Electric Smelting Furnace (ESF) at the Rönnskär Smelter is treated batchwise in a fuming furnace to recover zinc. Secondary Zn-rich materials are recycled both in the ESF and the fuming furnace. The Misch oxide product from the fumer is treated in a rotary kiln to remove chlorides and fluorides producing zinc clinker. The reducing conditions in the fumer promote the formation of copper rich matte and speiss phases. These are separated and recovered from the slag by gravity in an electrically heated settler. The cleaned slag product is granulated and used in construction work.

Paper Start Time: 14:50
Paper No.: 5593
Paper Title: **PIZO Technology from Concept to Commercial Facility**
Nigel Morrison; PIZO Technologies;
The PIZO (pig iron and zinc oxide) process was born from the desire by Heritage Environmental Services to avoid land filling of Electric Arc Furnace Dust (EAFD). Research to develop a patented one step process to reuse iron and zinc (the primary metal constituents of EAFD) commenced at the start of the new millennium. Laboratory scale work formed the basis for a demonstration plant which in turn resulted in the formation of a joint venture company with Nucor Steel to construct a commercial facility in Arkansas USA by the end of the decade.

15:35
Room: Regency B (Conv-3rd Floor)
Stream: LEAD-ZINC
Session: Secondary Zinc Processing III (WEDPM2)

Paper Start Time: 15:35
Paper No.: 5330
Paper Title: **Research and Development of Complex Technology for Zinc and Indium Recovery from Oxidized Raw Material and Waste Utilization**
A.M. Panshin; Open Joint-Stock Company (Chelyabinsk Zinc Plant); P.A. Kozlov, Open Joint-Stock Company (Chelyabinsk Zinc Plant);
JSC «CZP» has developed the project and is currently implementing the technology of Wealz-fumes densification in large-sized tube kilns and leaching of densified products for zinc, indium and lead recovery. While thermal treating of fumes, solid-phase reactions of oxides with various metals take place, organic compounds, carbon, sulphide sulphur are removed. Halides are removed into secondary fumes. Waelz-oxide undergoes densification in a tube kiln of L=40 m and ?2,5 m. Optimal modes for densification process are determined, at which impurities are removed efficiently and high zinc, cadmium and indium recovery is provided. The mastering of the densification process will take place in April July 2010.

Paper Start Time: 16:00
Paper No.: 5203
Paper Title: **Zn Recovery From Brass Slag**
Ali Aghajanloo; IZMDC; Davood Moradkhani, Zanjan University; Behnam Akhtari, IZMDC;
Brass slag can be used as one of the Zn secondary sources. Brass formed by Zn and Cu, is an alloy that contains a great amount of Zn. Based on XRF and Atomic Absorption analysis, the sample (under this study) contains 66% Zn and 12% Cu. In order to recovery Zn, the slag was leached by sulfuric acid. More than 80% of the material was dissolved. Parameters affecting the recovery efficiency were S/L ratio (w/v), temperature (°C), time (h) and pH. The maximum recovery at optimum condition was reached to 95%.

Paper Start Time: 16:25
Paper No.: 5207
Paper Title: **Processing for Extraction of Valuable Metals from Zinc Plant Residue**
Eskandar Keshavarz Alamdari; Amirkabir University of Technology; Alireza Eivazi Hollagh, Materials and Energy Research Center;
A hydrometallurgical process has been improved for the recovery of valuable metals from a zinc plant residue. The residue contains a

considerable quantity of zinc, manganese and cobalt. The process consists of a few parts as follow: (1) washing: pH= 3, S/L ratio of 1:6, 25°C, 90 min; (2) Reductive leaching: 20 g/L sulphuric acid, S/L of 1:10, 3 %(V/V) hydrogen per oxide and ambient temperature; (3) separation of zinc, manganese and cobalt by solvent extraction by using 20%D2EHPA+5%TBP in kerosene, 25°C and O:A ratio of 1:1. Zinc was separated from manganese and cobalt in pH 1-1.2. Then manganese was purified from cobalt in pH 2-2.2. The number of stages required for the extraction, stripping and scrubbing processes of cobalt and manganese was also evaluated. At last, a conceptual total flow diagram of the process has been proposed.

