

RECYCLING METALS FROM INDUSTRIAL WASTE

A Short Course and Workshop
with Emphasis on Plant Practice

June 24-26, 2014
Golden, Colorado



Sponsored by the Colorado School of Mines
Office of Special Programs and Continuing Education
Course Organizer: Paul B. Queneau - Adjunct Professor

June 24-26, 2014

RECYCLING
METALS FROM
INDUSTRIAL
WASTE



Office of Special Programs and
Continuing Education (SPACE)
Colorado School of Mines
1500 Illinois Street
Golden, CO 80401

ADDRESS SERVICE REQUESTED

Non-Profit Org.
U.S. Postage
PAID
Lone Oak
Mailing Services

COURSE PURPOSE AND SCOPE

This program focuses on current plant practices to convert metal-containing wastes to products. Processors, raw materials, and markets are identified and quantified. Speakers with decades of hands-on experience detail multiple approaches to recycling metals and associated materials - backed up by slides, videos, and the syllabus.

Particular emphasis is given to combinations of physical, hydrometallurgical, and pyrometallurgical processing, along with associated regulations, to facilitate economical recycling. The presentations are on a practical level, focusing on plant operations, with ample opportunity for interaction by the course participants.

PROGRAM OUTLINE AND SCHEDULE

Tuesday Morning, June 24

7:45 **Registration**

8:30 ***Recycling Copper***

Andreas Nolte, Head of Quality and Energy Management, Aurubis AG, Luenen, Germany

9:30 **Break**

9:45 ***Advances in the High-Speed, Automated, Opto-Electronic Sortation of Materials***

Jeffrey Webster, Manager of Spectramet® Technologies, wTe Corporation, Bedford, MA

10:15 ***Production of High-Purity Zinc Oxide***

Peter Robinson, Consultant, Integrated Resource Management, Fergus, Ontario

10:45 **Break**

11:00 ***Recycling at Tin Technology and Refining***

Ara Aposhian, General Manager, Tin Technology and Refining, Westchester, PA

11:30 **Networking Time, Followed by Lunch**
Colorado School of Mines Green Center

Tuesday Afternoon, June 24

1:00 ***ArcFume - Flexibility in Your Metallurgy***

Bror Magnus Heegaard, Managing Director, ScanArc Plasma Technologies AB, Hofors, Sweden

1:30 ***Basics of Induction Melting***

Chuck Gerszewski, Product Sales Manager - Melting, Pillar Induction, Brookfield, WI

2:00 **Break**

2:15 ***Tackling Some "Kobayashi Maru's" in Recycling***

Dennis B. Rodal, Director - R & D, ELG Haniel Metals, McKeesport, PA

2:45 ***Aluminum Recycling***

Anne Kvithyld, Sr. Research Scientist, SINTEF, Trondheim, Norway

3:15 **Break**

3:30 ***Center for Resource Recovery and Recycling (CR3)***

Brajendra Mishra, Professor at Colorado School of Mines, and Associate Director of CR3, Golden, CO

4:00 **Social at the Colorado School of Mines**
Coolbaugh Hall Atrium

Wednesday Morning, June 25

8:30 ***The Good, the Bad and the Ugly - Metallurgical Project Experiences and the Lessons to be Learned***

Michael King, Retired from Xstrata Nickel - Director of Metallurgical Technology; Saltire Services, Salt Lake City, UT

Sam Marcuson, Retired from Vale - VP Base Metals Technology Development; Marcuson & Associates, Mississauga, Ontario

9:30 **Break**

9:45 ***AMG Vanadium's New Multi-Hearth Roaster: Commissioning***

Dave Lewis, Director of Engineering, AMG Vanadium, Cambridge, OH

10:15 ***Treatment and Recycling of Mercury Waste***

Miriam Ortheil, Engineer, DELA GmbH, Dorsten, Germany

10:45 **Break**

11:00 ***Molybdenum Recovery from Coal Liquefaction Ash Residue***

Rahul Bhaduri, Consulting Engineer - Metals Advisor, Chevron Energy Technology, Richmond, CA

11:30 **Networking Time, Followed by Lunch**
Colorado School of Mines Green Center

