

SEPARATIONS SAVVY

ENGINEERED SMARTER. BUILT MODULAR.

Do you remember what LLE means?

When it comes to [Liquid-Liquid Extraction](#) (LLE), much of the basic equilibrium data needed for design, that exists for, say, distillation design, just does not exist. When LLE is being considered we often measure liquid-liquid equilibrium data as a first step at our pilot plant.

When is LLE used?

- Separation is not feasible by distillation
- Breaking of azeotropes
- Energy requirements of distillation are prohibitive
- A complex distillation sequence is required
- The material is heat sensitive
- The solute material is non-volatile

The general rule: If a separation can be made economically by distillation, there is no reason to consider LLE. However, in situations where distillation is not feasible for reasons such as a complex process sequence, high investment or operating costs, heat sensitive materials, or low volatility, LLE is often the best technology to use and we head to our [Houston-based pilot plant](#), often with clients alongside.

As Wendy Parker, Pilot Plant Director, said recently, *“Clients will come to us with a problem first. Our skilled chemical engineers will work out how best to solve it, and then our pilot plant proves it.”* Koch Modular provides a [Process Performance Guarantee](#) and will not build an extraction column without pilot plant testing the separation first.

Furthermore, the pilot plant can visually highlight problematic areas that will affect the equipment design:

Observations

- Can you see emulsification?
- How fast do the two phases separate?
- Is there a rag layer formation?

One of our applications required the extraction of methanol from an organic stream using water as the solvent. The target was to reduce the methanol concentration in the organic phase from 2.5% to less than 0.1% using a specified amount of water (S/F = 0.32, weight basis). The liquid-liquid equilibrium data showed that 5-6 theoretical stages were required. A pilot KARR® Column was set up. Due to the low S/F ratio (low water rate relative to the organic feed rate) the organic phase (light phase) was selected as the continuous phase and thus the interface was controlled at the bottom of the column. Pilot testing showed that higher capacity could easily be achieved with modified plate spacing. The desired raffinate concentration was achieved after several runs in the pilot plant, and then replicated. Based upon these results, a 45” diameter KARR® Column was designed, built and has operated successfully for this process.

Everyone has their favorite extraction columns! For delicate products like bio broths from a fermenter that tend to easily emulsify, the KARR® Column solution is often chosen, because the shear forces are gentler and more uniform across the column internals, which allows delicate biologics to remain intact.

[Click here to learn more about the KARR® Column and other LLE Columns.](#)



K-Quips

What is the purpose of the “fuzz” on the outside of a tennis ball?

- Make the ball easier to hit
- Increase skin-friction drag
- Limit moisture from affecting the ball's core
- All of the above

For the answer, please visit modularprocess.com/separations-savvy

UPCOMING EVENTS

October 29 - November 1
2017 ISPE Annual Meeting & Expo

October 29 - November 3
2017 AIChE Annual Meeting

