



AZEOTROPES Versus SOLVENT BLENDS

Some solvents, such as ENTRON CE, are a true binary azeotrope of *n*-propyl bromide and isopropyl alcohol. The following is information about azeotropes, including what they are, and how they are different from “azeotrope-like” mixtures.

An azeotrope is a property of a two or more chemicals. Generally, the two chemicals have boiling points that are in a similar range, for example plus or minus 20 Celsius degrees.

Azeotropes are classified according to their characteristics, including:

- Number of components in the mixture: two is considered a binary azeotrope, three is a ternary azeotrope, four a quaternary, etc. ENTRON CE is a binary azeotrope.
- Minimum-boiling or Maximum-boiling azeotrope: A minimum-boiling azeotrope is where the boiling point of the azeotrope is below the boiling points of the individual components, and likewise, a Maximum-boiling azeotrope, is where the boiling point of the azeotrope is above the boiling points of each of the the components. ENTRON CE is a minimum boiling azeotrope. Its boiling point is 68°C (154°F), and the boiling points of *n*-propyl bromide and isopropyl alcohol are 71°C (160°F) and 82°C (180°F), respectively.

The main advantage of an azeotrope is that it is inseparable by boiling. When an azeotrope is boiled, the vapor generated will have the same composition as the liquid. As a result, an azeotrope is often described to behave as if it were a single compound. **When an azeotrope is used in an application that requires boiling the solvent, such as vapor degreasing, the concentration of the mixture remains constant, and the compositions of the fluids in the boil sump and rinse sump and the vapor are all identical.**

When a two-solvent mixture described as **“azeotrope-like”** is boiled, the boiling point will likely be between the boiling points of the individual components, and the vapor will be rich in the more volatile component with the lower boiling point. When this fluid is used in a two-sump vapor degreaser, the change in composition from liquid to vapor could result in the boil sump and rinse sump having different compositions. Since the fluid in the rinse sump is the condensed vapor, it may be rich in the lower boiling component, and the concentration of the lower boiling component in the boil sump would decrease.

Azeotrope-Like Blends – A Word of Caution:

One should exercise caution when using blends or **azeotrope-like** mixtures of a nonflammable solvent and a flammable solvent in a vapor degreaser. Using the information above, the fluid in the boil sump could have a decreased concentration of the nonflammable solvent in one tank and consequently an increased level of the flammable solvent in the other tank. At some point this mixture may become flammable, either in the boil-sump or the distillate-sump. In either case, the flammable mixture would probably be above the flash point of that solvent (if there is one) and this could present a hazardous situation.

Always use stabilized nonflammable solvents in vapor degreasing equipment, or true azeotropes of solvent mixtures. Avoid any solvent blend that is considered to be “azeotrope-like”, which is a false azeotrope. Contact Rick Perkins for more information. www.chemlogic.us