

# The Effect of Gas Quality on Appliance Design

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# Appliance Design Requirements

- Safety
- Efficiency - minimum standards increasing
- Emissions - maximum levels decreasing e.g. NOx
- Noise - maximum levels from case and flue
- Electricity consumption - reduction in auxiliary power
- Minimise costs – while increasing technology/complexity
- Meet customer's requirements – must provide customer needs/expectations
- Reliable – more complex but must be equally as reliable
- Competitive with alternative heating solutions – to prevent fuel switching to higher carbon solutions

# Impact of Gas Quality

● Domestic & commercial boilers – efficiency, NO<sub>x</sub>

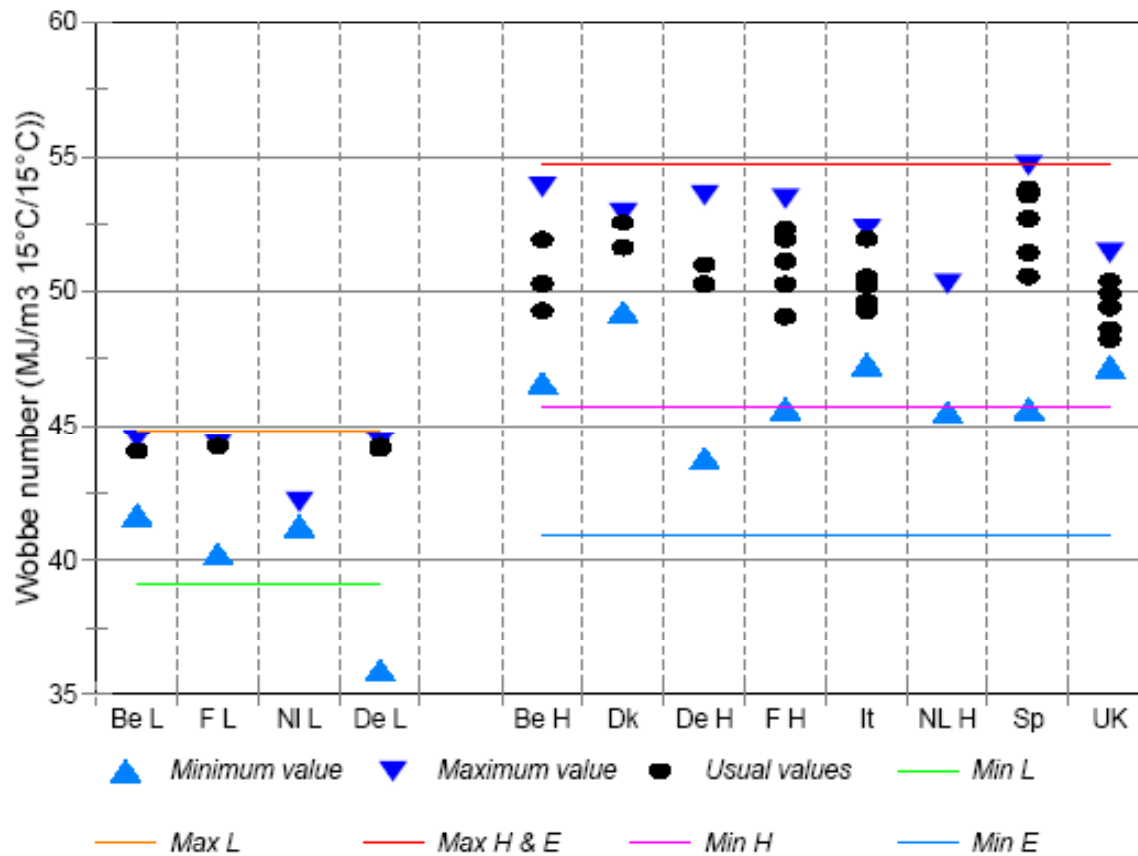
● Space heaters – visual flame effect, sooting

