



Heuristics in Hydronics



Is the adoption of an old hydronic solution contributing to the current performance gap?

CIBSE ASHRAE Group

Webinar 11th Dec 2013

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CEng, MCIBSE, AMIMechE



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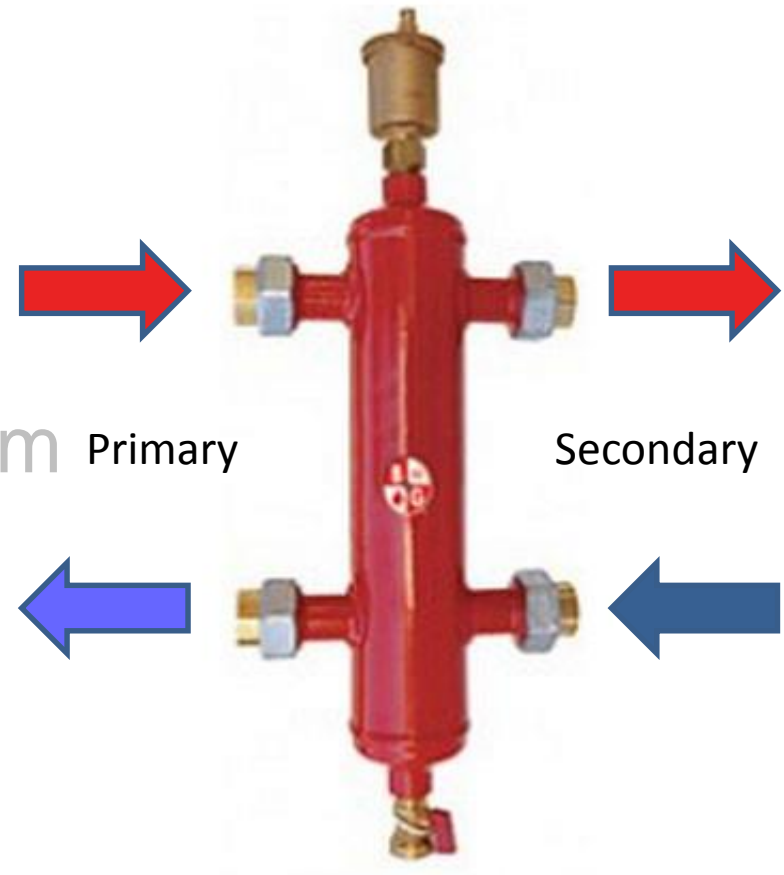


The Low Loss Header

- What is it?
- Why is it popular?
- Effect on heating system
- Market trends
- Conclusions

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Courtesy of Bell & Gossett



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The Low Loss Header

- What is it?
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-
- Low risk
 - Pre-engineered packages
 - Default start to schematic, Guides and standards



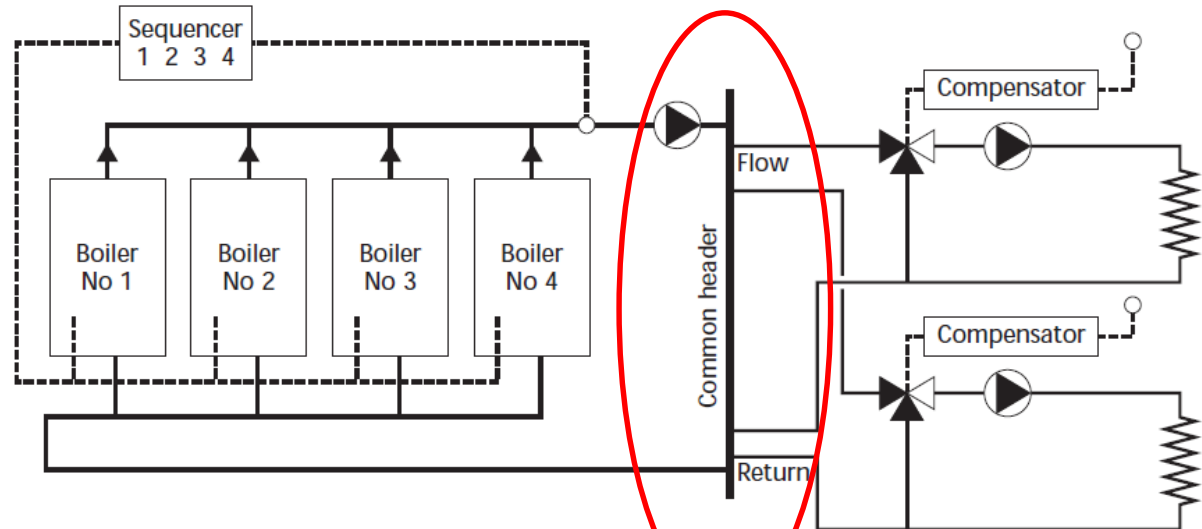
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- **CIBSE**



