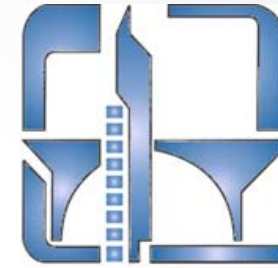




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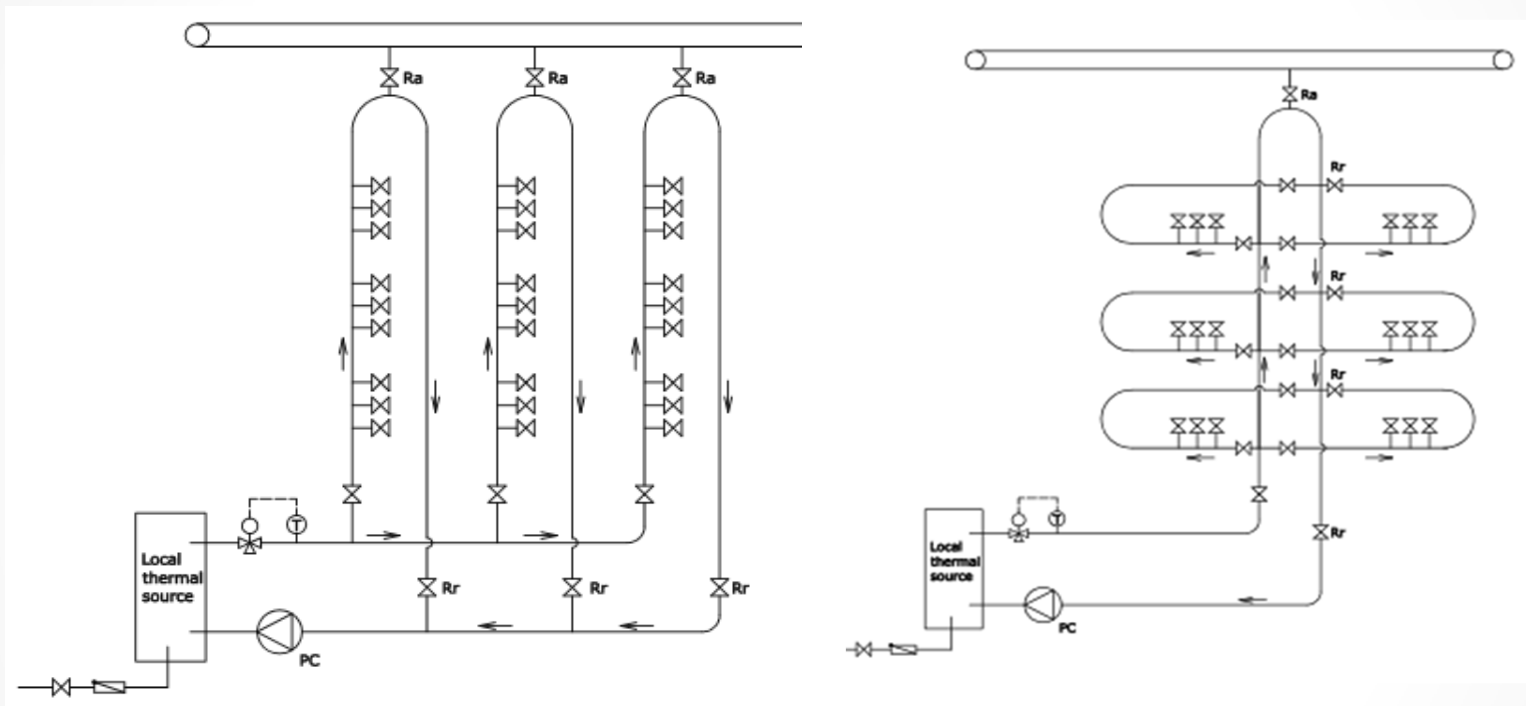
Alternative solutions for domestic hot water recirculation

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Recirculation of domestic hot water – important measure in order to reduce the waste of primary resources – water and thermal energy!

- In the distribution network of domestic hot water, the temperature drops significantly even if the consumption is low or missing
- In order to keep the temperature within acceptable allowable limits, it is necessary to recirculate a flow that compensates for the heat loss in the installation
- The classical solution is to double the entire transportation and distribution network (high costs), but in this paper we have approached innovative solutions, capable to avoid the difficulties that might be encountered, by resolving them both local and at the source.

Solutions?



For water recirculation it is foreseen the doubling of the circulation pipes - columns and distribution - throughout the installation (left) or only in the lower distribution (right).

