

Testing of CoMatrix™ Tower

for Organic Removal and Filtration of Electrolyte

The filtration and removal of organic from the electrolyte stream is essential for efficient plant operation. SpinTek recognized the need to improve the performance of the organic removal and filtration process prior to electrowinning. Objectives for this new organic removal filter were:

- Reduce capital cost by 60% over conventional SX filters.
- Reduce current backwash consumption by at least half.
- Find a better method for recovering the coalesced organic, in a more concentrated form.

The new CoMatrix™ system design utilizes a matrix plate coalescer, followed by an open tank area, coalescing media, and filtration media.

EQUIPMENT

SpinTek field-tested the new CoMatrix design in a working copper mine to evaluate data in a real world situation. System requirements identified:

- Simple to operate.
- Highly reliable.
- Capable of handling the high flow rates encountered in the solvent extraction industry.



CoMatrix® Escondida – 1880 m³/hr.

Data from prototype tests were used to design the test unit that generated the data presented in this report. The unit is 12" in diameter to provide a square footage of 0.8 feet. The target for the processing flow rate was 25 gpm/sqft, based on earlier field tests, which translated to a 20 gpm flow rate for this particular test unit. The unit is constructed of 316 stainless steel with PVC distributors and piping. Valving on this field test unit is manually operated.

The CoMatrix test unit was equipped with numerous sample ports to monitor system performance. A port for easy removal of captured organic facilitated cleanup and backwashing of the media beds. The unit was free standing and capable of operation on the main electrolyte feed stream—the same as the existing SX filters—without the necessity of any additional pumping.

TEST OBJECTIVES

- Verify that system design dramatically lowers costs and improves operational efficiency.
- Produce a highly concentrated organic for recovery and reuse in the plant creating a viable alternative to current SX design.
- Reduce backwash to promote water conservation and more online time for the coalescing/filtration system.
- Determine both the operation of the new system on normally operating electrolyte streams of 30-40 ppm organic and also 800 ppm organic levels that could be experienced during plant upsets.

TEST

The test was performed at a solvent extraction plant that operates a number of SX filters and provides an excellent model of a well-run plant with normally low organic levels in the electrolyte.

SpinTek installed a 12" diameter stainless steel CoMatrix unit parallel with the existing SX filters. The stream was taken at the same pressure as that fed to the existing filters. The effluent from the CoMatrix was then sent back to the feed tank since this was a test unit. As with an SX filter, a production CoMatrix would send the effluent to electrowinning without the need for additional pumping.

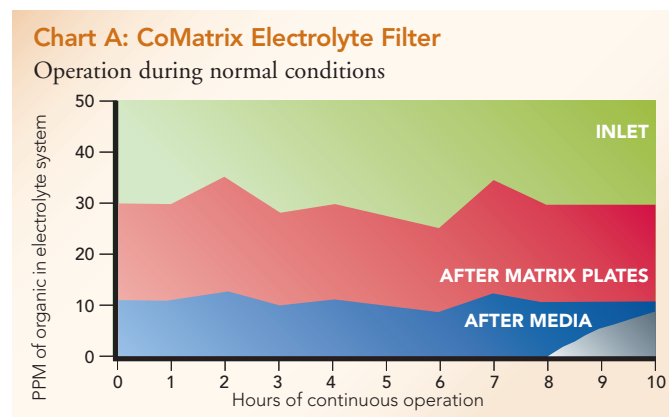
The CoMatrix was continuously operated at 25 gpm per square foot—five times the normal flow rate of existing SX filters. The effluent organic level was monitored as it entered the unit, after the matrix plate section and after the media beds. This test was to determine the length of run that could be obtained on a CoMatrix filter operated with 30ppm of organic in the electrolyte stream.

After testing was completed on the 30 ppm organic level, the unit was moved to a settler effluent in order to obtain a feed stream of electrolyte that was significantly higher in organic. The feed stream from this location averaged 800 ppm organic. The stream was used to simulate the operation of the CoMatrix filter during a plant upset.

