Sustainable use of steam

Translated from German
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Figure 1 View of the hospital

The Austrian State Hospital of Feldkirch (LKH) is the main hospital in Vorarlberg with approximately 550 beds. Hospitals of this size need corresponding amounts of energy to be able to maintain their operation adequately. As a source of energy, steam plays a considerable role in the energy consumption and hence in the running costs of a hospital, as energy is becoming increasingly expensive. Cost optimization in patient care is one of the core goals for the Management of the LKH. For an operational management oriented towards economic and ecological concerns, it goes without saying that cost optimization in supply technology has a high priority, for example through energy saving wherever possible.

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An example here involves the use of a heat exchanger for the conversion of surplus steam into hot water at a temperature of 80°C (figure 2), which is used for heating purposes and the return of any further surplus in the form of condensate to the steam power plant.

Figure 2
Heat exchanger with secondary circulating pumps

Use of steam in LKH

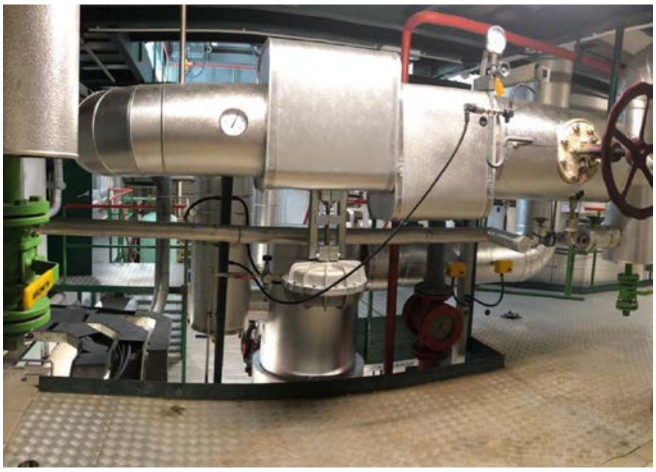

Figure 3
Quick-closing steam valve on the inlet side of the heat exchanger

The hospital has its own steam power plant to provide the large amounts of steam required. Numerous processes such as steam humidification in ventilation devices, the operation of kettles in the central kitchen, sterilization of work equipment and material, beds, waste and more would hardly be possible otherwise. Steam that is not currently required now no longer escapes into the surroundings, as was usually the case beforehand. It is now received in a Baelz steam heat transfer station in order to generate heating water at 80°C for the clinic heating. The heating water collects in a huge buffer storage tank, which also serves as a hydraulic separator, and can be fed into the heating network as and when required. The heating flow temperature is controlled via a digital controller, which actuates the condensate valves. For optimum adjustment of capacity requirements even in the lower load range, two condensate valves are installed in sequence. The stroke position of the condensate valves then changes the condensate height in the heat exchanger – this is known as

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condensate backup control. The steam-end pneumatic steam valve (figure 3) always remains fully open and is only closed – with simultaneous a “close” signal to the condensate valves – if the safety chain in the secondary circuit is triggered or in case of a power failure.

If the need for hot water for heating purposes is covered and the buffer storage tank is full, the surplus will be returned to the circuit. As the steam gives off its energy in the heat exchanger, condensate at approx. 90°C results, which then flows off into an open condensate tank by means of vapor pressure. There the condensate is pumped back via a lifting system directly into the steam power plant of the hospital (figure 4).

