Boiler design and geometry

Evaluate the operational outcomes of the many different designs of boiler

The four most common boiler configurations are shown below. Generally, 3 pass boilers will give the best turndown performance and thus deliver better overall efficiency - as well as lower carbon and NOx emissions.

### Three key actions to reduce fuel costs

1. **ensure burners have axial air flow to ensure delivery of high efficiency combustion**
2. **check burners operate at maximum turndown across all loads and, especially, at low fire**
3. **sequence boilers and digitally manage combustion**

- specify large heat transfer surfaces to ensure the lowest possible flue gas temperatures
- a generous furnace diameter is essential for effective internal flue gas recirculation thus reducing NOx emissions
- the higher the gas side resistance, the more fan power is required by the burner - thus increasing costs
- a low surface heat release rate is essential to achieve low NOx emissions

- specify economisers to make the most of the heat put into the system and reduce flue gas temperature to a minimum - large cost savings can be achieved
- ensure high density insulation is used on all parts of the boiler, not just the basic shell.
- on steam boilers, check that the condensate temperatures will allow appropriate temperature increases from the economiser. Potentially high fuel cost savings can be achieved in this way.

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Energy is too expensive to waste