



Smith & Loveless Inc.

Produce Superior Copper With S&L's DI-SEP® SX Filtration System

The **DI-SEP® SX** Filter serves as the final electrolyte cleaning step prior to the electrolyte re-circulation tank (ER) and electrowinning (EW) in copper mining. Marketed by the Industrial Products & Systems Division of Smith & Loveless, the primary objective of **DI-SEP®** filtration is the removal of organic and solids prior to electrowinning after the **SX** process.

The **Solvent Extraction (SX)** process has three main objectives:

- 1) Purification of the copper from unwanted contaminants.
- 2) Concentration of copper values to the point where final copper recovery process is applicable.
- 3) Conversion of the copper to an aqueous matrix compatible with the final copper recovery process.

The largest application of the **DI-SEP® SX** Filter is the extraction of copper from sulfuric acid leach solutions. These solutions result from leaching oxide, mixed oxide/sulfide and certain sulfide ores (low and high grade).

There are five basic leaching methods – dump, heap, insitu, vat and acitation) and a hybrid method (thin-layer leaching). The choice of leaching method is dependent on the grade of ore, the type of mineralization and the location of the ore body.

The most difficult problem in copper **SX** circuits is crud formation. Crud is the most common name given to a solid-stabilized emulsion that tends to gather at the aqueous/organic interface in the settlers. The extent of crud formation depends on constituents of the aqueous feed, most notably solids, colloidal silica and certain species that may precipitate during mixing, and surfactants. All copper **SX** circuits generate crud (also referred to as gunk).

Because the commercial success of copper **SX** is dependent upon the ability to produce a high quality final product and the final copper recovery in the plants, what we are dealing with is electrowinning (EW). Subsequently, a few words about copper EW are essential.

There is no question that good tankhouse practice, coupled with the quality of the pregnant strip solution generated in a typical copper **SX** plant will produce superior quality copper. Features contributing to this are good distribution of electrolyte



With systems in Peru, Chile, Mexico, Austrailia, Canada, and the United States, Smith & Loveless is the industry leader in SX electrolyte filter installations.

Typical Rich Electrolyte Solution Characteristics

The typical rich electrolyte solution characteristics after **SX** operations and prior to **SX** filtration are:

Cu ++ Concentration, Grams/Litre	45 – 55
H ₂ SO ₄ Concentration, Grams/Litre	140 – 150
Specific Gravity	1.17
Approximate Centipoise	1.2

across the cell, an electrolyte free of organientrainment and solids, straight anodes and cathodes, proper temperature, no shorts, cobalt and the use of smoothing agents.

DI-SEP® SX Filters are the final electrolyte cleaning step prior to the electrolyte re-circulation tank (ER) and electrowinning (EW). The primary objective of **SX** filtration is the removal of organics and solids prior to EW.

There are two typical **DI-SEP® SX** Filter effluent solution characteristics.

- 1) At the beginning of the **DI-SEP® SX** Filter cycle, solids removal will be 90% plus, down to the 10 micron size. Shortly into the cycle (15 – 25 percent) the solids removal rate will improve and solids leakage will be virtually undetectable.
- 2) Organic removal will be 100 percent for 100 ppm and below. Organic removal for 100 – 200 ppm can be 100 percent if the **DI-SEP® SX** Filter flow (GPM/sq. ft.) is within specification. Overrunning the filter in these conditions will result in some slippage; however, 98 – 100 percent organic removal can be expected.

Good **SX** practice (not overrunning cycle times, not flowing too fast, keeping in good mechanical order) along with good tankhouse, will work together to produce superior quality copper.



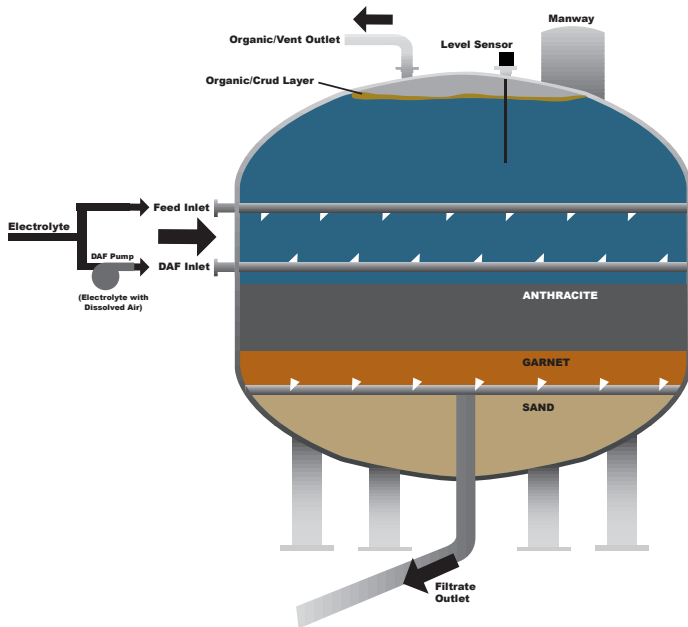
The Smith & Loveless **DI-SEP® SX** Electrolyte Filter removes 95-99% of organic material, which aids in producing extremely high quality copper.

Minimum & Maximum DI-SEP® Data

The following data is presented in ranges covering minimums and maximums, which are an accumulation of Southwestern, USA and Northern Mexico SW-EW plants data utilizing **DI-SEP® SX** Filter:

FE Concentration, Grams/Litre	NIL – 1.50
Co ++ Concentration, PPM	80 – 160
Guartec Dosing, G/T Cu	Approximately 200
CL Concentration, PPM	Approximately 30 & Less
* Organic, PPM	Less than 10 – 150
* Suspended Solids, PPM	10 – 100

* The higher data presented here represents typical upset conditions in SX operations.



Design Benefits

- Superior Filtration Efficiency (Typical 99% organic removal)
- Significantly Increased Throughput (2x-6x)*
- Less Frequent Backwash – Less Downtime and Loss
- Also Retrofits into Existing SX Filters (any brand)
- No Increases to Tank Side Wall Required
- Durable, Robust Design That Will Last
- Available for All Tank Sizes

*Successfully tested up to 6X normal flow