## Extractive Distillation for Heptane-Toluene Separation

**Contributor**: Ms Yutika Naik

**University**: Sardar Vallabhbhai National Institute of Technology, Surat

**Problem Statement**:

Extractive distillation with phenol as a solvent to separate n-heptane and toluene.

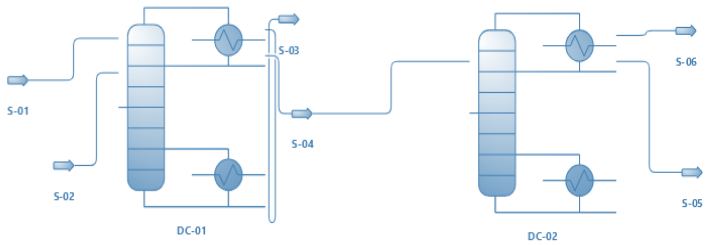
**System of unit:** The system of units taken in this flowsheet is C5, mass-flow rate in Kg/hr, pressure in bar and temperature in degree celcius.

**Background and Description:** When the two components in a binary mixture have very close normal boiling points, their relative volatility is likely to be small if they do not form an azeotrope. For such cases, it may be more efficient to use extractive distillation with a solvent than normal distillation. In extractive distillation, a less volatile solvent is used to increase the relative volatilities of the original mixtures, allowing for easier separation. In this example, phenol is used as the solvent for the separation of n-heptane and toluene.

In this simulation 2 extractive distillation colums have been used with phenol as a solvent. After first distillation,

N-heptane is a major component in top product with mole fraction of 0.581873 and as a bottom product, we get phenol (0.522971) and toluene (0.289009). To recover phenol we add another distillation column for extractive distillation in which we take bottom product of previous column as a feed. After distillation in second column, phenol was recovered as a bottom product.

### Flowsheet:




### Results:

| Object | Feed (S-01) | Solvant (S-02) | Top1 (S-03) | Bottom1 (S-04) | Top2 (S-06) | Bottom2 (S-05) |
|---|---|---|---|---|---|---|
| Pressure(bar) | 1 | 1 | 1 | 1 | 0.01 | 0.01 |
| Temperature(C) | 100.732 | 181 | 112.598 | 109.894 | 49.0504 | 74.83 |
| Mole fraction of n-heptane | 0.5 | 0 | 0.58187691 | 0.1880233 | 0.33639451 | 5.1445699E-14 |
| Mole fraction of toluene | 0.5 | 0 | 0.36116039 | 0.28901122 | 0.51707299 | 3.4062748E-12 |
| Mole fraction of phenol | 0 | 1 | 0.056962696 | 0.52296545 | 0.1465325 | 1 |

**Conclusion:** n-heptane and toluene can be separated in extractive distillation with phenol as a solvent.