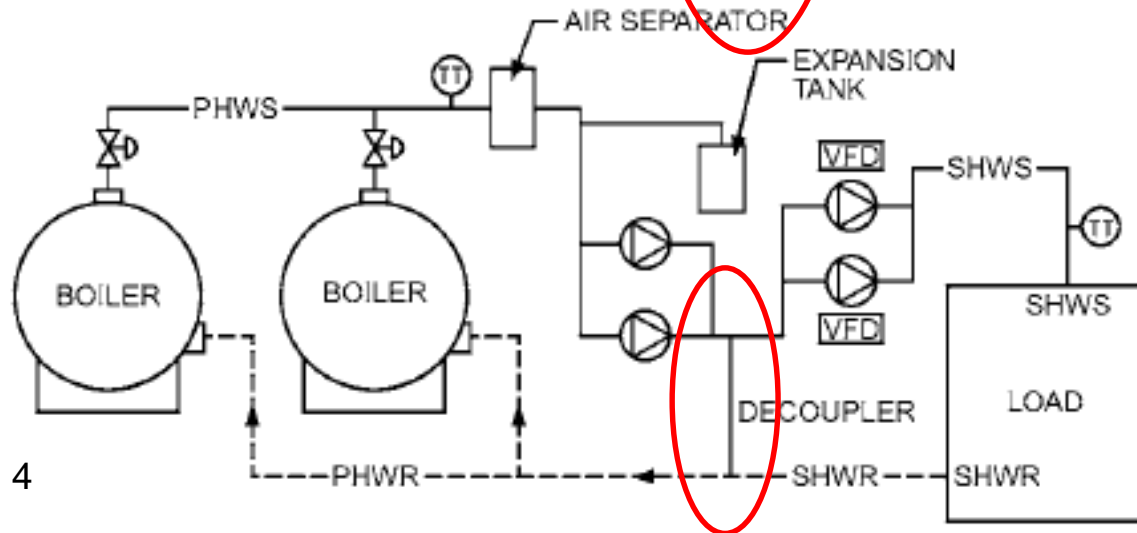
Guide B1 Heating



- **ASHRAE**



ASHRAE Handbook fig 4





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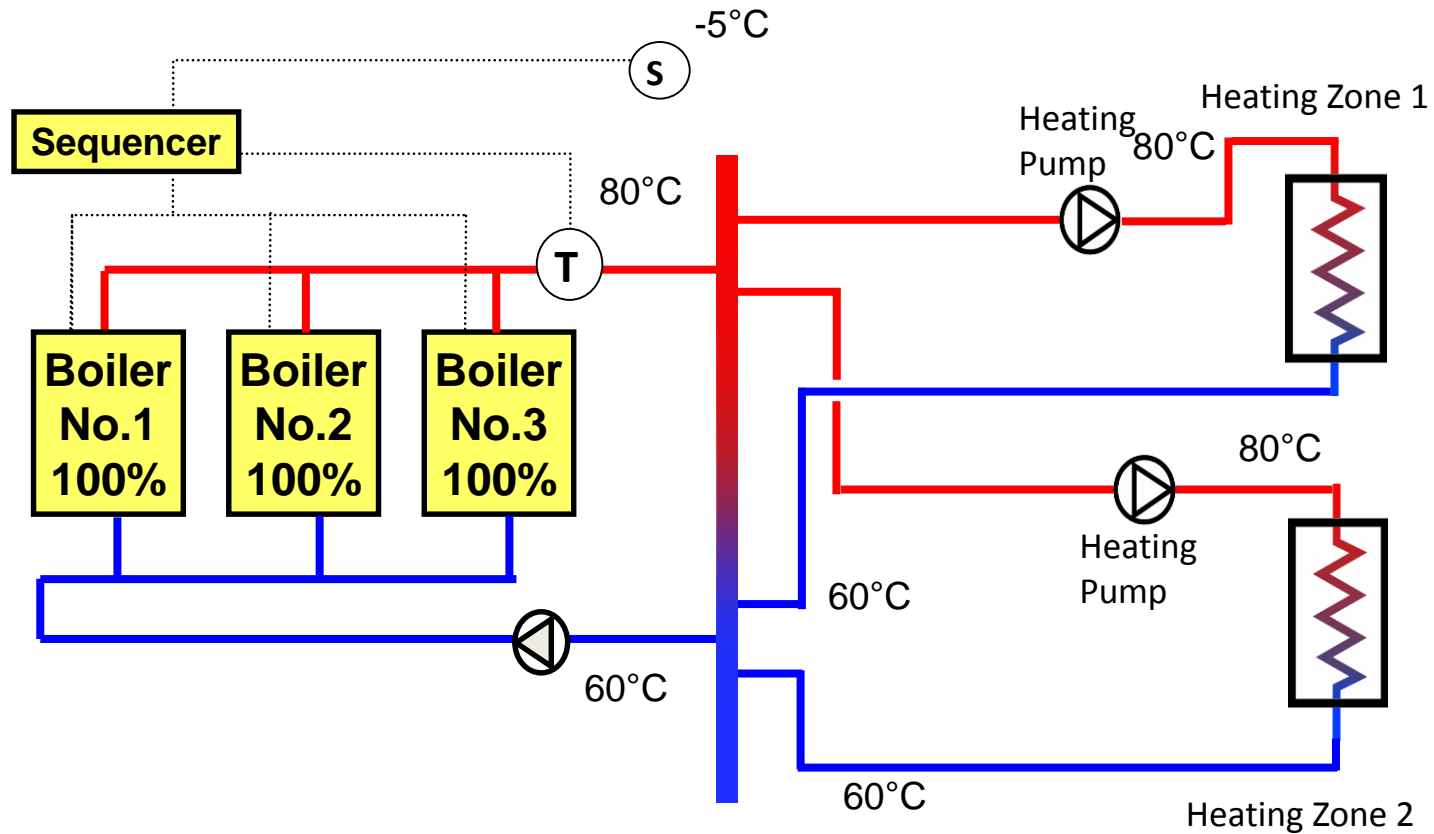