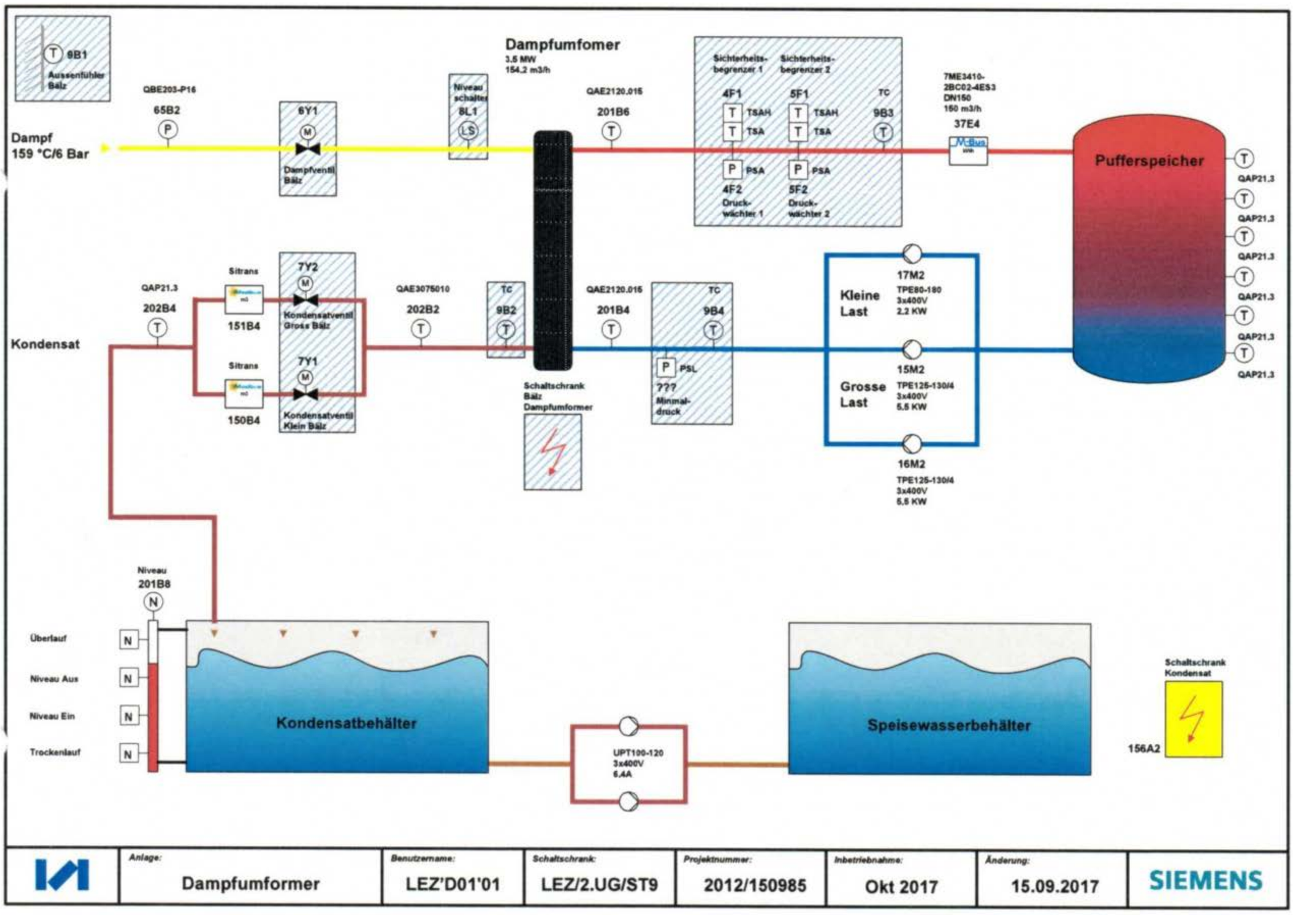

Figure 4
Layout of the BAC (building automation and control), kindly provided by Siemens AG

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Figure 5
Heat exchanger with ring channel

If the steam operating pressure on the inlet side of the steam station drops to a minimum steam pressure because other steam consumers require steam and these have a higher priority, the capacity of the heat exchanger is continually reduced. The buffer storage tank is then used for the heating supply to the entire hospital.

The steam / water heat exchanger has a capacity of 3.5 MW and a height of 3.10 m. Owing to the height and the high steam temperatures, the heat exchanger has been equipped with a compensator in order to absorb the longitudinal expansion of the stainless-steel pipes. In order to avoid steam / condensate hammer, the heat exchanger is provided with a ring channel (figure 5).

The highly meticulous control of the above system ensures a fault-free process for both steam consumption and heating. But the steam consumption in the daily operation of the hospital varies greatly.

With its 30 m^3 the buffer storage tank is therefore correspondingly dimensioned to provide a sufficient reserve for times of greater steam consumption in the hospital.

Conclusion

This system setup allows the capacity of the expensive energy source steam to be fully utilized and no surplus is generated with which valuable energy would be wasted.

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