PROGRAM OUTLINE & SCHEDULE

Wednesday Afternoon, June 25

- 1:00** *A Novel Approach to Recycling Metal-Bearing Fines*
David Droppert, Metallurgical Engineer,
Solumet Metal & Powder Inc., Montreal, QC, Canada
- 1:30** *Responsible and Sustainable Precious Metals Recycling & Refining*
Joe Peixoto, General Manager, Gannon & Scott,
Cranston, RI
- 2:00** **Break**
- 2:15** *Today's Electrolytic Cells*
Roger Neuscheler, Director of Engineering,
Silver Anvil Engineering, Lone Tree, CO
- 2:45** *Processing Developments: RCM's Miller Chlorination Salt Slag*
Vicken Aprahamian, Senior Process Engineer,
Royal Canadian Mint, Ottawa, Ontario
- 3:15** **Break**
- 3:30** *Our Changing World in China: Approach to Material Specification and Separation Technology*
Biagio Adragna, CEO, Tegro Group, Hong Kong, China
- 4:00** *Social at the Colorado School of Mines Geology Museum*

Thursday Morning, June 26

- 8:30** *How Ion Exchange Resins Can Add Value to Solvent Extraction Circuits*
Stefan Neufeind, Technical Marketing Manager -
Mining Applications, LANXESS Deutschland
GmbH, Cologne, Germany
- 9:00** *New Materials Create New Opportunities for Recycling*
Shane Thompson, Director and Materials Analyst,
RediMet, Aurora, OH
- 9:30** **Break**
- 9:45** *Material Flow - Necessary and Dangerous for Accurate Sampling*
Bob Jacobsen, Vice President, Sabin Metal,
Scottsville, NY
- 10:15** *Recycling of V/Ni/Mo from Industrial Residues*
Marcel Ambrusch, Purchasing Manager Secondary
Raw Materials, Treibacher Industrie, Althofen, Austria
- 10:45** *Recycling and Recycling Development at Umicore*
Maarten Quix, Recycling Development Manager,
Umicore, Hoboken, Belgium
- 11:30** **Adjourn**

REPRESENTATIVE LIST OF PAST ATTENDEES

5N Plus ♦ Agmet ♦ Air Products ♦ Aleris ♦ Alpha
AMG Vanadium ♦ Apex Materials Technologies
Atlantic Metals & Alloys ♦ Auburn Group ♦ Aurubis AG
Ausmelt ♦ Batrec ♦ Belfesa Steel ♦ BioteQ ♦ Blue Line
Boliden ♦ Brunswick Smelting ♦ Cal-Chem Metals
Catalytic Innovations ♦ CC Consulting
CDL Heavy Metal Recycling ♦ CDTECH ♦ Chevron
Christian Doppler Lab ♦ Colonial Metals ♦ Colt Refining
CONECSUS ♦ CRI Metal Products ♦ CSM/Kroll Institute
CUPROSA ♦ DELA GmbH ♦ Delft University ♦ DH Catalyst
Doe Run ♦ Dow International ♦ Drinkard R&D ♦ Eastern Alloys
ECS Refining ♦ E.I. DuPont ♦ Electrometals
ELG Haniel Metals ♦ Engitec Technologies
EQ Metals Recovery ♦ Erachem Comilog ♦ Exotech
Franklin Pierce University ♦ Freeport MacMoRan
Gannon & Scott ♦ Garrison Minerals
Gary J. Davis & Associates ♦ Genesis Recycling Technologies
GF Industries ♦ GFE Metalle und Materialien ♦ Global Steel Dust
Greenville Metals ♦ Gulf Chemical & Met. ♦ Hansen Consultants
Harsco Metals ♦ Hazen Research ♦ H.C. Starck GmbH
Heraeus Metal Processing ♦ Heritage Environmental
Huron Valley Steel ♦ Hussey Copper ♦ Hydrometal ♦ IBM
Industrial Mondelo ♦ INMETCO ♦ Intl. Applied Technologies
Jean Goldschmidt Intl. ♦ Johnson Matthey ♦ Kemiron
KGHM Ecoren ♦ Kinsbursky Brothers ♦ Langeloth Metallurgical
Lanxess Sybron ♦ Liberty Metals & Mining ♦ LithChem Energy
Lyntek ♦ Masterloy Products ♦ Metallo-Chimique
M&M Metals ♦ Metals Solutions ♦ Metal Tech ♦ Micronutrients
MK Reverse Logistics ♦ Molycorp Minerals
Morris Equipment Sales ♦ MSE Consulting
Natural Resources Canada ♦ Neo Performance Materials
Network Environmental Services ♦ Nickelhuetten Aue ♦ Nutra-Flo
Nulex ♦ Ocean Partners ♦ Olin Brass ♦ OmniSource
Paul Wurth S.A. ♦ Penoles ♦ Philip Services
Phoenix Automotive Cores ♦ PIZO Technologies
P.J. Mackey Technology ♦ P. Kay Metal ♦ PM Recovery
Porocel Industries ♦ Powmet ♦ Praxair ♦ Precision Cast Parts
RSR ♦ RHI AG ♦ Sabin Metal ♦ SGS ♦ Shell
Silver Anvil Engineering ♦ Sims ♦ Sipi Metals ♦ S.M. Stoller
Solumet Metal & Powder ♦ Southeastern Minerals
Stillwater Mining ♦ Sumitomo ♦ Sustainable Management
Teck Metals ♦ Tetra Tech ♦ The Bear Group
Titan Metal Powders ♦ Tonolli Canada ♦ Treibacher Industrie
TRICAT ♦ Umicore ♦ U of Leoben ♦ U of Alabama ♦ U.S. EPA
USGS ♦ U.S. Steel ♦ U.S. Zinc ♦ Vale Inco
Veolia ES Tech Services ♦ Verdant Holdings
Vital Specialty Materials ♦ Wilmington Iron & Metal
Winfield Solutions ♦ WM Mercury Waste ♦ WRC ♦ wTe ♦
Xstrata ♦ Zinc Nacional