The Low Loss Header

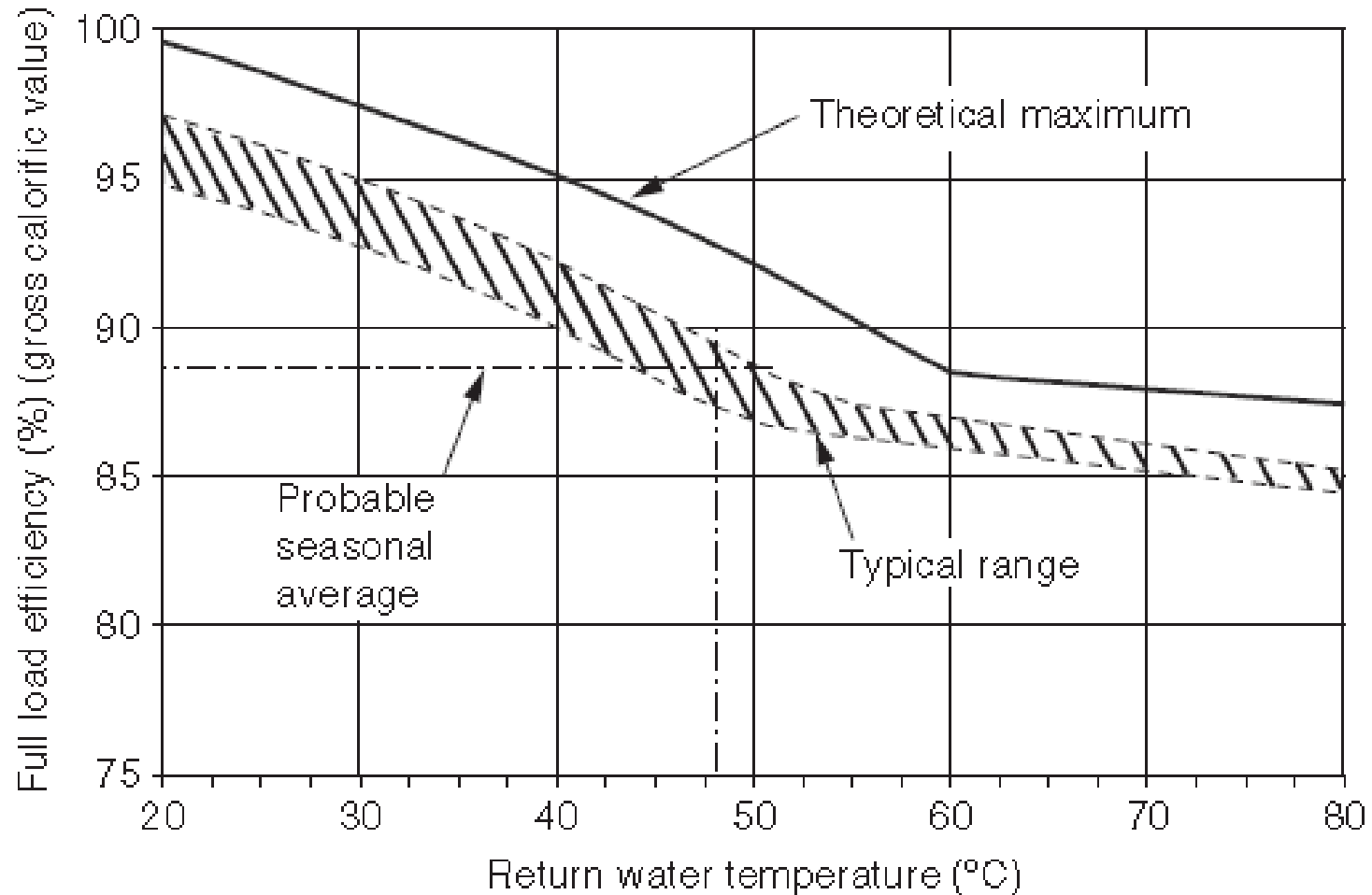
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Design Conditions – Constant Temperature