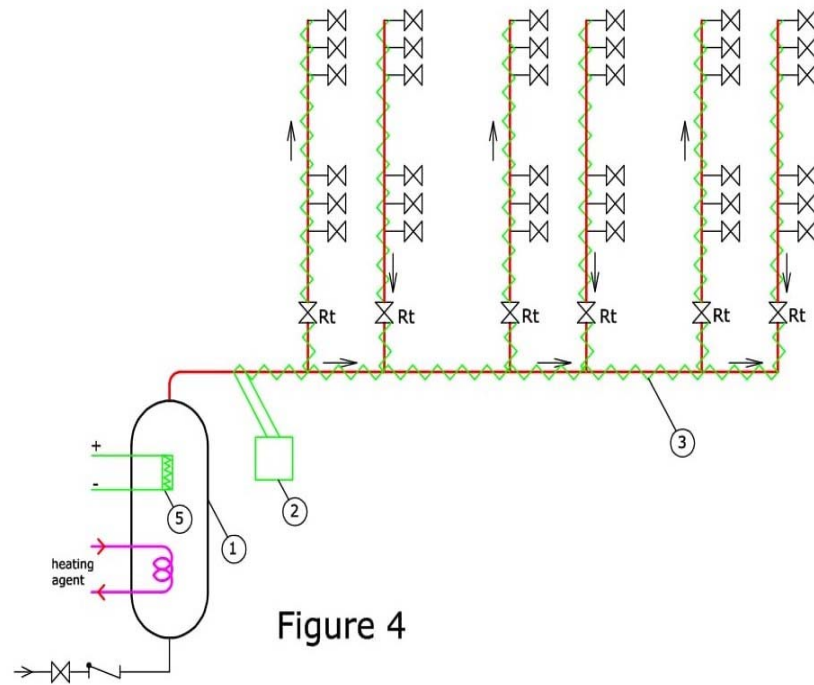


Figure 4

The total removal of the recirculation system can be accomplished by compensating the heat losses in the domestic hot water distribution ducts with electric heating cables attached to the pipes and distribution columns. The specific power for the heating cables, the thermal power and the capacity of the local source storage are determined similarly to the recirculation installations.

Functional regimes

Bi-energy boiler generator and variable speed recirculation pump

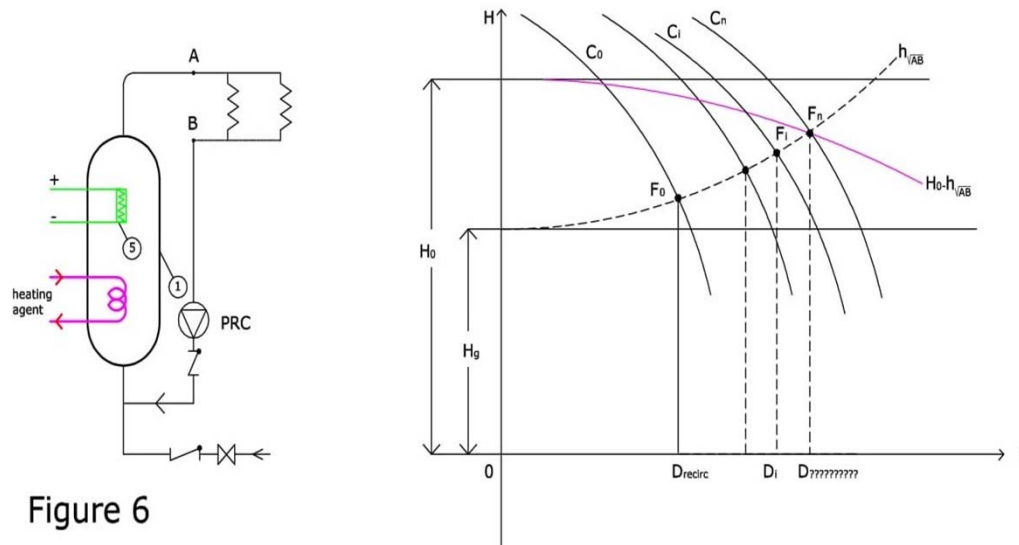


Figure 6

In the absence of consumption, the pump operates at the point 0 corresponding to the flow rate of the recirculation; When increasing the flow rate by changing the speed, the operating point moves on the network characteristic to the point n (when the pump is switched off, the system is fed to the external supply network pressure in n).

