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Combination Boiler “Cycling”

Introduction

A common concern expressed by combi boiler users is that the boiler “cycles” when used in central heating mode. This is best described by the combi repeatedly switching itself off and back on again with a frequency of approximately once every minute. This is often interpreted as the combi not working correctly but in the vast majority of cases the combi is operating perfectly normally. It does not help that caravan holiday homes have very thin walls and what would go unnoticed in a domestic house is more audible in a caravan.

Combi Power Rating

The Morco combi boilers fitted to caravan holiday homes are in many ways identical to those fitted in domestic properties. The power of the combi is typically 24kW which is the same as those used in many domestic properties. If you add the maximum heat output of all the radiators and towel rails in a caravan holiday home you will arrive at a figure of 5-6 kW. This is significantly less than the total power of the combi but the combi is not “over-specified” as the 24kW is needed to heat water for showers and sinks. When a hot tap is switched on, cold water entering the van is heated instantaneously as it flows through the combi heat exchanger. The combi does not store hot water and heating water instantaneously is very energy intensive that is why it needs to be so powerful.

How the Heating System Works

Once a combi boiler is asked to provide central heating it will fire up and provide heating. Initially the 15-20 litres of central heating fluid in the sealed system is cold and the boiler imparts a great deal of heat. The target temperature for the central heating fluid is set on the control knob on the combi, typically within the range of 55°C to 85°C. The higher the temperature the more heat will be given off by the radiators. After a period of time the central heating fluid achieves its target temperature and the burner will switch off. The central heating pump will continue to run so that the fluid is pumped around the sealed system and the combi can monitor the temperature of the fluid and hence detect when to re-ignite the burner. The pump is audible, especially in a caravan holiday home where the walls are so thin. After a period of time the temperature of the water in the system cools as the heat leaves the system via the radiators and the combi senses this and the burner will re-ignite. The combi is a sophisticated appliance and it has the ability to “modulate” the amount of gas that is burned in line with the amount of heat that is required in order to keep the heating fluid at the temperature set on the control knob. However, all combis have a minimum burn level below which combustion cannot safely take place and this is typically around 7.5kW.

The Design Compromise

You will have noted that the minimum burn at 7.5kW is more than the 5-6kW maximum heat output of the radiators in a typical holiday home. It is also useful to know that once the home is up to

temperature the heat output drops significantly below the maximum level of 5-6kW. Therefore there is often a significant mismatch between the minimum amount of heat that the combi can supply and the actual amount of heat that the radiators are delivering to the home. This difference is what causes the “cycling” as the combi delivers short bursts of heat to keep “topping up” the system.

In theory a combi could be made small enough to have a very low minimum burn level and then the energy being produced would match the energy leaving the system and the combi would not need to switch on and off. The reality is that burner design would be so small that the combi would not be able to provide the level of hot water that we all demand for a hot shower and so the design is necessarily a compromise. This compromise is common to all combi boilers and there are millions of 24kW combis fitted to small flats and houses where the radiator maximum heat output is less than the 5-6kW in a caravan holiday home. The reason why the problem is less obvious in domestic property is that the combi is often located in a garage or under the stairs and that domestic property walls provide a much greater level of sound insulation.

Possible Solutions

Caravan holiday homes are normally fitted with thermostatic radiator valves (TRVs). These allow the temperature to be selected for **each** room and the valve will then ensure that this temperature is maintained during all weathers. Once the temperature is selected and is acceptable, there is no need to alter the valve position unless a higher or lower temperature is required. The valve works by gradually restricting the flow of hot water to the radiator, it does not switch the boiler on or off and hence cycling can be an issue.

Alternatively a room thermostat can be fitted and this may reduce the incidence of “cycling” as it **does** switch the combi on and off. When the combi is switched off by a thermostat, the fan, the pump and the burner are all switched off. However, a thermostat only controls the temperature in the room in which it is placed. If a room thermostat is retrofitted to a home that already has TRVs it effectively overrides some of the control that the TRVs provide. It is best to turn the TRV in the room in which the room thermostat is placed to maximum at all times. You may find that it becomes difficult to control, the temperature of other rooms such as the bedrooms and bathrooms as the TRVs may be calling for heat but because the room thermostat has switched the combi off, there is none available. See the fact sheet on “Thermostats, Programmers and TRVs” for more information

Combi boilers are generally provided with a built in time clock (see below). They vary in design but generally have “segments” that switch the boiler on or off in 15 minute bands. If a combi is “cycling” you could try turning alternate segments to the “off” position during the time period in which you wish the boiler to operate. This would result in the boiler working in 15 minute stints and each stint would start with the system heating fluid at a relatively low temperature. Depending on the relative temperatures of the system fluid and the holiday home rooms, the boiler would therefore cycle less.

