Overview

There are 8 condenser types from which the user may select when defining a condenser for an ESP multistage column. These types are:

1. Partial Condenser (default)
2. Total Condenser at the bubble point with fixed distillate rate
3. Total Condenser at the bubble point with fixed reflux rate
4. Total Condenser at the bubble point with fixed reflux ratio
5. Sub-Cooled Total Condenser with Fixed Distillate rate and Temperature
6. Sub-Cooled Total Condenser with Fixed Reflux rate and Temperature
7. Sub-Cooled Total Condenser with Fixed Reflux Ratio and Temperature
8. Decanter – Organic Phase removed, aqueous phase refluxed to column.

Condenser types

Partial Condenser (Default)

This is the default condenser type. A condenser of this type has the distillate as all vapor and the reflux as all liquid. In a two-liquid case, the vapor leaves as the distillate and both liquid phases are refluxed to the column. The user must specify an initial enthalpy via the heat exchanger parameter for this condenser to be properly specified.

Total Condenser at the bubble point with fixed distillate rate

The temperature is adjusted such that the vapor/liquid ratio is at the bubble point temperature. The distillate is all liquid at the specified rate. In the case of two-liquids, both liquids are considered the distillate. The user is required to make an initial estimate of the enthalpy using the heat exchanger parameter for the top stage.

Total Condenser at the bubble point with fixed Reflux rate

The temperature is adjusted such that the vapor/liquid ratio is at the bubble point temperature. The distillate is all liquid but the refluxed liquid is at a specified rate. In the case of two-liquids, both liquids are considered the distillate. The user is required to make an initial estimate of the enthalpy using the heat exchanger parameter for the top stage.

Total Condenser at the bubble point with fixed Reflux ratio

The temperature is adjusted such that the vapor/liquid ratio is at the bubble point temperature. The distillate is all liquid but the ratio of liquid distillate and liquid reflux is at a specified ratio. In the case of two-liquids, both liquids are considered the distillate. The user is required to make an initial estimate of the enthalpy using the heat exchanger parameter for the top stage.

The definition of reflux ratio is

$$Reflux\ Ratio = \frac{Distillate\ Rate\ (moles)}{Reflux\ Rate\ (moles)}$$

Sub-cooled Total Condenser with a fixed distillate rate and temperature

The temperature of this condenser is set below the bubble point temperature. The distillate is all liquid and the enthalpy is adjusted to match the specified distillate rate. In the case of two-liquids, both liquids are considered the distillate. The user is required to make an initial estimate of the enthalpy using the heat exchanger parameter for the top stage.

Sub-cooled Total Condenser with a fixed reflux rate and temperature

The temperature of this condenser is set below the bubble point temperature. The distillate is all liquid and the enthalpy is adjusted to match the specified reflux rate. In the case of two-liquids, both liquids are considered the distillate. The user is required to make an initial estimate of the enthalpy using the heat exchanger parameter for the top stage.

Sub-cooled Total Condenser with a fixed reflux ratio and temperature

The temperature of this condenser is set below the bubble point temperature. The distillate is all liquid and the enthalpy is adjusted to match the specified reflux ratio. In the case of two-liquids, both liquids

are considered the distillate. The user is required to make an initial estimate of the enthalpy using the heat exchanger parameter for the top stage.

Decanter –Organic phase removed, Aqueous phase is refluxed to column

There is no temperature specification for this type of condenser. If the fluid reaching the condenser is two phase (organic and aqueous) then the organic phase is removed and the aqueous phase is refluxed to the column. In the case of two-liquids, the water-rich phase is considered the aqueous phase. The user is required to set enthalpy using the heat exchanger parameter for the top stage.

This condenser type is not valid if there is no water in the simulation.