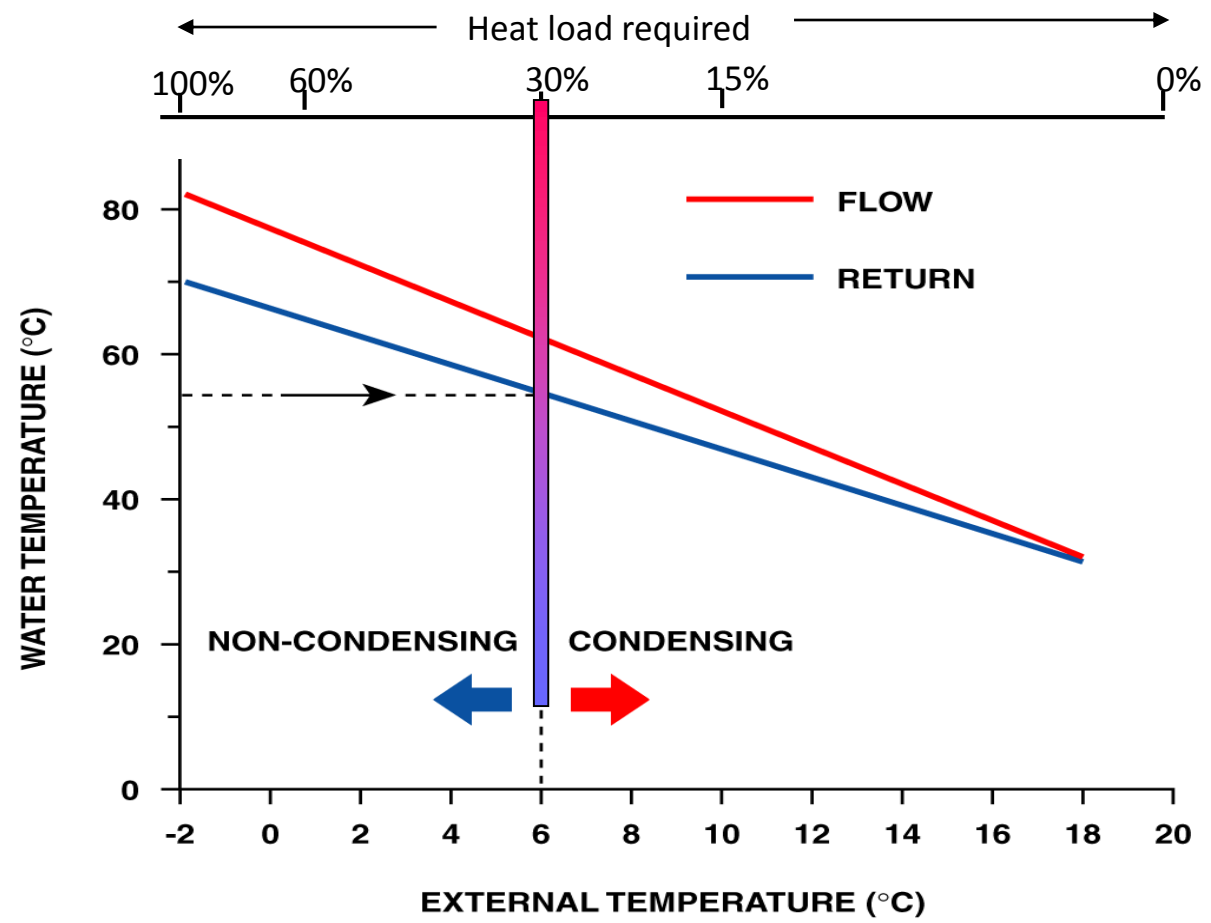
Efficiency benefit of cool return water for gas fired boilers



