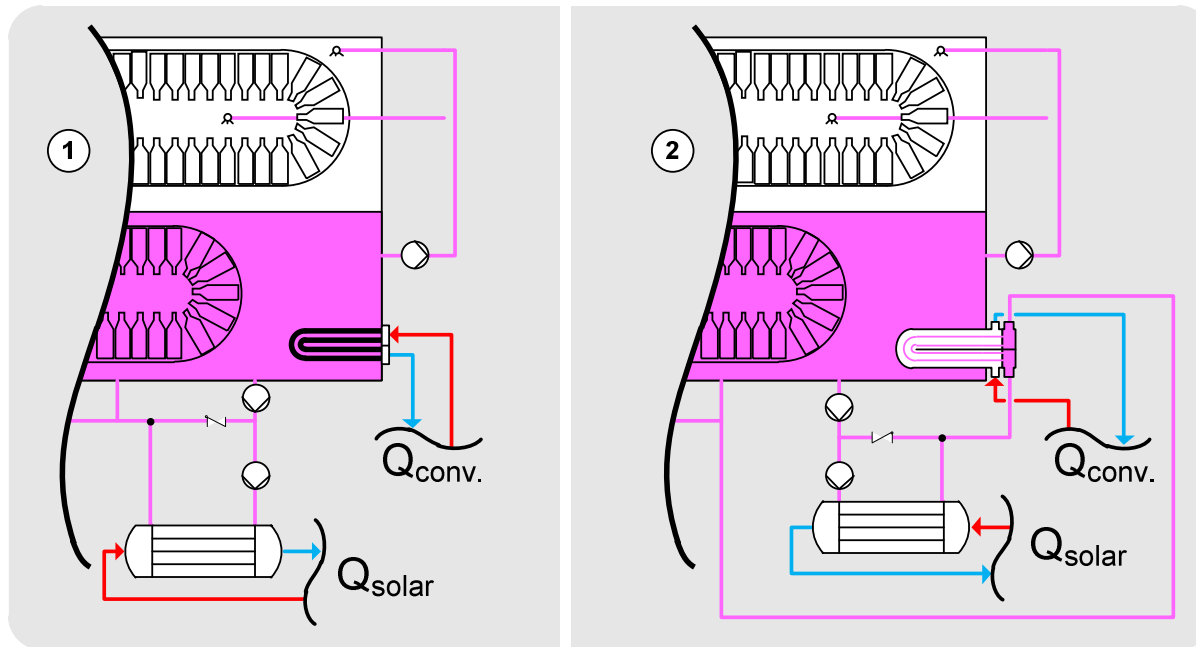


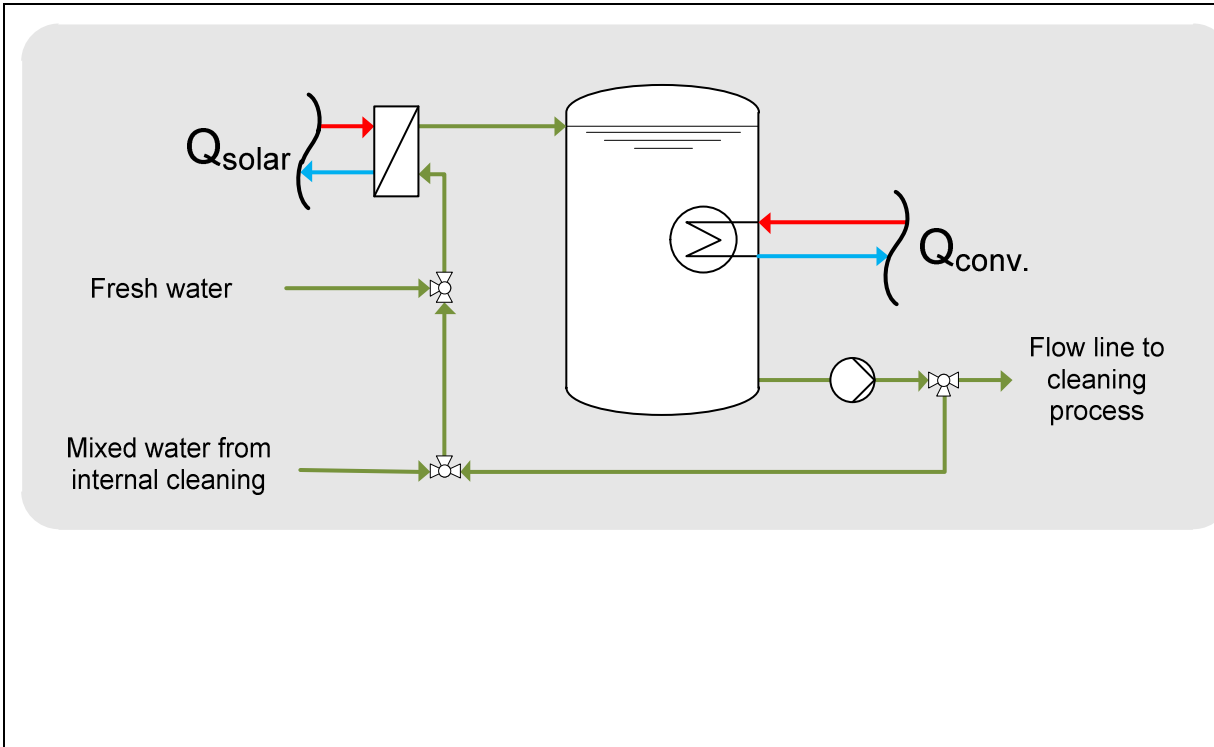
## Cleaning of bottles and cases



Example how to integrate solar heat for bottle washing machines in beverage companies.

The integration of solar heat for bottle washing depends very much on the type of the installed conventional heat exchanger and its integration into the machine. Bottle washing machines with an internal tube bundle provide the opportunity of overheating the caustic that is withdrawn from the region of the tube bundle, and pumped to the section where bottles enter the main caustic bath (scheme No. 1). At this point of the bottle washing machine, the highest temperature is required, so the caustic can be overheated by solar energy by 3..4 K compared to the temperature of the main caustic bath.

Using another tube bundle design, the caustic is removed from the bath and passes the tubes of the bundle. The steam entering the tube bundle heats the caustic within the tubes as well as the entire bath via its shell. A possible way of integrating solar heat in bottle washing machines using this type of heat exchanger is illustrated in scheme No. 2. The solar heat is used for preheating the caustic before entering the tube bundle.



Example how to integrate solar heat for keg cleaning processes in beverage companies.

Kegs have to be cleaned from in- and outside. The interior cleaning is done with different spray stations (water, caustic, acid, hot water and steam). Keg cleaning lines have containers for the used media (water, acid, and caustic), which usually are kept at the required temperature by internal heating coils.

To utilize solar heat for keg cleaning, a heat exchanger has to be integrated in the flow line of the respective containers. The Figure illustrates this for a mixed water container. The return flow from internal cleaning is called mixed water and used to clean the exterior surface. Due to the illustrated way of integration, solar heat can be used to heat the mixed water directly while entering the container. The bypass is necessary to utilize solar energy also for heating the container between the cleaning batches. This can be neglected if a keg line is operated continuously. The illustrated integration scheme for heating the container of mixed water can also be applied to caustic and acid tanks. Usually, these media will have higher return temperatures and a cold water inlet is not given.