14:00
Room: Regency A (Conv-3rd Floor)
Stream: LEAD-ZINC
Session: Zinc Concentrate Leaching II (WEDPM1)

Paper Start Time: 14:00
Paper No.: 5443
Paper Title: **Precipitation Behavior of Silica in Zinc Refinery Process**
Nobuyoshi Sogabe; Kamioka Mining & Smelting Company Limited; Seiji Ikenobu, Mitsui Mining & Smelting Company Limited; Fumihiro Nishiyama, Mitsui Mining & Smelting Company Limited; Yusuke Sakata, Kumamoto University; Masayasu Kawahara, Kumamoto University;
The source of high-quality zinc ore is decreasing, and thus zinc hydrometallurgy is increasingly dependent on zinc ores that contain more impurities. One of the impurities is silica, which leads to the production of zinc silicate (Zn2SiO4) in the roasting process. Silica is easily leached from Zn2SiO4 and saturates the solution. As a result, silica polymerizes and turns to a gel, which makes the solid-liquid separation of impurities from zinc solution difficult. The purpose of this study is to examine the effects of temperature, pH and the presence of inorganic impurities and silica seed on the precipitation of silica.

Paper Start Time: 14:25
Paper No.: 5252
Paper Title: **Pressure Acid Leaching of Zinc Silicate Ore**
Hongsheng Xu; Kunming University of Science and Technology; Minting Li, Kunming University of Science and Technology; Cunxiong Li, Kunming University of Science and Technology; Chang Wei, Kunming University of Science and Technology; Gang Fan, Kunming University of Science and Technology; Zhigan Deng, Kunming University of Science and Technology;
In the paper zinc silicate ore is treated by the method of pressure leaching in sulphuric acid medium, by which zinc selectively and rapidly extracted into solution, and rejected silica and iron from its minerals. The optimum conditions for higher zinc extraction, and lower dissolution of iron and silica were investigated by considering variables of particle size, sulphuric acid concentration, leaching temperature, leaching time and solid to liquid ratio. The results indicated that under the optimum conditions employed above 97% of zinc extraction, and 6% of iron and 10% of silica dissolution were achieved.

Paper Start Time: 14:50
Paper No.: 5277
Paper Title: **Minimization of Heavy Metal Solubility Behavior of Filter Cake in IZMDC Plants**
Behzad Sedaghat; RECo; Davood Moradkhani, RECo; Ali Rashtchi, RECo; Ahmad Khodadadi, TMU;
This study presents the results from simple, high recovery and low costs methods for minimization of heavy metal (Zn, Ni, Cd and Mn) solubility of filter cake in ZPRs. The column leaching test was employed for the simulation of process. Two kinds of tests were performed: compaction and CaO addition for isolation. The compacting ratios were 1, 0.875 and 0.775, respectively. The thicknesses of the lime were 0, 1 and 2 cm, respectively in 30 days test times. Best condition for decreasing of heavy metal solubility was achieved in compacting ratio of 0.775 and CaO addition of 1cm.

15:35
Room: Regency A (Conv-3rd Floor)
Stream: LEAD-ZINC
Session: Zinc Electrowinning III (WEDPM2)

Paper Start Time: 15:35
Paper No.: 5017
Paper Title: **Characterization of Industrially Deposited Zinc: An Investigation of the Sticky and Non-sticky Nature of Deposits**
Edouard Asselin; University of British Columbia; Debasis Dhak, University of British Columbia; Akram Alfantazi,University of British Columbia; Mandy Chen, University of British Columbia;
Sticky zinc deposits represent a serious operational problem in electrowinning cell houses and can result in a slowdown in production as well as the wastage of both the underlying cathode (normally high purity aluminum) as well as the deposited zinc. To understand this

phenomenon, a thorough characterization (physical and chemical) of sticky and non-sticky industrial zinc deposits is undertaken in this work. Industrially deposited zinc supplied by Kidd Creek was analyzed. The samples (8 samples of each type) were chosen from both sticky and non sticky portions of the deposits. X-ray diffraction, optical microscopy, scanning electron microscopy, elemental analysis by inductively coupled plasma emission spectroscopy and micro-hardness studies were performed on the samples. The X-ray diffraction study showed that most of the sticky samples have the preferred orientation of (002) (100) (102) (103) (110) (004) (112) (200) (201) (104) while (002) (100) (200) planes are absent in most of the non sticky samples. Clearly the sticky samples showed a tendency toward horizontal deposition with respect to the cathode surface because of the preferred (002) (100) (200) plane deposition. In non sticky samples the preferred orientation showed more angular or perpendicular deposition with respect to the cathode surface. Micro-structural studies showed that most of the non-sticky samples showed prominent micro grains oriented in certain directions, mostly vertically, which is clearly reflected in the XRD study, while for sticky samples the micrographs showed no clear pattern of grain orientation. The micro-hardness behaviors of the cross section of the deposits were found to be quite distinguishable between sticky and non sticky deposits. The elemental analysis indicated that antimony and fluoride may play a major role in the sticky/non-sticky behavior of the deposits.