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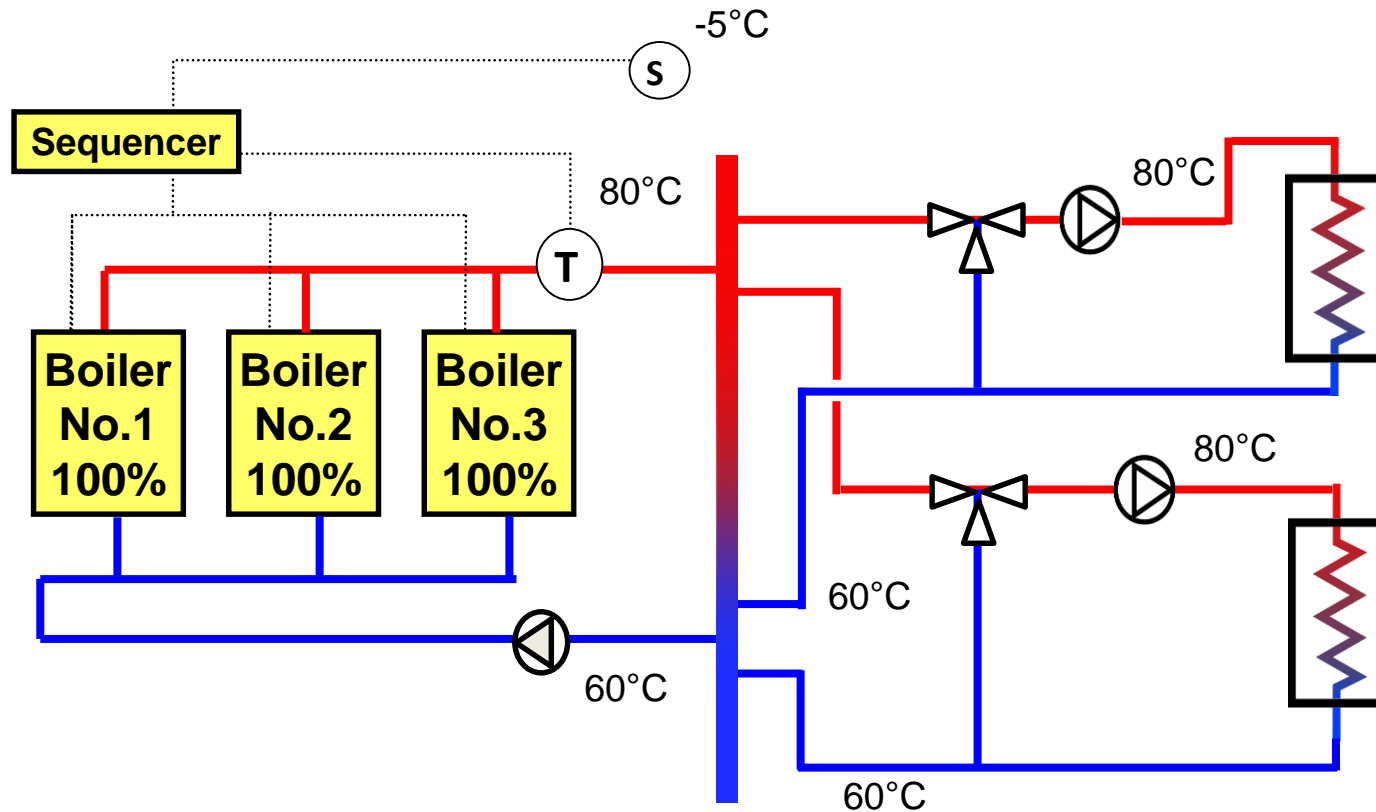


Directly compensating flow temperature reduces return water temperature on lower load days





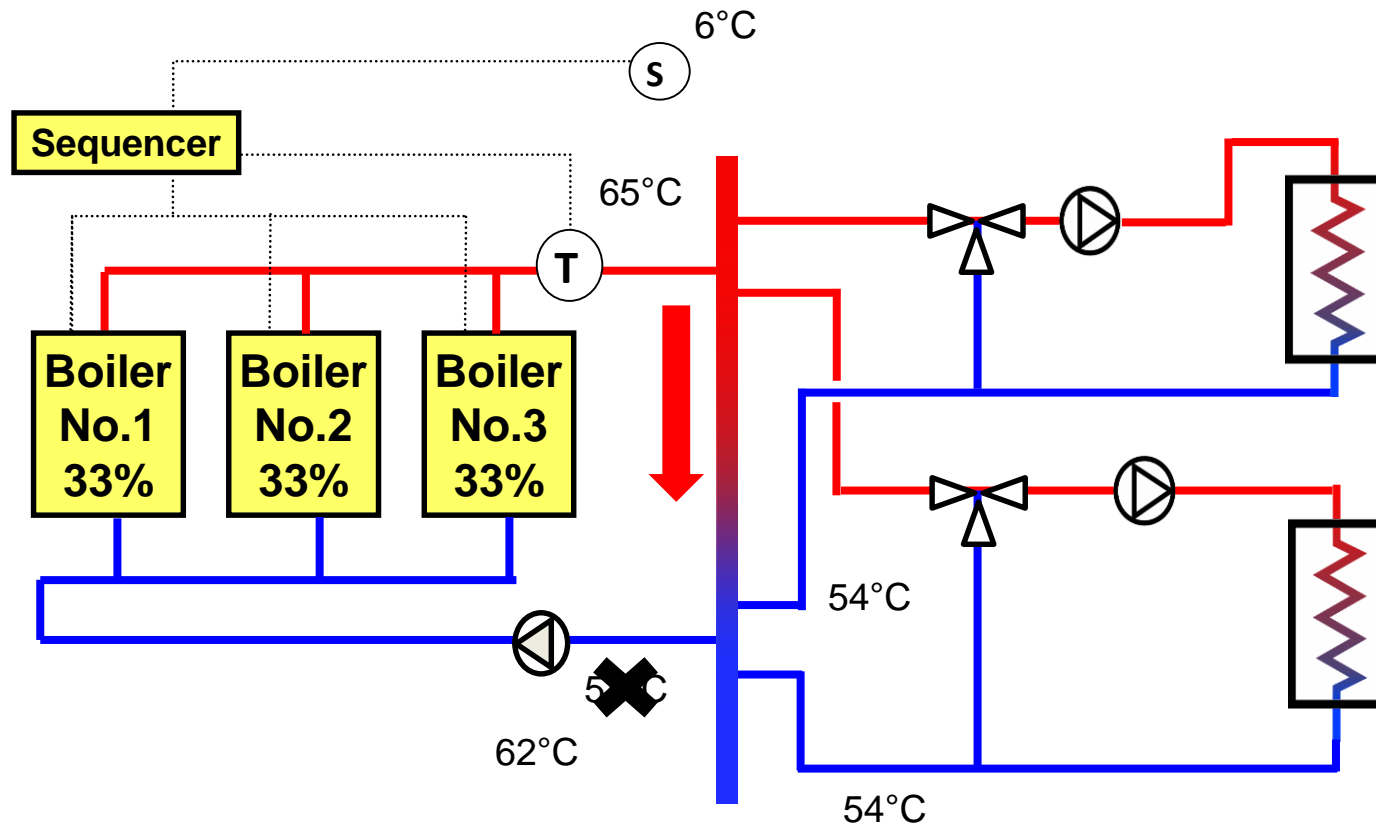
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Design Conditions – Constant Temperature Primary, Variable Temperature Secondary



