

ESep

Energy-Efficient Process for the Production of Fuel Grade Ethanol

Ethanol has received a significant amount of attention in recent years as a pollution reducing additive in motor gasoline. Unfortunately, most ethanol is produced from corn; and its production is energy intensive. Moreover, significant increases in ethanol production from corn can potentially impact the availability of corn for food. For ethanol to be a truly cost-effective alternative fuel, however, there needs to be a more energy-efficient way of producing it from non-conventional sources (cellulosic materials) that don't need to be planted and that can easily be harvested to provide a nearly inexhaustible supply.

This is only part of the challenge, however. The cost of recovering ethanol from fermentation broth must also be reduced. The combination of distillation and molecular sieve drying in the current process of making fuel grade ethanol contributes to much of the energy consumption.

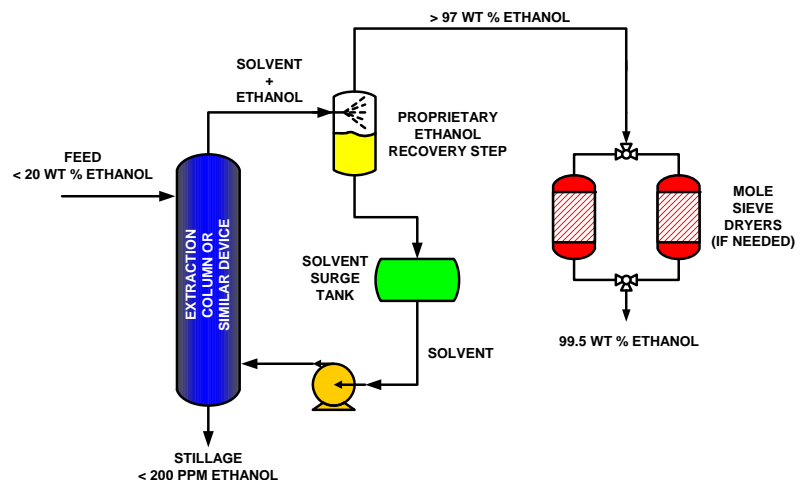
ESep is an extraction novel process that was designed by Trans Ionics Corporation to selectively recover ethanol from dilute fermentation broths without conventional distillation and promises to drastically reduce both capital and operating costs for fuel-grade ethanol production versus the currently used process.

Currently in all ethanol plants, the fermentation product "beer" (nominally 8 – 13 wt% ethanol) is heated, degassed and introduced to a multi-tray distillation column (that uses natural gas for process heat fuel) to produce hydrous alcohol (~95 wt% ethanol), which then is further dried using molecular sieves to produce fuel grade (99.5 wt%) ethanol. As the cost of energy continues to rise, the cost to operate conventional distillation columns rises as well.

A conventional distillation system comprises a multi-stage column having both stripping and rectification sections. Ethanol is enriched upward through the column by the input of heat to the reboiler typically using natural gas as fuel.

Since ethanol and water form a constant boiling mixture at around 95.6 wt% ethanol, 93-94 wt% is the highest purity product stream economically achievable using distillation.

ESep eliminates the traditional distillation system, replacing it with the simpler process shown above. In ESep, a stream from the fermentation tank (or other source) containing dilute ethanol in water is circulated to the ESep extraction unit, where ethanol is selectively separated from water in a proprietary configuration. Ethanol is separated from the extraction solvent in a second proprietary step that produces a product stream that is typically > 97 wt% ethanol. Residual water can be removed from this stream using mole sieves to produce fuel-grade ethanol. Process simulations indicate that the ESep process will save > 50 % of the energy used during distillation and ESep is also expected to be much lower in capital cost since it does not require stainless steel and operates under mild conditions. ESep can be used on both dilute aqueous "beer" streams in new construction or on the overhead from the stripper in retrofit systems.



For more information please contact:

Dr. Robert C. Schucker
Trans Ionics Corporation
2408 Timberloch Place, Suite D-5
The Woodlands, TX 77380
Phone: (281) 296-5585
Email: rcschucker@transionics.com