

LIGHTNIN EXTRACTION *news*

A Newsletter for Solvent Extraction Engineers

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Worldwide Opportunities Await Solvent Extraction Innovators



Mike Giralico

LIGHTNIN Solvent Extraction Team members Mike Giralico and Dr. Tom Post attended the Randol '95 Mining Conference, October 2-4 in Vancouver, Canada. Following is Mike's report.

Being responsible for LIGHTNIN's international mining sales, I was excited to see the enthusiasm and optimism shown for the future of worldwide mining in general and copper mining in particular.

Throughout the conferences, there were repeated references to worldwide gold and copper deposits ripe for mining and processing—most of which are in what were called Third World countries.

It seems that the companies and individuals that embrace new, efficient solvent extraction technologies that reduce entrainment losses will be the ones who continue to grow in this developing marketplace.

New Generation Designs

To demonstrate this, Tom Post and I gave a paper explaining the advantages of our energy-efficient Solvent Extraction System featuring the R-320 pumper impeller. We stressed why it is important that mine owners, engineering companies, chemical suppliers, and LIGHTNIN work as productivity partners to develop the optimum "new-generation" design of conventional mixer settler systems.

The basic objectives of this new design are to maximize mass transfer, reduce or eliminate entrainment losses to maximize profits, and help the environment. Not to use available leading edge technology is a disservice to our customers and investors.

Ahead of the Pack

I am proud to report that LIGHTNIN is well ahead of the pack in doing our part. LIGHTNIN's new technology and our understanding for the process puts us in a unique

position of being a consulting engineer and an equipment supplier. In other words, we sell mixing first and mixers second. Our designs limit recirculation, are energy efficient, and produce optimum droplet distributions to reduce or eliminate entrainment. Another important design feature is our new system can be used in conventional mixer settler designs that will be used many times in the future throughout the world. This also gives our customers an easy retrofit option to improve existing systems.



Jim Simmons checks the hub alignment and fit of an R320 impeller before shipment.

Auxiliary Mixers: Underestimated But Critical Component of Solvent Extraction Systems

While pumper impellers reap the glory in a solvent extraction plant, you shouldn't ignore the significance of auxiliary impellers. Here's why: fluids are being contacted longer by auxiliaries than by pumpers, and the added stages increase the mass transfer efficiency of copper if the auxiliaries are optimized for their best performance.

The problem? Inefficient auxiliary designs work against the system, so many operators simply turn them off.

The main reason we see for turning off auxiliary units is because older SX plants impart too much energy to the auxiliary tank, causing unnecessary turbulence, kinetic energy, and air entrainment.

When higher energy levels are used to inhibit phase separation, the extra energy is transferred into kinetic turbulent energy. Droplet size is decreased, drop size distribution is widened and the extra fines increase entrainment losses and operating costs. So, if you turn off the auxiliaries and notice decreased entrainment losses, you'll assume that the auxiliaries were not only unnecessary, you'll think you have proof that they were detrimental.

But by turning auxiliaries off, you'll only increase the size of the settlers indirectly, and lose copper transfer efficiency.

The extra energy churns up the surface motion, causing surface air induction behind the baffles, in the corners, and through direct impeller vortexing. This creates foam that increases entrainment losses and causes crud that will need to be removed and reclaimed.

Another reason auxiliaries are turned off is because many pumpers have low hydraulic efficiencies (see past issues of Solvent Extraction News) and are over-designed. They are pumping so much energy in the form of turbulence into the liquid that the droplets are too small, air is being induced, entrainment is high, and the mass transfer is sufficient.

Variable Frequency Drives

A third common reason is that auxiliaries may not have variable frequency drive (VFD) controllers that make the system adjustable.

LIGHTNIN strongly recommends that you install VFD controllers to your A310 or A6000 auxiliary mixers to produce the most copper and minimize entrainment.



A VFD lets you decrease the speed to the lowest level without phase separation. Without a VFD, excess energy is creating more fines and increasing the separation times without a VFD, an operator may be tempted to turn the auxiliary off, but this will reduce copper transfer efficiency. You'll need to choose which works best. A correctly designed system with a VFD will optimize conditions.

Costs for a suitable VFD should not be a limiting factor. The added benefit of having more copper and less organic entrainment should more than outweigh its cost. After all, *LIGHTNIN*'s auxiliaries only consume about one-tenth of the energy that pumpers do.