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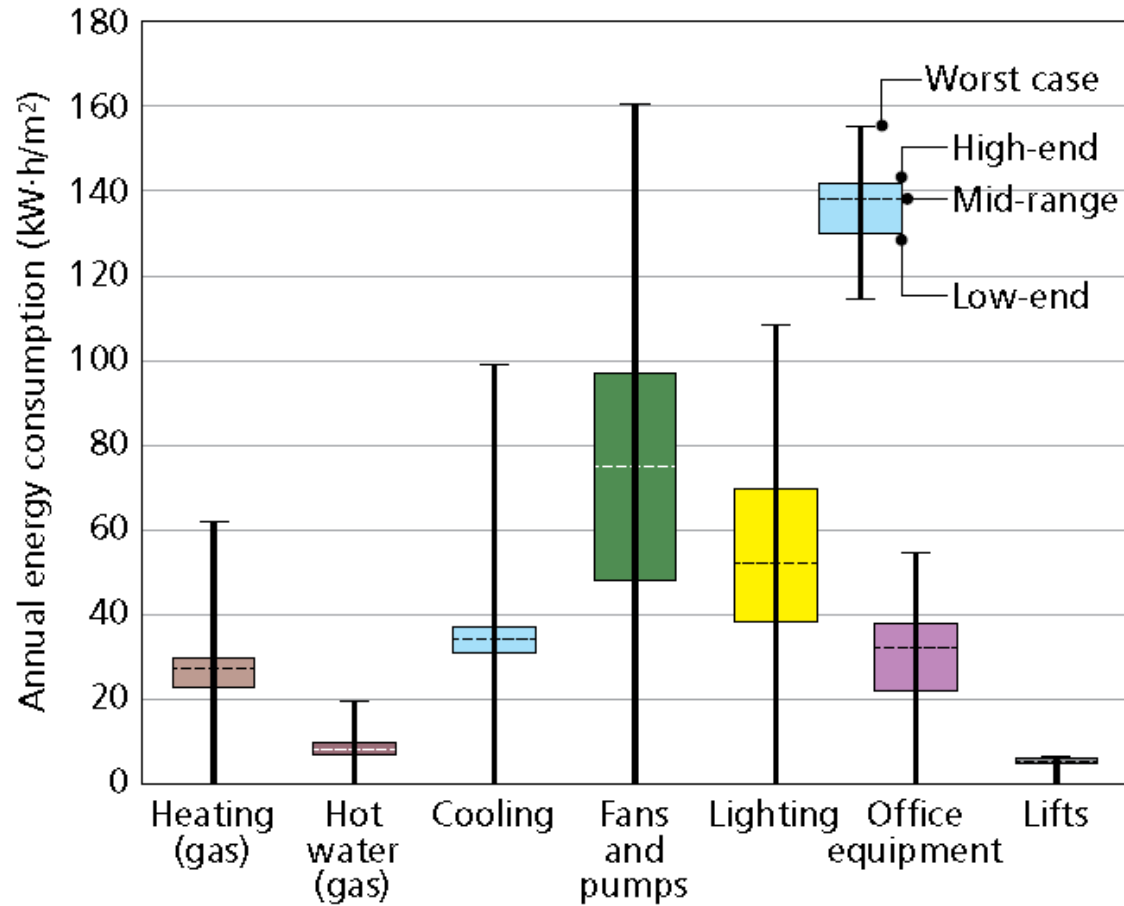