COMMENTS FROM PAST PARTICIPANTS

A dense concentration of knowledge and contacts - Excellent time value; not rushed. Setting feels intimate, and presentations and programs are well organized.

B.J. Stephan, Senior Executive VP,
Gulf Chemical & Metallurgical, Freeport, TX

In my opinion, probably the best short course of this kind on earth, allowing the chance to test your knowledge and to generate new ideas.

Patrick Weerts, Commercial Manager, 5N Plus
Belgium SA, Tilly, Belgium

I have attended this short course over ten times, and I am still learning.

Ian Linton, President, Metal Solutions,
Casa Grande, AZ

This course and conference is one of the best I have ever attended. Very practical and informative and great networking.

David Briggs, Managing Director,
Purity Systems, Warriewood, Australia

The strength of the presentations, the technical information, and the cross-section of industries related to metals recycling, is impressive and extremely useful.

Richard Nickerson, President, Cal-Chem Metals,
Phoenix, AZ

It was a great pleasure to join the short course. I have attended many conferences worldwide, and I must say that yours was one of the best.

Grzegorz Bigosinski,
Director of Hydrometallurgy Division,
KGHM Ecoren S.A., Lubin, Poland

I think this is the finest conference anyone in the recycling business can attend. The opportunity to listen to and meet with others in this industry is not available in any other forum.

Cas Koshinski, General Manager - Operations,
INMETCO, Ellwood City, PA

REGISTRATION INFORMATION

■ Cost

The registration fee is \$1445 if registering by April 21, \$1545 after April 21 and by May 19, \$1645 after May 19. Included are the syllabus, continental breakfasts, luncheons, and socials.

■ Cancellations and Attendee Substitution Policy

Any modification, including cancellation, of your registration requires written notice that must be emailed (space@mines.edu) or faxed (303-277-8683) to the SPACE Office. The following information applies:

- ◆ Attendee substitutions may be made without cost penalty at any time up to the date of the start of the event.
- ◆ Cancellations will be accepted if notice of cancellation is received at the SPACE Office at least five (5) working days prior to the date of the start of the event. Registrants who cancel within this period will be charged a \$275 service fee.
- ◆ No refunds will be made to registrants who fail to cancel within the specified cancellation period.

■ Credits

Two Continuing Education units are awarded for this course by the Colorado School of Mines.

■ Location and Attire

Golden and the Colorado School of Mines (CSM) are located at the foot of the Rockies 15 miles west of Denver. The area is steeped in western history. Mountain hiking and biking trails begin in town along Clear Creek and the white-water park. Attire is casual.

■ Accommodations

(available until May 24, if blocks are not full)

Blocks of rooms in Golden are at the Dove Inn (Tel: 303-278-2209; Fax: 303-273-5272), Table Mountain Inn (Tel: 303-277-9898; Fax: 303-271-0298), and the Golden Hotel (Tel: 303-279-0100; Fax: 303-215-1010). The rooms are under the designation "Recycling Short Course." Golden is a popular summer destination, so book your reservation early.

■ Course Content Details

Contact Paul Queneau at The Bear Group: 303-854-2036, fax 303-273-0494, e-mail: pqueneau@mines.edu

■ Registration Information

Contact the Office of Special Programs and Continuing Education at CSM:

phone: 303-279-5563
fax: 303-277-8683
e-mail: space@mines.edu
website: www.csmSPACE.com