Qualifications in Electrowinning/Electrorefining of Copper – Nickel – Cobalt - Zinc
Scope of Services

- Process and Cathode Quality Auditing
- Material and Heat Balances
- Design Simulations for Verification of Integrated Cell Blocks
- Design of Hardware
- 3D Modelling
- CAPEX Review
- OPEX Review
- Conceptual Designs: New and Upgrades
- Inspection Services
- Commissioning and Start-Up Assistance to Owner
Electrolytic System

- Electrolytic System
  - Hydraulical System
    - Electrolytic Cell
    - Flow Distributor
  - Electrodes
    - Anodes
    - Cathodes
  - Ventilation System
    - Mist Capture
    - Mist Washing
  - Material Handling
  - Electrical System
    - FRP Systems
      - Cranes
      - Siding & Roofing
      - Grating
      - Safety Devices
    - DC Bus
    - Capping Bpards
    - Short Circuit Detection
    - Transformer Rectifiers

Areas of Influence

Design and Supply
Cell Block Concept Design & Supply

- Electrolytic Cells
- Electrodes
- Cell Top Furniture
- DC Busbars and Power Supply
- Accessories
- Integration with other equipments
  - Cranes
  - Ventilation System
  - Shorting Frame
  - Handling Equipment
Electrolytic Cells

- Polymer Concrete
- Corrosion Resistant
- Electrical Isolation
- Integrated Supports
- Integrated Feed System
- Integrated Overflows
- Integrated Guides
- All dimensions needed by the process
- Fully transportable
Lead Anodes

- Rolled Plates
  - Calcium-Tin-Lead
  - Silver-Lead
- Antimonial Lead Full Bar Encapsulation
- Stitch Lead Burning of Plates to Bars
- Fine Grain Structure
- Low Segregation
- No cracks nor Voids
- Perfect Flatness
Anode Accessories

- Minor Airborne Metal Sulphates and Sulphuric Acid in Tankhouses
- Uniform Cathode Quality
- Capture Oxygen Generated
- Customized Design and Fabrication
- Easy Assembly
- Premium Materials
- In-house Material Testing Facilities
- Flexibility For Design
Cathodes

- 316L, Ti, Al Blanks
- Explosion Bonded Process Provides Maximum Bond Strength Between Dissimilar Metals
- Excellent Corrosion Resistance
- Highest Electrical Efficiency
- Full Compliance of Specifications
- World’s Largest Cathode Supplier
Edge - Strips

- Customized Design
- Customized Fabrication
- Premium Materials
- In-house Material Testing Facilities
- Flexibility
Cell Top Furniture

- Customized Designs
- Modular or Full Cell Length
- Accurate Positioning
- Premium Materials
  - High Mechanical Resistance
  - High Electrical Resistance
  - Corrosion Resistant
**Cell Top Furniture**

- Customized Designs
- Modular or Full Cell Length
- Accurate Positioning
- Premium Materials
  - High Mechanical Resistance
  - High Electrical Resistance
  - High Electrical Resistance
  - Corrosion Resistant
Cell Accessories

- Customized Design
- Customized Fabrication
- Premium Materials
- In-house Material Testing Facilities
- Flexibility
DC Busbars

- Complete Design
- Main Feeder Bus Bars from T/R Unit i.e. Positive, Negative and Crossover sections.
- Riser Bus bars
- Apron Bus Bars
- Intercell Bus Bars
- Shorting Switches
- Flexibles
- Maximum output per cross section
- Minimum Electrical losses in connections
Short Circuiting Frames

- Customized Design
- Flexible Contacts
- Maximum Current Carrying Capacity
- Lowest Temperature Increase at Maximum Current Density
- Shortest installation time
- Accurate Positioning
Transformer/Rectifiers

- Single floor fabrication – All in One Shop
- Own Oil Filled Transformers
- Complete Auto-Cad and 3-D Design
- Full Shop Test
- CSA Certified
- UL Listed
Cathode Stripping Machines

- 50 years world leader in custom engineering & fabrication of process materials handling equipment.