Design Conditions – Constant Temperature Primary, Variable Temperature Secondary

Boiler efficiency penalty
Primary circulator capital and running costs



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TM54 fig19



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Energy costs

Boiler efficiency penalty:

8% => $1500\text{h/a} \times 500\text{kW} \times 3\text{p/kWh} = \text{£}22,500/\text{a}$

Primary circulator:

$8,000\text{h/a} \times 2\text{kW} \times 7\text{p/kWh} = \text{£}1,120/\text{a}$

Carbon emissions

Boilers => $750,000\text{kWh/a} \times 0.198\text{kg/kWh} = 148 \text{ tCO}_2/\text{a}$

Circulator => $16,000\text{kWh/a} \times 0.541\text{kg/kWh} = 8.7 \text{ tCO}_2/\text{a}$

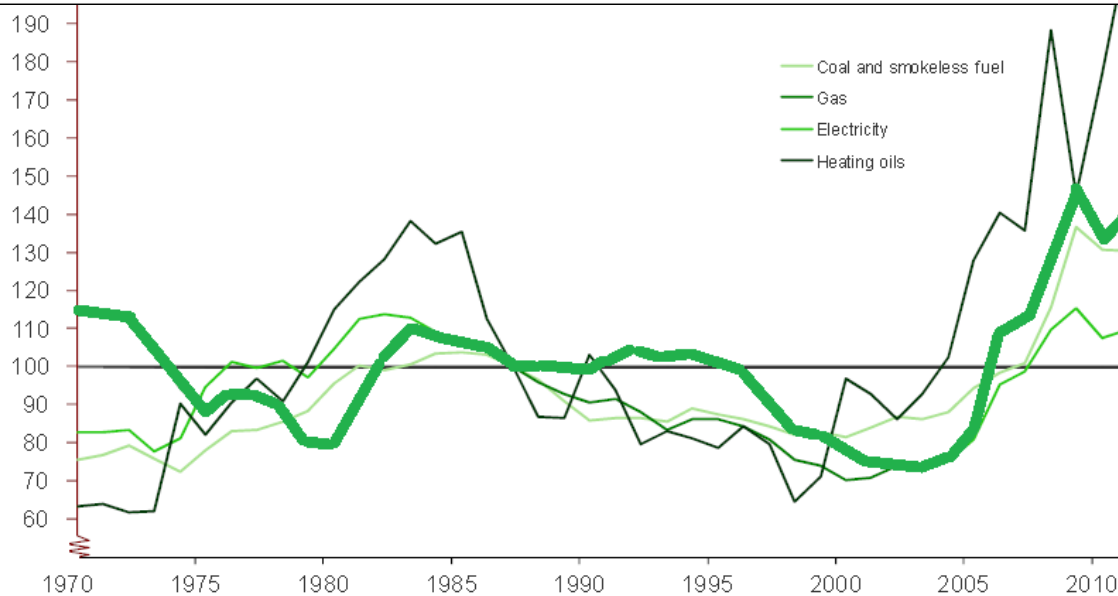
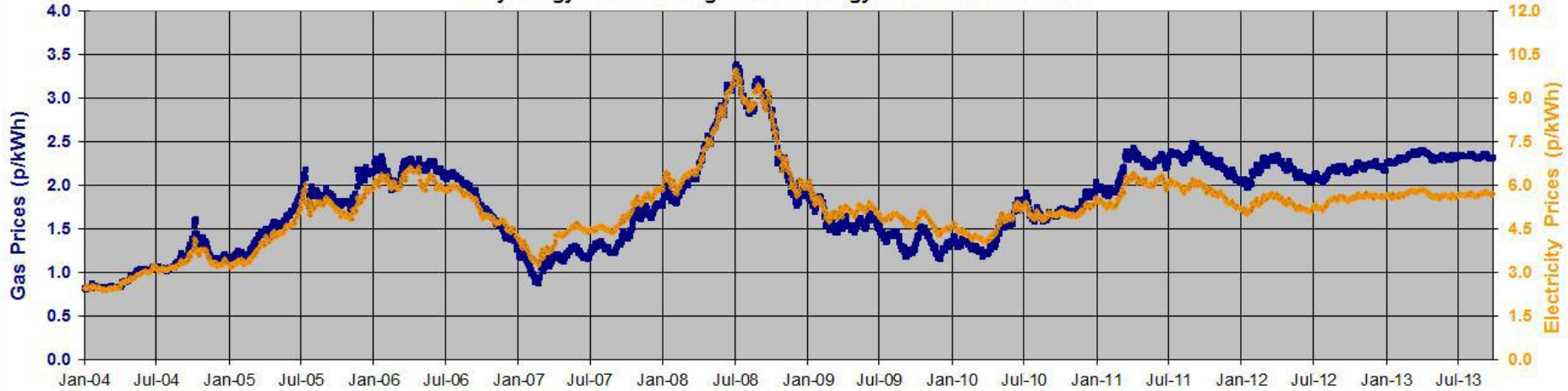
Compliance with ErP => Life cycle thinking



