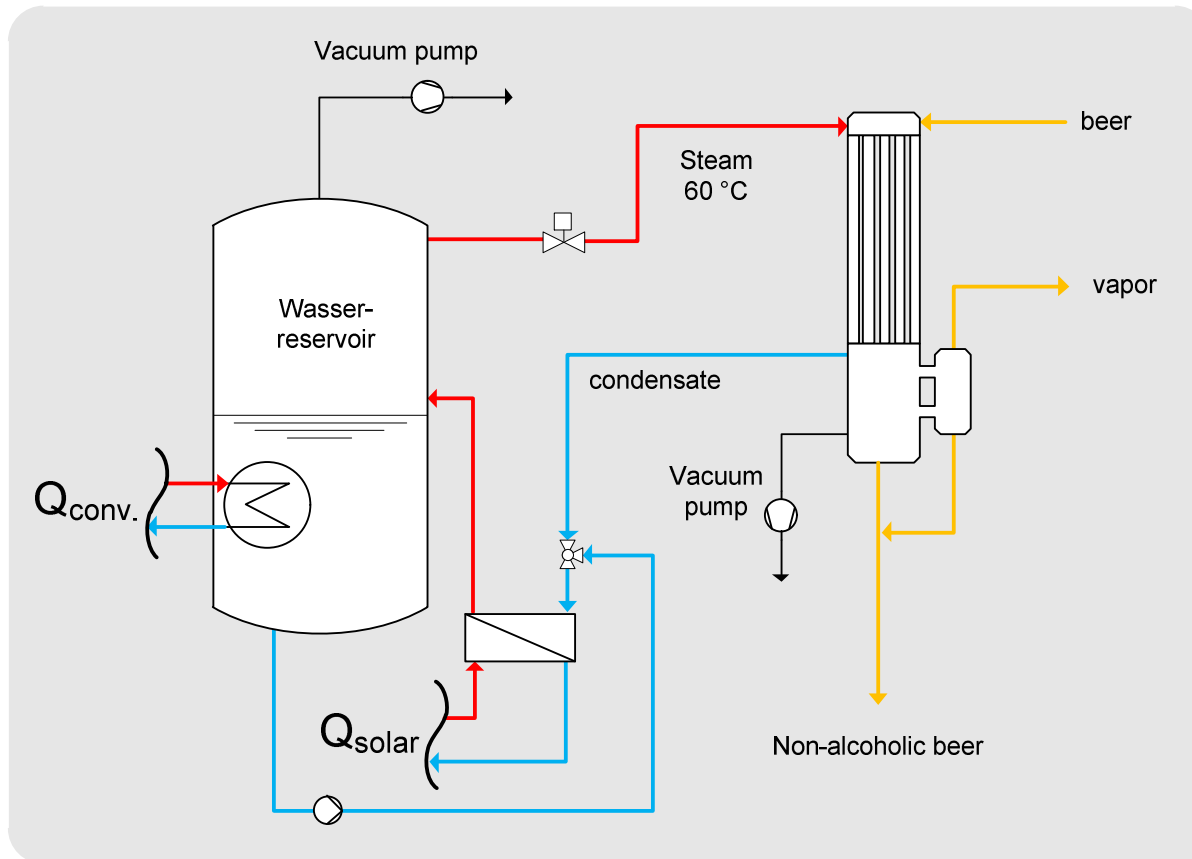


## Evaporation



Example how to integrate solar heat for dealcoholization of beer.

Dealcoholization processes are necessary to meet the growing market for non-alcoholic (<0.05% by volume) and low-alcoholic beer (<0.5% by volume). In addition to arrested fermentation and reverse osmosis, there are also thermal processes to produce non-alcoholic beers. However, not all breweries produce non-alcoholic beer. Dealcoholization processes are often found in large breweries. The installations are usually designed with relatively low production capacities to maintain long and constant operation times.

Typical installations used for thermal dealcoholization are rectification columns, thin film- and falling film evaporators. Rectification columns and falling film evaporators are usually designed in multi-stage. Based on the sensitive product characteristics, the evaporator is operated with slight vacuum (both, product and heating side). Thereby the dealcoholization occurs at low temperatures. Usually saturated steam at about 60 °C is used as heating medium.

A heating system consisting of a conventional heated storage, a solar heat exchanger and a vacuum pump are required to assist the dealcoholization process with solar energy. As shown in Figure 9, solar heat is used to preheat the condensate return. In case of insufficient solar irradiation, the condensate temperature can be increased with the conventional heated storage. Due to the illustrated bypass it is possible to use solar heat already for the start up the plant.