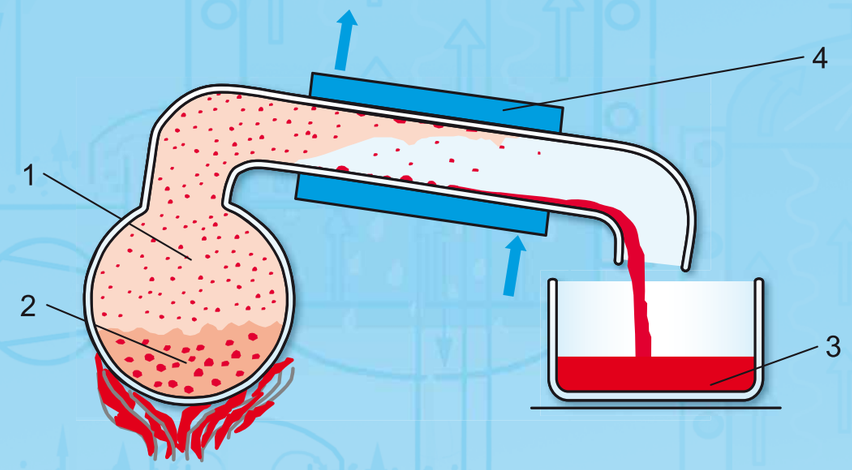
BASIC KNOWLEDGE

DISTILLATION

Distillation is a thermal separation method that can be used to fractionate liquid mixtures. It utilises the different volatility of the components of the mixture to be separated. Volatility refers to the tendency of a substance to pass from the liquid phase into the gas phase. Examples of volatile liquids include acetone, alcohol and petrol.

To achieve separation, the liquid mixture to be fractionated is brought to boiling point. The resulting vapour phase is made up of several components, mainly the more volatile components of the mixture. The vapour phase is separated from the liquid phase and condensed (distillate). The less volatile components predominantly remain in the liquid phase.

Distillation does not result in complete separation of the liquid mixture, but rather its division into two mixtures with different contents of volatile and less volatile components. The separating principle is based on the fact that the content of volatile components is greater in the vapour phase than in the liquid phase.



Principle of distillation:
***1** vapour phase, **2** boiling liquid mixture, **3** distillate, **4** condenser*

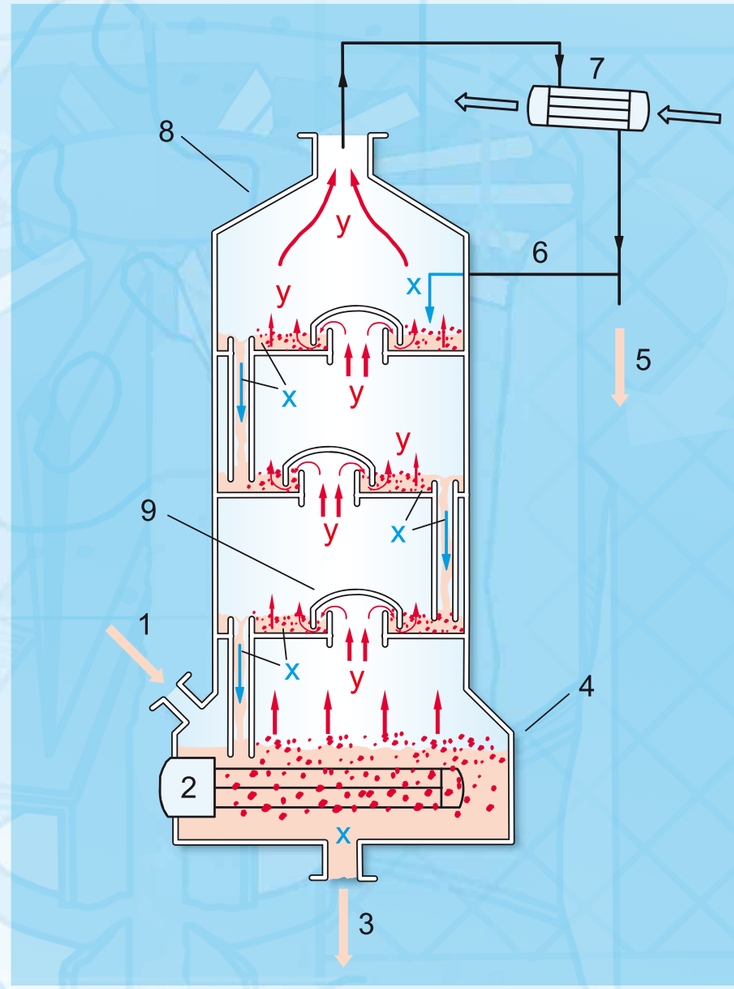
BASIC KNOWLEDGE

RECTIFICATION

Rectification is an application of distillation and its uses include fractionation of crude oil.

If the distillate obtained during distillation is distilled again, a new distillate is obtained with an even higher concentration of volatile components. As the procedure is repeated, the concentration of volatile components in the distillate increases on each occasion.

In practice, this multi-stage distillation process is carried out in the form of countercurrent distillation (rectification) in a column. The liquid mixture to be separated (feed) is fed to the base of the column, where it is brought to boiling point. The vapour produced moves upwards inside the column, exits it at the top and is condensed. Part of the condensate is carried away as top product. The remainder flows back into the column and moves downwards as liquid opposite phase.



Simplified illustration of a rectification column:
***1** feed, **2** base heating, **3** bottom product, **4** base of column, **5** top product, **6** reflux, **7** condenser, **8** top of column, **9** tray (here: bubble tray), **x** liquid phase, **y** vapour phase*

On its way to the top of the column, the mixed vapour created at the base is subjected to an intensive exchange of heat and material with the liquid phase as it passes through the tray or packing in the column. The less volatile components of the vapour phase condense and increase in concentration in the liquid phase. At the same time, the condensation heat released evaporates the more volatile components of the liquid phase. These processes in the column increase the vapour phase concentration of volatile components moving from the base to the top of the column. The liquid phase concentration of less volatile components increases in the opposite direction, from the top of the column to the base.