Co-Matrix™ Filters for Electrolyte Filtration

SpinTek Filtration, Inc.
Delkor South America Ltd.
Organic Recovery
## SpinTek Installations

<table>
<thead>
<tr>
<th>Location</th>
<th>Capacity (m³/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVRD USINA, Brazil</td>
<td>129</td>
</tr>
<tr>
<td>Chelopech, Bulgaria</td>
<td>225</td>
</tr>
<tr>
<td>Gaby, Chile</td>
<td>1,400</td>
</tr>
<tr>
<td>Kansanshi Copper, Zambia</td>
<td>494</td>
</tr>
<tr>
<td>BHP-Billiton (Escondida), Chile</td>
<td>1,700</td>
</tr>
<tr>
<td>Spence, Chile</td>
<td>2,400</td>
</tr>
<tr>
<td>Goro Nickel, New Caledonia</td>
<td>1,750</td>
</tr>
</tbody>
</table>
### SpinTek Installations

<table>
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<tr>
<th>Location</th>
<th>Capacity (m³/hr)</th>
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<tbody>
<tr>
<td>Skorpion Zinc, Nambia</td>
<td>700</td>
</tr>
<tr>
<td>Nkana Leach, Zambia</td>
<td>145</td>
</tr>
<tr>
<td>Mufulira, Zambia</td>
<td>145</td>
</tr>
<tr>
<td>Sable Zinc, Zambia</td>
<td>100</td>
</tr>
<tr>
<td>Gunpowder, Australia</td>
<td>400</td>
</tr>
<tr>
<td>Toquepala, Peru</td>
<td>825</td>
</tr>
</tbody>
</table>
Dual-Media Filters
SX Dual-Media Filter
Gunpowder
CoMatrix Filter
CoMatrix™ Electrolyte Filter
Design Operation – 60m3/hr.m2

![Graph showing Organic Entrainment (ppm) vs. Elapsed Time (hours) for Inlet, After Matrix Plates, and Outlet.](image)
Operation
Filter Service Flow

Aqueous

Packing

Anthracite

Garnet

Service Mode

Filtered Aqueous
Filter Organic Purge

Aqueous → Organic Purge

Organic Purge → Organic Purge

Packing

Anthracite

Garnet
Coalescing Droplets on Matrix Plate Surface
Filter Feed Evacuation

Air

Packing

Anthracite

Garnet

Feed Evacuation

Aqueous Recovery
Filter Water Fill

Water Inlet → Vent

Packing

Anthracite

Garnet

Water Fill Step
Filter Air Scour

Air Outlet

Packing

Anthracite

Garnet

Air Scour Step

Air Inlet
Filter Backwash

Water Inlet

Backwash Step

Garnet

Anthracite

Packing

Backwash Outlet

Water Inlet
Filter Service Flow

Aqueous

Packing

Anthracite

Garnet

Service Mode

Filtered Aqueous
Technical Comments

- Process Design considers 12 hour cycle
- Mechanical Design considers the filters rated at 350 kPa.
- **Operating Costs** for CoMatrix will be lower, value depends on backwash
- Coalescing Plates not considered a consumable. Some extra cost added into Capital Spares (see op cost tables)
Organic Recovery

- To Recover - Entrained Organic solution from the electrolyte prior to Electro-winning
- Entrained Organic defined as droplets of organic solution not miscible in the aqueous portion
- Current technology considers the use of
  - Column Flotation
  - Coalescers
  - SX Dual Media Filters
- This presentation reviews the electrolyte filtration step in the organic recovery process.
Design Concept

- Anthracite bed holding capacity defined in kg organic per m² anthracite bed surface
- Anthracite load bearing capacity defines filter capacity
- Coalescing plates take out part of the organic load
- Less organic load on anthracite bed means
  » Longer cycles without backwash
  » Higher feed rates for the same cycle
  » Higher organic content in feed
Feed Flow of 1800m³/hr

Dual Media – Design Base - 12 m³/hr. m²
- 150m² of Filter Area
- 10 x 4.6m (15’) diameter DM Filters

CoMatrix – Design Base - 60 m³/hr. m²
- 30m² of Filter Area
- 3 x 3.6m (12’) diameter Filters
CoMatrix Benefits

- Smaller Foot Print, less instruments, less valves, piping, controls etc.
- Lower Capital Cost
- Lower Operating Cost
  - Less Filter Media
  - Backwash Water Consumption 6lt per m3 Electrolyte
  - Dual Media Backwash Consumption +- 19lt per m3 Electrolyte
- Can accept higher Organic in Feed Stream – if lower design rates used
Objectives:

- Compare Operation of CoMatrix Design to standard Dual Media Design

Test Runs – Oxide Cu Leach Plant in Chile

- Dual Media ran at design Rate – 12 m³/hr.m²
- CoMatrix ran at:
  - 3 x DM Filtration Rate - 36 m³/hr.m²
  - 4 x DM Filtration Rate - 48 m³/hr.m²
  - 5 x DM Filtration Rate - 60 m³/hr.m²
Industrial Scale Pilot Plant Trials

Measurements
- Operating Time – in service
- Backwash Time – out of service
- Flow Rates
- Pressure drops during in and out of service operations

Pilot Equipment
- 0.05m² CoMatrix Filter x 3mts high + filter media, CoMatrix packs, valves, PLC etc.
Results 3 x DM Filtration Rate

GRAFICO N°1
Contaminación de Orgánico en Electrolito
Filtro: Dual Media y Filtro Comatrix 60% FN

Dual Media

Entrada F. Spintek
Entrada F.
Dual Media
Salida F. Spintek
Salida F. E
Dual Media
Results 4 x DM Filtration Rate

GRAFICO N°2
Contaminación de Orgánico en Electrolito
Filtro Filtro Comatrix 80% FN vs Filtro Comatrix 80% FN

Contaminación de Orgánico (ppm)

Ciclo de Operación

Entrada F. Spirtek Entrad F. : Dual Media
Salida F. Spirtek Dual Media
Salida F. Dual Media

Falls retrolavado en filtro Smith&Loveless
Organic Break Through after 8 hours
CoMatrix Installations
Anglo Base Metals - Skorpion

Raffinate & HCl Solution Filters

Loaded Electrolyte Filters
- 4 x 4.11 m dia CoMatrix
- 480-625 m³/hr flow to each filter – 1880 m³/hr total
- Original project contemplated 8 x 4.72 m Dual Media Filters
- 60 ppm inlet organic, 2 ppm outlet
- Start up – June / July 2006
- Initial problems with services and automated sequence
- Initial Data sketchy. 2 to 3 ppm organic and 1 to 3 ppm inorganics at design flow @ 12 hour cycles
- 6 x 3.81m dia CoMatrix
- 420-470 m³/hr flow to each filter – 2500 m³/hr total
- Original project contemplated 12 x 4.57m Dual Media Filters
- 100 ppm inlet organic, 2 ppm outlet
BHP Billiton
Spence
GRACIAS – THANK YOU