Another example of the value of VFD's is phase continuity. Because an organic continuum takes twice as long as an

LIGHTNIN Solvent Extraction Team member Mike Giralico's list of countries with excellent mining opportunities for the next decade:

AFRICA

East Africa
Ethiopia
Ghana
Ivory Coast
Mali
Mauritania
Suriname
Tanzania
West Africa
Zaire
Zambia
Zimbabwe



AMERICAS

Argentina
Bolivia
Brazil
Canada
Chile
Ecuador
Guiana
Mexico
Panama
Peru
United States
Venezuela



ASIA

Australia
East Kalimantan
Greece
Halmahera
India
Indonesia
Mongolia
Myanmar
Papua New Guinea
Philippines
Thailand
Vietnam



stems

aqueous continuum to separate, much less energy is required in those auxiliaries. Not much can be done to the pumpers, because they were designed to produce head and flow, so fine-tuning must be made with up-pumping auxiliaries.

In some SX-plants, even our high-efficiency auxiliaries are turned off, usually because the A310 or A6000 impeller is mounted on the shaft incorrectly. For the impeller to work correctly, it must generate flow toward the liquid surface in an up-pumping mode. This means that the impeller must be turned upside down from its normal operating position, and the motor must be wired to turn counter-clockwise. Simply turning counterclockwise, without changing the direction of the impeller, will result in a low-flow, high-power device. This will also create a backflow on the downcomer and create a higher pressure drop on the system. This condition is worst, when the A310 is pumping downward.

Conclusions

Many factors influence the amount of energy required, such as residence time (flow throughput), temperature, viscosity and phase continuum. *LIGHTNIN's* up-pumping A310 or A6000 impellers can maintain the dispersion created by the pumper at the lowest installed power of all known auxiliary designs. In addition, an A310 or A6000 impeller with a VFD can actually increase the average drop size, which is a great pre-conditioner for settlers.

Using the *LIGHTNIN* pumper and auxiliary system, future SX plants can be built with smaller settlers, which should really start to save costs.

LIGHTNIN's High-efficiency Auxiliaries

The *LIGHTNIN* A310 impeller can produce high internal flow rates at low power levels; internal flows that are four to 14 times the flow rate produced by the pumper. That helps to reduce short-circuiting! That's contacting! That's copper mass transfer!

The A310 impellers maintain the highest internal flow possible of any metal design, ensuring optimum contacting for phase separation.

The A6000 highest-flow, corrosion-resistant composite impeller lets you maintain flow and reduce power 50 to 60 percent, or maintain power and increase flow up to 200% compared with pitched blade turbines.



Guaranteed Results

Working together, you and *LIGHTNIN* determine how mixing can optimize your process. Then we guarantee the results.

LIGHTNIN operates the world's largest mixing labs, in which we can test your actual materials to determine optimal flow, head, power and other factors. Our proprietary computer software predicts performance for your specific process conditions and allows us to select the proper mixing box and impeller configuration.

Once we recommend an impeller, you can study its operation in a mixing vessel during a variety of lab-scale tests. Simultaneously, you see all of the relevant parameters measured. All of this is recorded on video tape for immediate or future analysis.

Fine-tuning Production With VFD Controllers

You'll greatly increase the flexibility of your production by installing variable frequency drive (VFD) controllers.

When Pregnant Leach Solution concentrations drop, you'll need to increase the pumper speed to maintain production at the electro-winning house. This will change the residence times in the system. Generally, an decrease in residence time requires less power from the auxiliaries to inhibit phase separation.

With fixed auxiliary speeds, a decrease in the pumper speed can not be accommodated by the auxiliaries and the phases may separate. On the other hand, increasing the speed on the pumpers decreases the residence times, and less power is needed to keep the coalescence forces in check. At fixed speeds, the excess power can cause air induction too. Being able to vary the auxiliary speed keeps the system fine-tuned, producing the optimum copper production.

Auxiliary VFDs may also be necessary to control process variables not related to impeller design. For example, during winter or in cooler climates, the mixture has a higher viscosity that require longer separation times. Is the size of that settler sufficient? The coalescence rate has decreased, and now less energy from the auxiliaries is needed.

Performance Tip

Reduce the speed on the auxiliary mixers until the onset of phase separation, then set the speed slightly higher. This will ensure that your droplets are seeing the least amount of destructive forces and will greatly reduce fines. The average drop size will actually increase from the pumper box, which is an ideal pre-conditioner to the settler.

How efficient is your solvent extraction system?

If you don't know, you could be wasting money and energy. The solution may be a simple retrofit.

To make the most from your SX plant and decrease operating costs considerably, fax this page to the *LIGHTNIN* Solvent Extraction Team.

Your local *LIGHTNIN* representative will contact you to set up a free assessment of your current system using our exclusive computer model.

Within a week of the assessment, you'll receive a performance analysis of your current system, plus a projection of the improvements you could realize by retrofitting to *LIGHTNIN* Solvent Extraction Mixers.

Yes, I'd like a free assessment of my current Solvent Extraction System. Please have my local *LIGHTNIN* representative contact me.

Name _____

Company _____

Address _____

Phone _____

Fax _____

FAX THIS PAGE TO THE LIGHTNIN SOLVENT EXTRACTION TEAM AT 716-527-1720.

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