- Integrated systems solution provider to Copper, Nickel, Cobalt & Zinc refineries.

- Cathode Stripping Machine:
  - Cathode In-feed Conveyor
  - Cathode Washing System
  - Cathode Transfer System
  - Semi or Automatic Stripping Station
  - Copper Sheet Stacking Station
  - Blank Out-Feed Conveyor
  - Hydraulics Equipment and Electrical Controls
Solvent Extraction Plants

- Modular
- Pilot to Commercial
- Transportable
- Relocatable
- Complete Plant
- Standard Design
- Flexible to tolerate changes in flow and PLS concentration
- Friendly Operation
Areas of Innovations

New or Improved Technologies
Acid Mist Capturing

- Acid Mist Capture at Source
- Contaminants Recovery at Wash Chamber
- Full Compliance of regulations, particularly at Altitude and Sub-Zero applications
- Fully Integrated with mechanical handling
- Friendly to Operators
Bags and Electrodes Frames

- Acid Mist Encapsulation
- Excellent Chemical and Thermal Resistance.
- Excellent Mechanical Wear Resistance.
- Easy Cathode Insertion and Removal.
- Uniform Cathode Quality
- Premium Materials
- In-house Material Testing Facilities
- Flexibility
- Longer Life.
Superior Starting Sheets For Cu EW/ER

- Eliminates use of stripper cells
- Reduced Cathode Harvesting Cycle compared to Blanks with Less Manipulation
- Faster Productivity in Cathode Washing
- Virtual “Cu Blanks”. Stainless Steel or Titanium blanks eliminated
- Potential Pitting in SS Blanks and “Frequent Rebuffing” of cathode surface eliminated.
- Edge Strips not required
- Sheets exceed dimensional quality respect of SS Blanks when hanging.
- Best for Tankhouse Upgrading
EXMAJET – High Current Density in Cu EW

- Current Density Electrowinning > 550 A/m²
- Increased Productivity
- Improved Cathode Quality
- No External Air Needed
- Improved Hydrodynamics
- Control of Bubble Size
Portable Lix/Sx/Ew Plants

- Standard Design
- Modular
- Transportable
- Relocatable
- Flexible Capacities
- Simple
CASE HISTORIES
Nickel Electrowinning
with Ti Blanks
South Africa
Cell Pair Design
Combination and Coordination of Hoods and Hooks
Cathode
Cladding in the full length
Capping Modified
Copper Bars
Cathode Frames and Guides
Nickel Electrowinning with Starting Sheets and SS Blanks
CAPTURE AND RECOVERY OF ACID MIST IN ELECTRO-WINNING
Spence Project
BHP Billiton - Chile

Drip tray in action

Crane testing for hood handling
Pilot Testing on a Nickel Plant

Adaptable solution for existing EW nickel cells
Teamwork for our customers:

<table>
<thead>
<tr>
<th><a href="http://www.metalex.cl">www.metalex.cl</a></th>
<th><a href="http://www.gcorner.co.uk">www.gcorner.co.uk</a></th>
<th><a href="http://www.neeltran.com">www.neeltran.com</a></th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Metalex" /></td>
<td><img src="image2" alt="Corner Systems" /></td>
<td><img src="image3" alt="Neeltran Inc." /></td>
</tr>
<tr>
<td><img src="image4" alt="Consolidated Alloys" /></td>
<td><img src="image5" alt="Limpact" /></td>
<td><img src="image6" alt="Exma" /></td>
</tr>
</tbody>
</table>
Hernando de Aguirre 162 Oficina 806
Santiago – CHILE
Tel: +56(2) 335 2217
Fax: +56 (2) 321 8280
Mobile: +569 94371714
Contact: Alex R. Lillo
Email: alillo@metalex.cl