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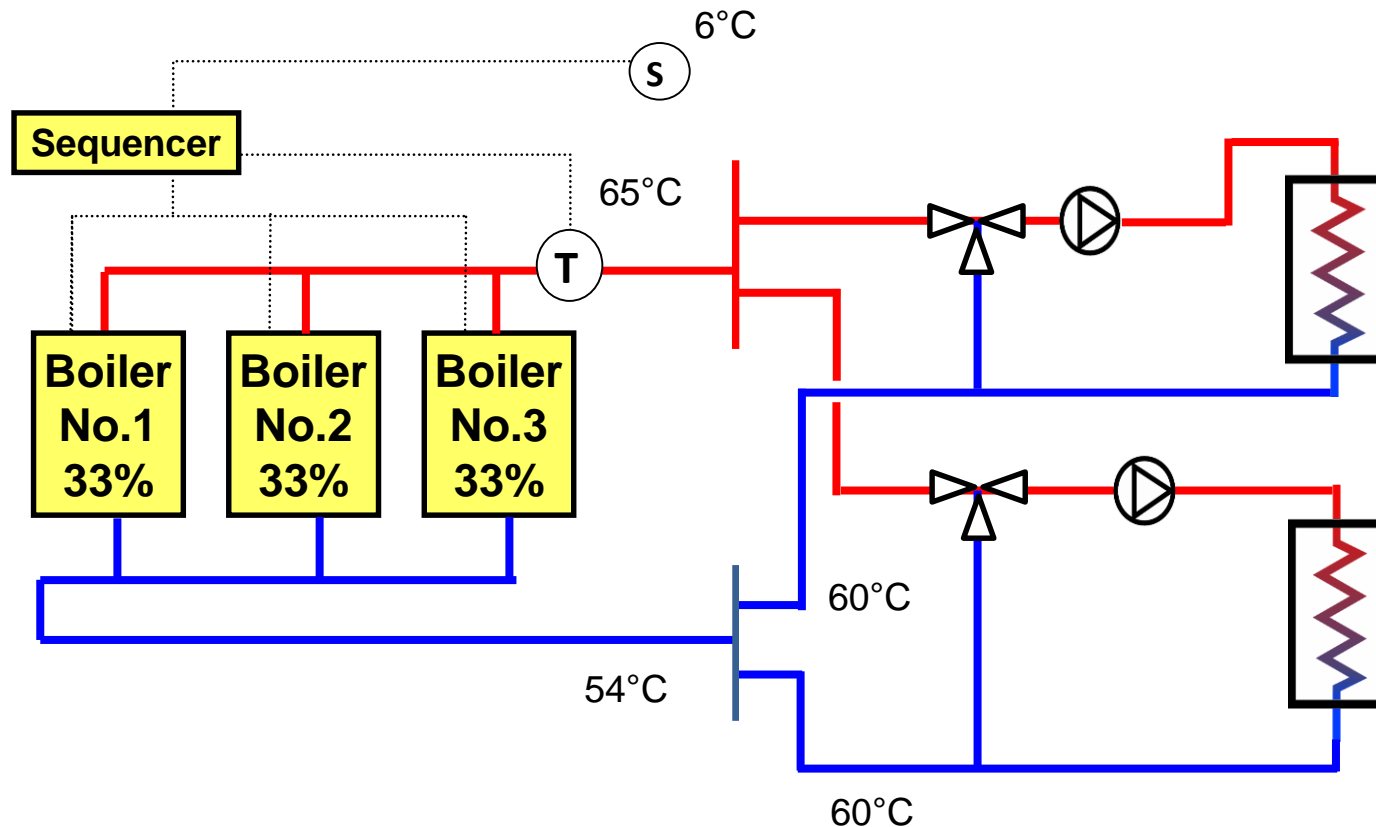
BuyEnergyOnline Rolling Annual Energy Indices since Jan-04



Source: Quarterly fuel prices, DECC. Table 2.1.1



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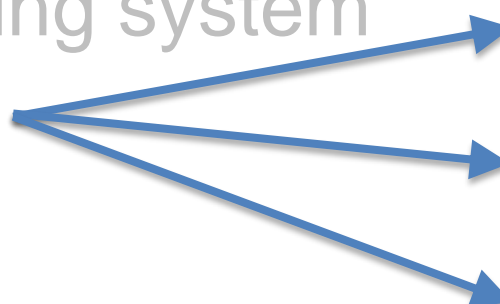


Variable Flow, Variable Temperature System.
Heat generators not of low water content design



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Available range of
Specific water content
0.1 l/kW to 1.0 l/kW

$$Q = UA\Delta t_m$$

Move towards lowest
initial cost

Move towards performance
specification

Feedback to manufacturers to
reduce product cost



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Conclusions:

- Market - focussed on lowest initial cost, not lowest life cycle cost + sustainability
- Engineers need to be aware of the consequences of early design decisions and later value engineering
- Optimise for your project