

The information provided below are extracts from:

“CIBSE Guide B: Heating, Ventilating, Air Conditioning and Refrigeration” The Chartered Institution of Building Services Engineers London, 2005.

#### **1.4.2.3 Seasonal boiler efficiency**

Boiler efficiency is the principal determinant of system efficiency in many heating systems. What matters is the average efficiency of the boiler under varying conditions throughout the year, known as ‘seasonal efficiency’. This may differ significantly from the bench test boiler efficiency, although the latter may be a useful basis for comparison between boilers. Typical seasonal efficiencies for various types of boiler are given in Table 1.7. For domestic boilers, seasonal efficiencies may be obtained from the SEDBUK<sup>(52)</sup> database.

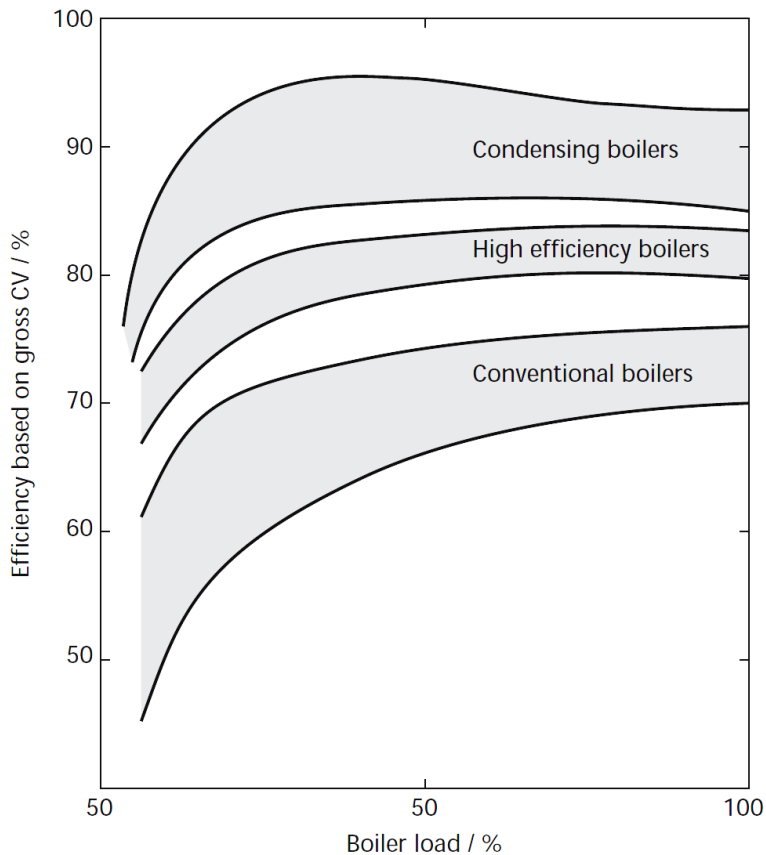
Many boilers have a lower efficiency when operating at part load, particularly in an on/off control mode, see Figure 1.4. Apart from the pre-heat period, a boiler spends most of its operating life at part load. This has led to the increased popularity of multiple boiler systems since, at 25% of design load, it is better to have 25% of a number of small boilers operating at full output, rather than one large boiler operating at 25% output.

Condensing boilers operate at peak efficiency when return water temperatures are low, which increases the extent to which condensation takes place. This can occur either at part or full load and depends principally on the characteristics of the system in which it is installed. Condensing boilers are particularly well suited to LPHW systems operating at low flow and return temperatures, such as under-floor heating. They may also be operated as lead boilers in multiple boiler systems.

**Table 1.7** Typical seasonal efficiencies for various boiler types<sup>(12)</sup>

Boiler/system	Seasonal efficiency / %
Condensing boilers:	
— under-floor or warm water system	90
— standard size radiators, variable temperature circuit (weather compensation)	87
— standard fixed temperature emitters (83/72 °C flow/return)*	85
Non-condensing boilers:	
— modern high-efficiency non-condensing boilers	80–82
— good modern boiler design closely matched to demand	75
— typical good existing boiler	70
— typical existing oversized boiler (atmospheric, cast-iron sectional)	45–65

\* Not permitted by current Building Regulations

**Figure 1.4** Typical seasonal LTHW boiler efficiencies at part load<sup>(53)</sup>