Consumer Guide:
Balancing the central heating system

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System Balancing

Keep your home heating system in good working order.

Balancing the heating system

Balancing of a heating system is a simple process which can improve operating efficiency, comfort and reduce energy usage in wet central heating systems. Many homeowners are unaware of the merits of system balancing -an intuitive, common sense principle that heating engineers use to make new and existing systems operate more efficiently.

Why balance?

Balancing of the heating system is the process of optimising the distribution of water through the radiators by adjusting the lockshield valve which equalizes the system pressure so it provides the intended indoor climate at optimum energy efficiency and minimal operating cost. To provide the correct heat output each radiator requires a certain flow known as the design flow.

If the flow of water through the radiators is not balanced, the result can be that some radiators can take the bulk of the hot water flow from the boiler, leaving other radiators with little flow. This can affect the boiler efficiency and home comfort conditions as some rooms may be too hot or remain cold.

There are also other potential problems. Thermostatic radiator valves with too much flow may not operate properly and can be noisy with water "streaming" noises through the valves, particularly as they start to close when the room temperature increases.

What causes an unbalanced system?

One cause is radiators removed for decorating and then refitted. This can affect the balance of the whole system. Consequently, to overcome poor circulation and cure "cold radiators" the system pump may be put onto a higher speed or the boiler thermostat put onto a higher temperature setting.

This may or may not alleviate the symptoms of cold radiators, but it will increase the energy consumption of the system even further, and may also result in noisy radiator valves. It should be noted that a faulty pump may give a similar problem or a build-up of sludge in the radiator.

Given the clear benefits of heating system balancing, this simple process is expected practice on any new system or boiler installation and shouldn't be neglected

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The balancing process

How the heating engineer will balance the system

Your engineer will firstly, remove air from the system by bleeding the radiators. Systems are normally balanced by adjusting the lockshield valves usually fitted on the return side of each radiator.

This ensures that each radiator circuit in the system has an equal pressure drop and receives the correct flow of hot water to heat the space in which it is fitted. The lockshield valve restricts hot water flow to certain radiators in order to divert flow to others, thereby balancing the system.

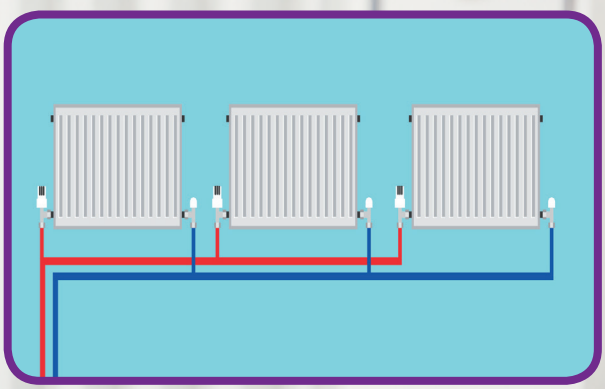
Once any air in the system has been removed the heating is turned off to allow the radiators to cool down. Your heating engineer will then turn the central heating on and note down the order in which the radiators heat up, those nearest the pump normally get hot first. If the pump is fitted inside the boiler then the radiator nearest the boiler normally heats up first.

Flow valves or thermostatic valves (where fitted) are set to the fully open position and lockshield valves on all the radiators by turning them anti-clockwise. The plastic cap on the lockshield valve is removed and a small spanner or an adjustable spanner is used to adjust it.

With all the radiator valves fully open, the heating engineer can check by touching them to see if they all heat up at the same time. If they do your radiator system does not require any adjustments. If the radiators are not heating evenly then the radiators which get hottest quickest should have the flow restricted by closing the lockshield valve.

This pushes more flow through the remaining cooler radiators. To balance a poorly designed system it may be necessary to close a valve more than 80%. Having restricted the return valves on the hottest radiators by 50% or 60% to start with, the engineer will monitor system performance.

Cooler radiators will start to get hotter. Some previously cool radiators may get fully hot. If some are still cool, further adjustment is required by restricting all the hotter radiators. Radiators which were previously restricted before are closed down further and some which weren't restricted are restricted because they are now hot. The engineer will continue to monitor the system, and, if necessary, restrict the hotter radiators.



Note: any changes made to an individual radiator can affect all other radiators on the system.

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Monitoring temperature

Using a digital thermometer

Radiator temperature can be monitored by hand or by using a pair of clip-on pipe thermometers on the flow and return pipes at either end of the radiator. Starting with the radiator nearest the pump (circulator) or boiler (if the pump is integral in the boiler), the lockshield valve is adjusted until the required temperature drop between the flow and return pipe is achieved.

This is typically 20°C for condensing gas boilers but always check the appliance manufacturer's guidance. Your engineer will allow a couple of minutes after each adjustment for the temperature to stabilise.Then move on to all the other radiators in the order that they heat up.

Other methods

Modern Thermostatic Radiator Valves can be balanced using internal settings on the valve body. The installer selects the correct setting from a "look up table" for a given room and radiator size combination.
The ultimate solution is to look at optimising the radiators output to match the room requirement. This is done via changing the return temp at each radiator. This can easily be achieved with the use of Automatic Flow Control (AFC) TRVs.

Automated Solutions

New solutions exist to make system balancing even easier. There are APPs available in the industry that calculate the flow required for a specific radiator and then guides the engineer to set the lockshield valves correctly for each individual radiator and pipe run. These APP's will take the engineer through the process, radiator by radiator, and can also provide a report detailing the properties heating system, any settings made, date of balancing and installer details.

Once the balancing is complete, the radiators heat up at an even rate and, in most cases; the boiler can run at a lower temperature, increasing efficiency.

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