Bi-energy generator, reservoir and constant-speed circulating pump

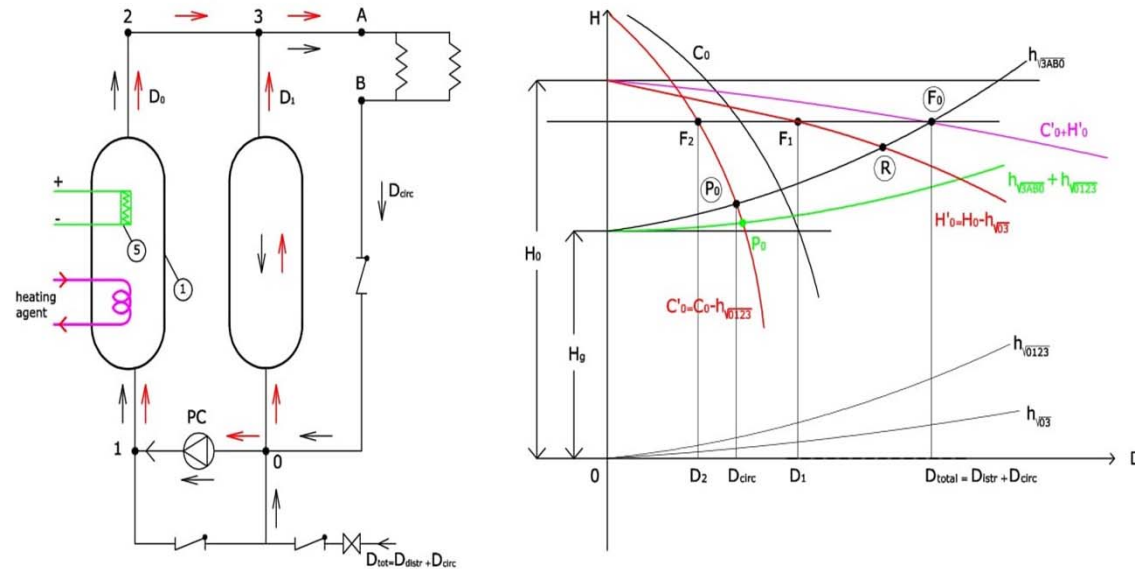


Figure 7

The PC circulation pump works continuously.

In non-consuming periods, recirculation of the water volumes in the distribution network and in the battery without external input is made through the generator.

In periods of consumption with lower flows than the nominal volume of the pump, consumers are supplied directly through the generator with the reduction of the recirculated volumes, and at higher flows the deficit is compensated from the reservoir.

Bi-energy generator, reservoir, circulation pump and constant-speed recirculation pump

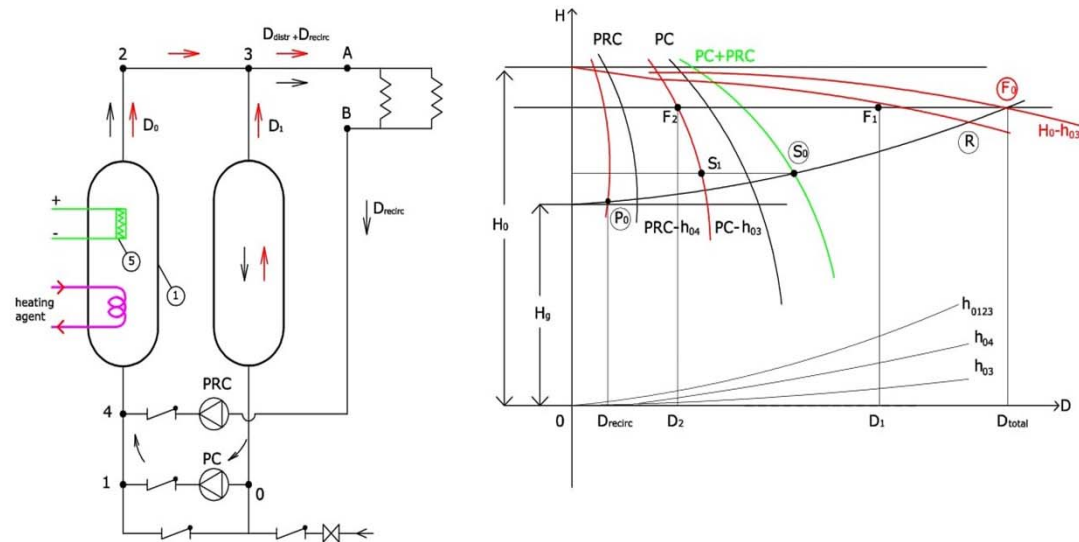


Figure 8

To reduce the energy consumption for pumping, the recirculation pump (PRC) works only during the non-consuming period of time to drive the volume of water in the distribution network in order to compensate for heat loss. Maintaining the temperature of the water in the reservoir is under the action of the circulating pump (PC) that can work synergistically or in parallel with the recirculation pump (PRC).

Conclusions

- Supplying flows, resuming consumption below the minimum comfort temperature leads to waste of resources (water and energy);
- The difficulty of intervening in the existing underground network and the related costs are the main impediments to promoting the solution;
- As an alternative solution, it is proposed to carry out recirculation installations with local-centralized thermal sources, located at the level of dwelling blocks;
- To reduce the investment effort it is envisaged to eliminate the recirculation columns and take over their function by interconnecting the distribution columns;
- Compensation of heat loss from the domestic hot water distribution system can be done with electric heating cables;
- Technical solutions can be differentiated in relation to local situations and financial availability;
- The efficiency of solutions is conditioned by the correct dimensioning of all system components;

Thank you for your attention!