Testing of CoMatrix™ Tower

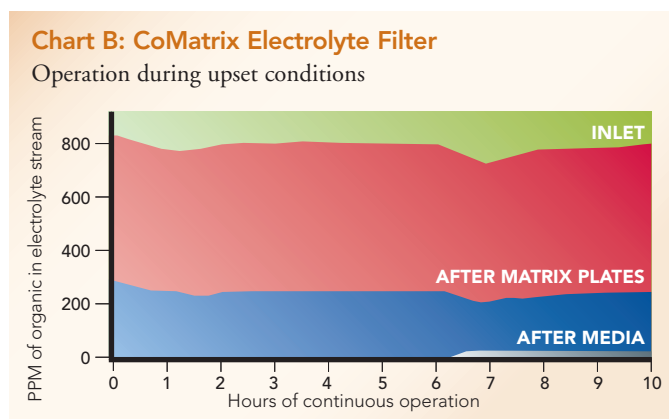
RESULTS

The CoMatrix consistently removed 60-75% of total organic. (Chart A). This translated to a reduction of the feed organic level of 30 ppm down to a level of 10 ppm prior to the media bed.



The media beds lowered the organic level to a low level. The run length before breakthrough of organic, signaling media backwash, averaged 8 hours—a 33% reduction in run length compared to an SX filter. The actual throughput between backwashes was increased by 330% with the same effluent quality.

At a feed concentration of 800 ppm, the CoMatrix removed from between 60-75% of the organic prior to the media beds (chart B). The media beds coalesced the remaining organic to a low level. Run length decreased from the previous low organic runs of 8 hours down to 6 hours before backwashing was required.



During runs on both low and high organic electrolyte streams, it was possible to obtain coalesced organic at the top of the system which could be easily discharged from the system for recovery.

A complete drain down and backwashing cycle was performed at the completion of a run and the system returned to service.

SUMMARY

CoMatrix systems can operate five times faster than most existing SX filters delivering overall savings of 65% in capital and shipping costs.

The reduction of backwash water by 70% leads to significant water conservation, more easily recovered organic and less off-line time for the filters.

Demonstrated that the system can handle normal and high organic loads. The CoMatrix normal run length of eight hours was only reduced to six hours when the feed organic loading was raised from 30 ppm to 800 ppm.

The vastly improved coalescing ability of the CoMatrix also includes the proper media to filter the electrolyte stream down to 10 micron.

SECTION A

Example of CoMatrix backwashing efficiency

A normal electrolyte stream of 2,800 gpm would typically use five 12' diameter SX filters. Based on a 30-40 ppm influent to the SX filters, backwashing could occur every 12 hours.

A single CoMatrix system would be used for the 2,800 gpm flow and requires backwashing every 8 hours.

The backwashing of the CoMatrix takes the same amount of time and backwash water as a conventional SX filter.

SX Filters Backwash Cycle

$$5 \text{ SX filters} \times 2 \text{ backwashes/day} = 10 \text{ backwashes/day}$$

$$10 \text{ backwashes/day} \times 10 \text{ min} \times 1,130 \text{ gpm BW flow} = 113,000 \text{ gpd}$$

CoMatrix Backwash Cycle

$$1 \text{ CoMatrix filter} \times 3 \text{ backwashes/day} = 3 \text{ backwashes/day}$$

$$3 \text{ backwashes/day} \times 10 \text{ min} \times 1,130 \text{ gpm BW flow} = 33,900 \text{ gpd}$$

Over a one-year period of time this difference is 41.2 million gallons for the SX filters and 12.4 million gallons for the CoMatrix or a water savings of 70%.

Also, since the CoMatrix filter recovers approximately 2/3 of the organic in a concentrated stream, less recovery time is lost for the retrieval of the organic.