Paper Start Time: 16:00
Paper No.: 5441
Paper Title: ***Prediction Models of Current Efficiency and Cathodic Overpotential for the Zinc Electrodeposition Process***
Sergio Castro; Industrial Minera Mexico; Roel Cruz, Instituto de metalurgia-Universidad Autónoma de San Luis Potosí; Jacinto Bolanos, Industrial Minera México SA de CV; Lucia Alvarado, Instituto de metalurgia-Universidad Autónoma de San Luis Potosí; Berencie Ramos, Instituto de metalurgia-Universidad Autónoma de San Luis Potosí; Raul Gonzalez, Facultad de Ciencias Químicas-Universidad Autónoma de San Luis Potosí; Rene Lara, Instituto de metalurgia-Universidad Autónoma de San Luis Potosí;
Laboratory tests were carried out to develop prediction models of current efficiency and cathodic overpotential for the zinc electrodeposition process. Nine variables of electrolyte composition and 3 levels of their concentration were analyzed on the basis of an experimental design of surface response. For the cathodic overpotential, individual effects where obtained for zinc, arabic gum and arsenic+antimony. Besides, binary effects were obtained for zinc-acid and iron-ammonia. For current efficiency, SrCO3, cobalt and arsenic + antimony have the most important effect, while manganese-ammonia exhibits the only binary effect. The results of the application of prediction models at pilot plant level are also presented.

Paper Start Time: 16:25
Paper No.: 5010
Paper Title: **Effect of Current Density on Zinc Electrowinning from Sulfate Solution Containing Nickel Impurity**
David Dreisinger; University of British Columbia; Bruce Downing, Magpower Systems; Huajun Guo, Central South University, China; Jianming Lu, University of British Columbia;
The effect of current density on zinc electrowinning from sulfate solution containing nickel impurity has been investigated. The mini-cell method was applied to the study of zinc electrowinning under various conditions. With increasing current density from 450 to 750 A/m2, the average induction time for zinc re-dissolution decreased from 47.19 to 28.65 hours, while the average zinc mass prior to the onset of re-dissolution increased from 2.693 to 3.619g, and the average current efficiency (in the electrowinning with a electricity quantity of 3888C) decreased from 93.74 to 92.93%, Compared with the average cell voltage at 450A/m2, those at 550, 650 and 750 A/m2 increased by 2.09%, 2.81% and 5.52%, respectively. The current density in the range of 450-750 A/m2 made little difference on cathodic polarization.

Paper Start Time: 16:50
Paper No.: 5288
Paper Title: **Zinc Electrolyte Cooling**
Immanuel Peter; Hindustan Zinc Ltd.; Rajendra Kumar Singhvi, HZL, Vedanta;
Zinc is mainly produced through the Roast-Leach-Electrowinning route. In the hydro metallurgical Zinc plants, reducing the raised temperature of the warm Zinc-sulfate solution of the electrowinning process, removal of acid-mist environment prevailing inside the tank house & the water balance by evaporation losses is possible only by the counter-current forced draft cooling towers. The biggest concern of this conventional cooling towers is its frequent shut down for maintenance. Its high time to develop a tower in which the maintenance of demisters, spray nozzles and even the removal of cakes/sludge are possible while the cooling tower is under operation.

Paper Start Time: 17:15
Paper No.: 5171
Paper Title: **Comments on the Process of Electro-winning of Zinc in the Mining Industries**
Mahmoud/R. Reda; CanadElecrochim;
According to Faraday law, during electro-winning of zinc the total cathodic current (due to zinc deposition and parasitic hydrogen evolution) must be equal the total anodic current due to (oxygen evolution and lead corrosion). The rate of parasitic hydrogen evolution can be decreased by doping the aluminum cathode with various metals or oxides that exhibit high hydrogen overvoltage such as

mercury or arsenic oxides and others. The efficiency can be increased by decreasing oxygen overvoltage of Pb/Ag anode and decreasing lead corrosion (due to gas evolution) using suitable nano sized catalyst.