Hydronic balancing

Data Sheet
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The aim of hydronic balancing is to supply all heat emitters – such as radiators or underfloor heating circuits – with hot water according to their respective room temperature requirements.

To achieve this, the pressure conditions within the system must be balanced and the maximum flow rate must be set for every emitter. The result is increased comfort thanks to heat distribution which corresponds to actual demand – even after night-time set-backs – and without noisy valves.

In addition, the pump output, and therefore also the power consumption and/or the supply temperature, can then be reduced in most cases. The resulting lower return temperature also ensures the equivalent effect in condensing boilers. This results in a significant increase in efficiency and energy savings of up to 35% through well-implemented hydronic balancing. (IMI Hydronic Engineering, 2018).

WHY BALANCE?

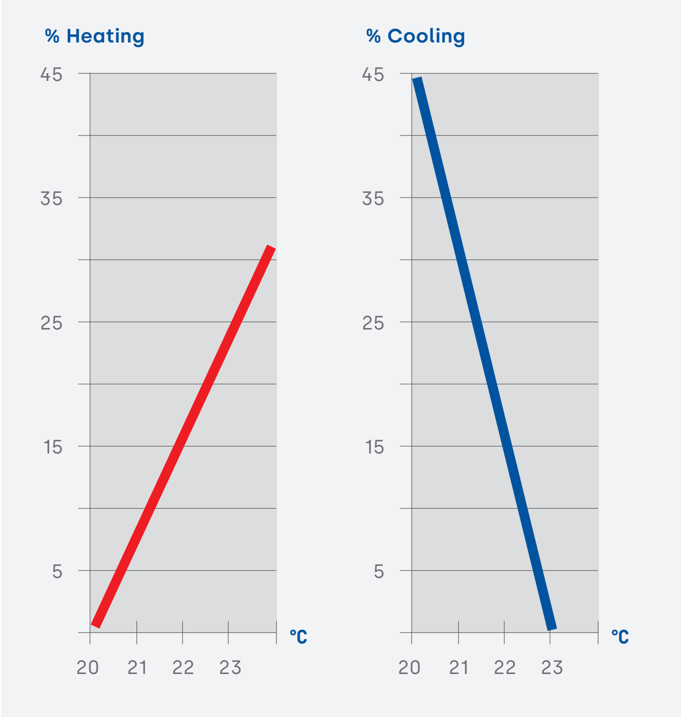
Many property managers spend fortunes dealing with complaints about the indoor climate. This may be the case even in new buildings using the most recent control technology. These problems are widespread:

- Some rooms never reach the desired temperatures.
- Room temperatures oscillate, particularly at low and medium loads, even though the terminals have sophisticated controllers.
- Although the rated power of the production units may be sufficient, design power can't be transmitted, particularly during start-up after weekend or night setback.

These problems frequently occur because incorrect flows keep controllers from doing their job. Controllers can control efficiently only if design flows prevail in the plant when operating at design condition.

The only way to get design flows when required is to balance the plant. Balancing means adjusting the flows at correct values at design condition. Avoiding underflows at design condition makes sure that underflows will be avoided in all other normal conditions. Balancing is necessary for three reasons:

1. The production units must be balanced to obtain design flow in each boiler or chiller. Furthermore, in most cases, the flow in each unit has to be kept constant when required. Fluctuations reduce the production efficiency, shorten the life of the production units and make effective control difficult.
2. The distribution system must be balanced to make sure all terminals can receive at least design flow, regardless of the total average load on the plant.
3. The control loops must be balanced to bring about the proper working conditions for the control valves and to make primary and secondary flows compatible.



Percentage increase in energy costs for every °C too high, or too low, relative to average building temperature.

Why is the average temperature higher in a plant that is not balanced? During cold weather it would be too hot close to the boiler and too cold on the top floors. People would increase the supply temperature in the building. People on the top floors would stop complaining and people close to the boiler would open the windows. During hot weather the same applies. It is just that it would be too cold close to the chiller, and too hot on the top floors. One degree in a single room rarely makes any difference to human comfort or to energy costs. But when the average temperature in the building is wrong, it becomes costly.

One degree above 20 °C increases heating costs by at least 8% in mid Europe (12% in the south of Europe). One degree below 23 °C increases cooling costs by 15% in Europe. (Department of Energy & Climate Change, 2012).

A further consideration is the importance of correct flows in relation to a constant delta T. Heat pumps typically demand a small delta T of ~5K, whilst district heating distribution is commonly operated at up to 30K delta T on the secondary side. Both of these temperature requirements require a high quality TRV to ensure a constant, accurate flow-rate.

Professional Development Centre, Sandall Stones Road, Kirk Sandall, Doncaster DN3 1QR
E. ufcminfo@polypipe.com **W.** ufcm.co.uk

ufcm UnderFloor Climate Management