Ethanol drying with Molecular Sieves
CECA adds value to your process !

Molecular Sieve dehydration units have become a key technology in ethanol processing. The recovery of alcohol with a purity over the azeotropic concentration is now achieved using physical adsorbents, rather than extractive distillation processes, for economical and environmental reasons.

Why Molecular Sieves ?

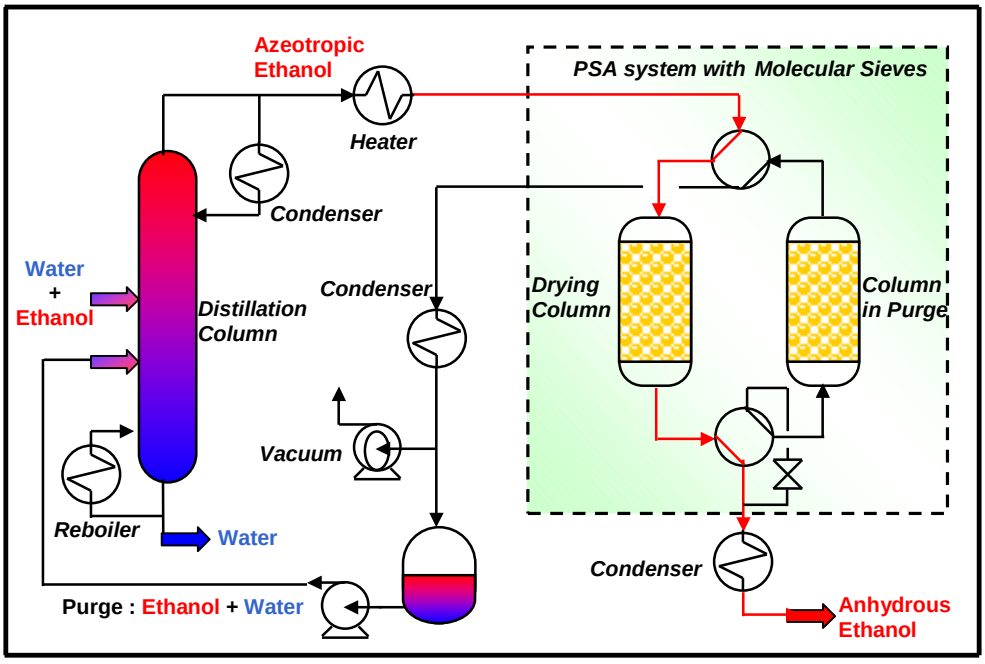
Molecular Sieves are physical adsorbents whose active part are synthetic zeolites. The crystal structure of zeolites traps the small polar molecules into cages, while larger molecules do not have significant interaction.

By selecting a Molecular Sieve with the suitable pore size, it is thus possible to selectively remove water from another stream like ethanol. Final alcohol dehydration is performed with grades having a 3 Angströms (= 3.10^{-10} m) cage opening. With such “3A type” products, the best selectivity water vs. ethanol is achieved.

The Process

The most convenient system is a Pressure Swing Adsorption (PSA) unit in vapour phase, since the typical Molecular Sieves lifetime is much longer than for a Temperature Swing Adsorption (TSA) system. In PSA units, the adsorbent withstands less hydrothermal stress, and the energetic input is also lower.

The azeotropic feed (gas phase ethanol) is at about 92 to 96%v/v (184-192 proof). Depending on the process licensor, adsorption is typically carried out at 1.5-4 bar and 125-160℃ (20-60 psia, 280-345℉). Flow direction i s downwards.



At least two columns filled with Molecular Sieves are necessary to ensure continuous service. The drying step typically lasts a few minutes, after which the column in duty is put offstream to be regenerated, while the feed is sent to the second bed.

Water removal from the adsorbent is carried out under vacuum, typically at 0.1–0.5 bar (1.5-7 psia), with a side stream of anhydrous product. The spent vapour is condensed and recycled upstream, to the distillation column.

The dry ethanol can reach a purity of 99.98% (199.96 proof). Process parameters are adjusted to get a certain water specification for commercial ethanol, while maximizing throughput and minimizing operating costs.

Criteria for the Molecular Sieve choice

Anhydrous ethanol is nowadays mainly used as a biofuel, for direct blending or ETBE manufacturing, but its use is also developed in industrial, food, pharmaceutical and cosmetics applications, with a requirement for high purity grades.

Whatever the end-use and the process license, the target is to improve adsorbent properties. CECA identified and continuously works on some key parameters with their corresponding tests. These include lab simulation of the industrial unit operation.

This sustained control system is the guarantee for excellence and ensures the reliability of Molecular Sieve performances. See our Product Brochure for more details on the unique features of **SILIPORITE ® EPX3B** and **EHP.** Both grades are available for shipment in metal drums or Big Bags.

Lifetime of the beds is typically around 8 years, but can go beyond 12 years depending on the process and feed stock.

Five reasons to choose CECA

1 – Through our experience of more than 20 years in PSA Ethanol units, you directly benefit from the feedback of numerous units (over 8,000 tons installed)

2 – Our products have proved reliability and high performances in all process schemes developed by the main licensors, and with all possible feed stocks

3 – Our Molecular Sieves are manufactured with a full quality commitment: every batch we sell is internally controlled by more than ten analysis

4 – Our R&D facilities are equipped with pilot & analytical tools constantly used for product development or your specific projects – quickly and result-oriented

5 – We deliver not only products but solutions. Our experts provide technical recommendations by hotline or directly onsite, and are at your service before, during and after start-up

For more information contact us at siliporite@ceca.fr or visit www.siliporite.com !