TUESDAY, AUGUST 23, 2005, P.M.

SESSION 29: INTERNATIONAL CONFERENCE ON NICKEL AND COBALT

PROCESS TECHNOLOGY II
Sponsor(s): The Non-Ferrous Pyrometallurgy Section, Metallurgical Society of CIM
Room: Walker
Chair(s): J. KAPUSTA, Air Liquide, Canada and
K. ADHAM, Hatch, Canada

PAPER 29.1—14:00
HATCH ELECTRODE COLUMN – "SET IT AND FORGET IT".
M. DARINI, N. VOERMANN, F. MCCAFFREY, S. SOUTHALL and B. EMERY, Hatch, Canada

Electrode Columns are commonly used in electric furnaces to deliver current and regulate furnace power during the smelting process. Hatch has developed an innovative patent-pending system for lowering (slipping) and/or raising (back slipping) the electrodes through an electrode column, without requiring the release of any clamping devices. All clamping forces are applied by springs. Unlike systems employing hydraulically applied clamping forces, (e.g., water bladders) the spring system is failsafe. Its inherent simplicity virtually eliminates the need for maintenance. The Hatch system comprises two axially movable slipping clamps and a stationary power clamp, each of which apply a distributed, radial clamping force to the electrode. The magnitudes of the slipping sleeves' clamping forces and sequencing of their axial movements are selected such that the slipping clamps, in conjunction with the weight of the electrode, provide slipping or back slipping without release of any clamping force.

PAPER 29.2—14:25
AN OVERVIEW OF BIOLOGICAL TREATMENT CONCEPTS FOR NICKEL, COBALT AND SO_2.
G. SCHOUTEN and J. HUISMAN, Paques BV, Netherlands

In this paper an overview will be given of biological applications for the removal of nickel and/or cobalt from liquids as well as the biological removal of SO_2 form (flue) gases. Both biological concepts have proven to be efficient, cost-effective and sustainable. A new development is the combination of gas and liquid treatment in one unit to remove SO_2 from gas and i.e. nickel or cobalt from liquids simultaneously. This new approach combines the characteristics of two systems resulting in unique advantages based on natural biology.

PAPER 29.3—14:50
RECENT DEVELOPMENTS IN COPPER-NICKEL SEPARATION TECHNOLOGIES.
M. XU and P. WELLS, Inco Technical Services Ltd., Canada

In the past decade, there have been many developments in processing of nickel/copper sulfide ores. Improved pentlandite/pyrrhotite flotation selectivity with the use of new reagents, fine regrinding and Redox measurement (control) has led to increased pyrrhotite rejection and thus higher concentrate grades. Flash flotation has increased overall nickel and associated precious group metal recoveries. Recovery of both fine and coarse particles has been improved through an understanding of flotation cell hydrodynamics. The separation of copper from nickel in such ores has seen a similar level of development. From the late 80s to very recently, the use of flotation columns, the use of pyrrhotite depressing reagents and the improved understanding of the complex mineralogy of chalcopyrite, pentlandite and pyrrhotite have considerably increased copper / nickel separation efficiency. Copper concentrate with more than 30% copper and less than 0.5% nickel grade is now obtainable at 80-85% copper recovery from mill feed compared to 70-75% copper recovery with 30% copper and 1% nickel grade only a few years ago. Improved copper / nickel separation in milling operations has the potential to substantially improve the processing of the resulting concentrates and thus the overall return from the extraction of nickel and copper from sulfide ores.

COFFEE BREAK—15:15-15:45

PAPER 29.4—15:45
ELECTROWINNING OF COBALT FROM CHLORIDE SOLUTION – A PILOT PLANT STUDY.
T. ÅKRE, O. DOTTERUD, Falconbridge Nikkelverk A/S, Norway
G. HAARBERG, J. THONSTAD, Norwegian University of Science and Technology, Norway and
S. HAARBERG, Sintef Materials and Chemistry, Norway

An electrowinning pilot plant has been constructed at Falconbridge Nikkelverk A/S, Kristiansand, Norway. The equipment consists of a mixing tank where the electrolyte composition and temperature are controlled, an electrowinning tank equipped with a maximum of five cathodes and six anodes of commercial size and design, and a dechlorination facility. Electrowinning experiments were carried out in this pilot plant on cobalt chloride solution from

the cobalt tankhouse. Key parameters were varied to obtain an improved understanding of the cobalt electrowinning process, focusing on the detrimental deposition of cobaltic hydroxide on dimensionally stable anodes.

PAPER 29.5—16:10
SPLC – A POWER SUPPLY FOR SMELTING FURNACES.
T. GERRITSEN, Hatch, Canada

Electrode control systems regulate power by physically positioning electrodes. Due to the size and weight of the electrodes, this is a slow process where power fluctuations of less than a few seconds are not fully corrected. Nickel laterite AC furnaces operating in high voltage, shielded arc mode typically incur frequent power variations of approximately +/- 20% around the power set point. To provide enhanced power control, Hatch has recently supplied, at commercial scale, a thyristor-switched reactance system called an SPLC. The SPLC incorporates predictive control software to operate furnaces at the maximum transformer rating by reducing the large power swings experienced without the SPLC. The resulting higher average power enables higher production, without increasing transformer or power plant capacity. A 60 MW production version of the SPLC has been commissioned on Falconbridge Dominicana's laterite nickel furnace, yielding excellent results with a 3 to 1 reduction in power fluctuations.

PAPER 29.6—16:35
OPERATIONAL READINESS – A VALUE PROPOSITION.
J. NDLOVU, A. MYEZWA, Anglo Platinum, South Africa
L. NELSON and F. STOBER, Hatch, Canada

The Polokwane Smelter relies on a single 68MW high-intensity six-in-line furnace to smelt a planned 650 000 t/a dry concentrate to produce a platinum group metals (PGM)-bearing matte. As typical of a greenfields project, project development and the project implementation stages of design, engineering, construction and commissioning received considerable attention. Somewhat unusual though, was the role of a dedicated multi-disciplinary operational readiness and operational support team, comprising the owners team and specialists from the furnace designer, HATCH, to effect a safe and rapid ramp-up to the design smelter capacity of 68MW. The challenges encountered in developing an effective partnership will be discussed. The modus operandi and roles of the operational support team within the overall ramp-up objective will be presented. This includes an invaluable coaching and on-the-job training role on metallurgical and engineering aspects of the high-intensity operation. Equally important was the focus on safe operation, protection of the asset and maximizing its utilization in as sustainable manner. Finally achievements of the team will be reviewed to demonstrate the contribution of a strong operational support partnership to a successful furnace ramp-up.