Ethanol Concentration (Production of Absolute Alcohol)

Complete separation of water-ethanol mixtures cannot be achieved by simple rectification because of the formation of an azeotrope.

At 1 bar the azeotrope, which boils at 78.2°C, has a composition of 95.6%w/w ethanol.

The production of absolute alcohol (100°/₀) requires a different technique.

Corning offer a system based on the well-proven method of azeotropic distillation. The addition of a third substance, usually toluene, to the water-ethanol mixture increases the relative volatility of water and ethanol and makes the separation possible. Water, ethanol and toluene form a ternary azeotrope, which boils at approximately 4°C below pure ethanol. This azeotrope forms two phases, one rich in water and ethanol, the other in toluene.

By using two distillation columns, water-ethanol mixtures may be separated to give substantially pure components. Figure 1 shows a basic flow diagram for the process.

The feed stream (1) is mixed (3) with the ternary azeotrope (2) leaving the top of the primary column. The two-phase mixture is then divided in the separator into a light, toluene rich phase (5) and a heavy, ethanolwater phase (4). The ethanol-water phase (4) is fed to the secondary column which produces the ethanolwater azeotrope, with traces of toluene, as tops product (6), and water as the bottoms product (7).

The distillate (6) from the secondary column is then mixed with the toluene phase (5) leaving the separator and is fed to the primary column (8). The primary column produces ternary azeotrope as the tops product (2) and absolute alcohol as the bottoms product (9).

The absolute alcohol has a water content not greater than 0.1 % and toluene levels of 2% or less.

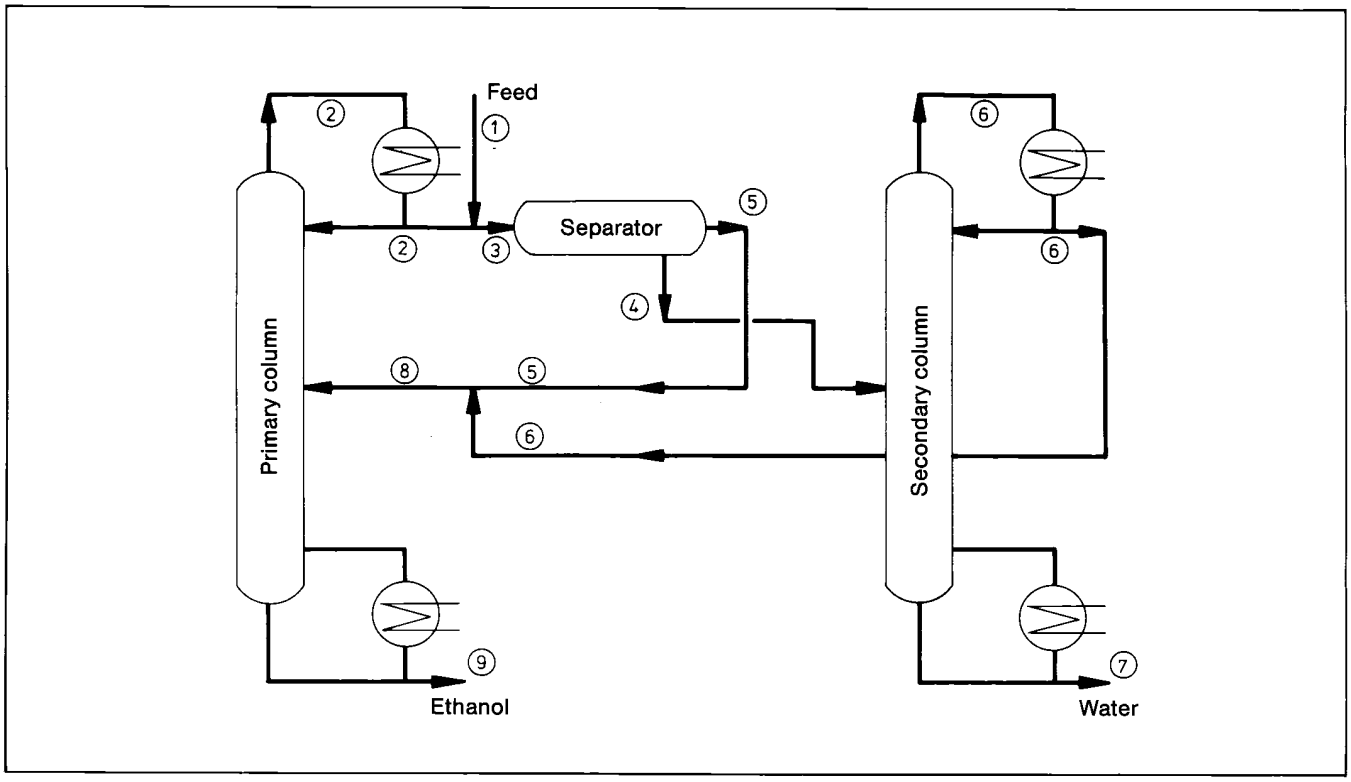

Figure 1

The plant is constructed in borosilicate glass throughout.
A typical plant for the production of 50 kg/hr absolute alcohol, using 25%w/w ethanol as a feedstock, would have a 300mm diameter primary column with an overall height of 25m. The column internals are of the sieve tray type.

QVF is able to optimise this process for other feed compositions and for other alcohol-water systems which form azeotropes.

This Technical Information leaflet supercedes all previous issues.
QVF Process systems pursues a policy of continuous product improvement . we therefore reserve the right to alter any product or process as described and illustrated.

Tollgate Industrial Estate
Stafford ST16 3HS England
Tel +44 1785 609900 Fax +44 1785 609899
E-mail qvf@qvf.co.uk