● Domestic & commercial catering – radiant grills

● Natural gas vehicles – impact of N<sub>2</sub>

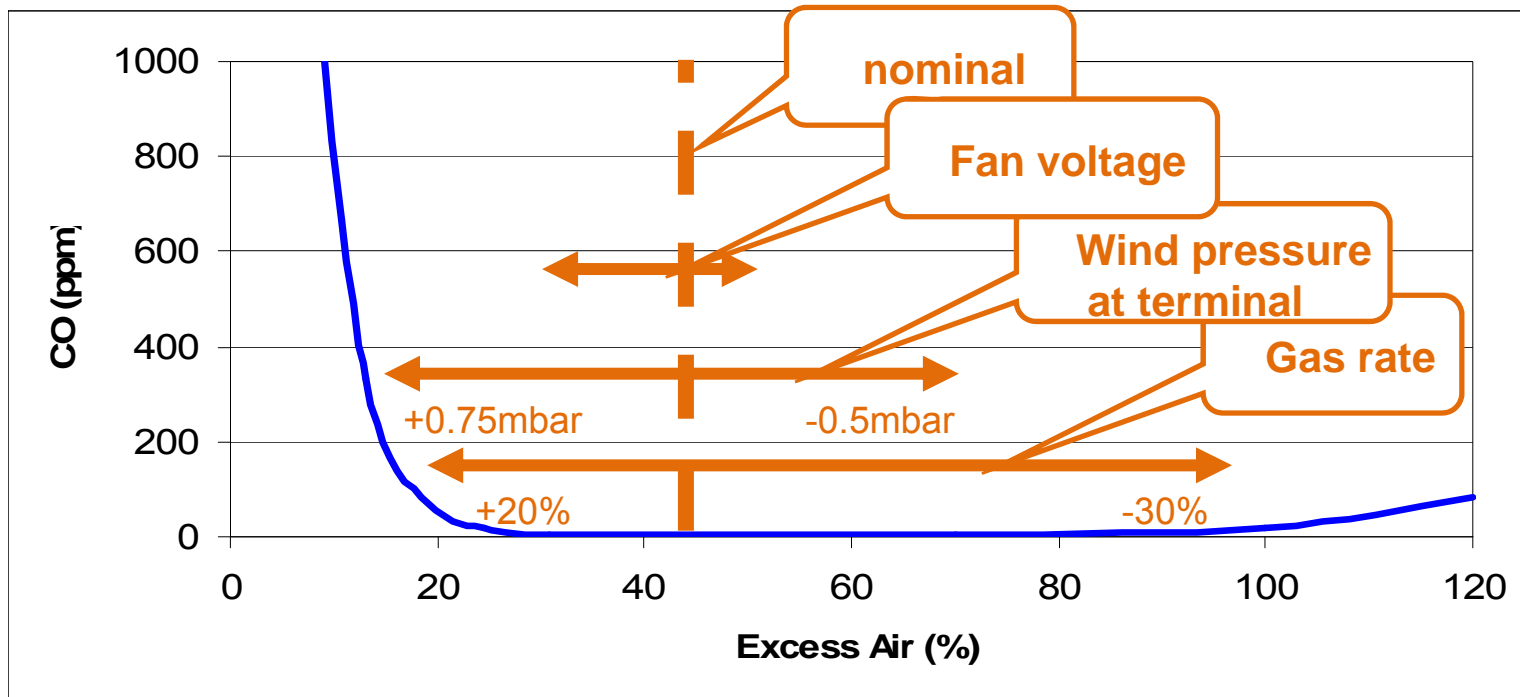
● Fuel cells - reformers

# Current Gas Wobbe No.



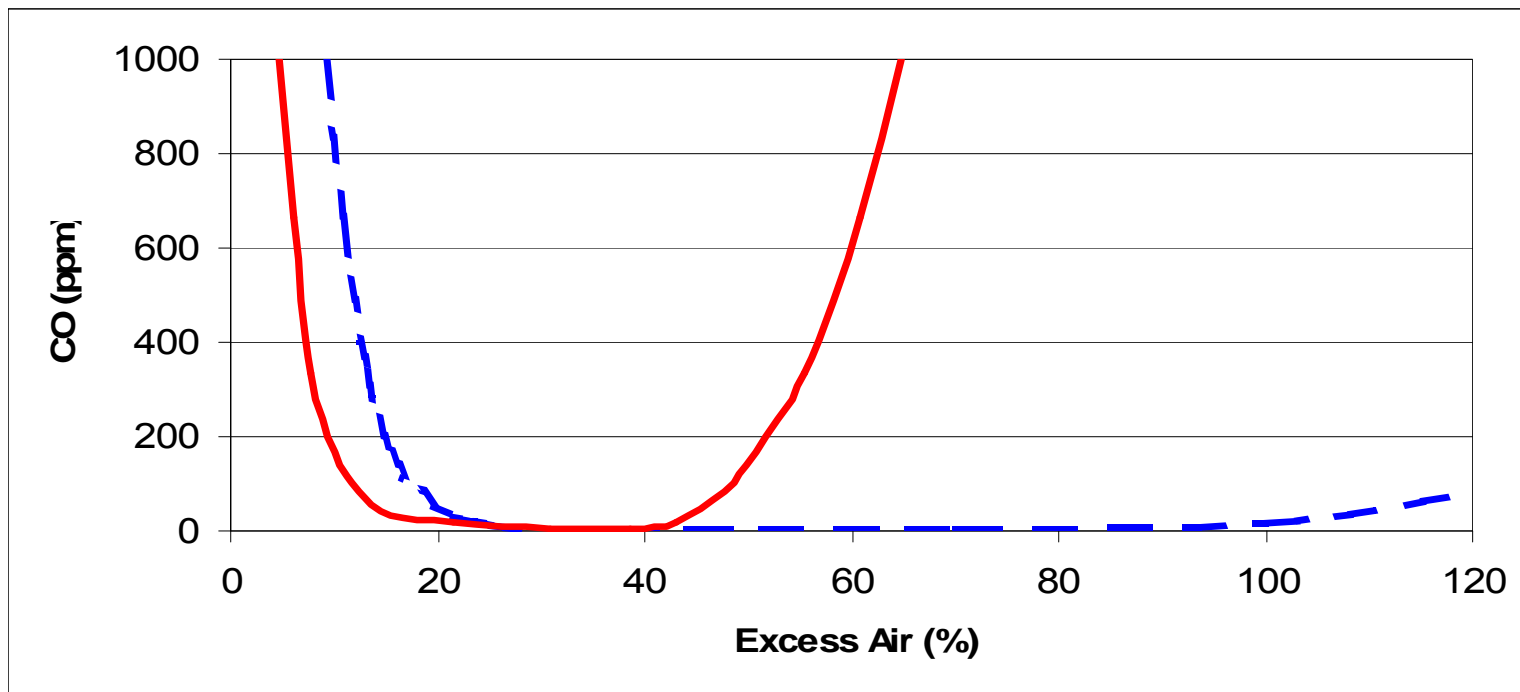
# Combustion Performance

## Partially aerated burner



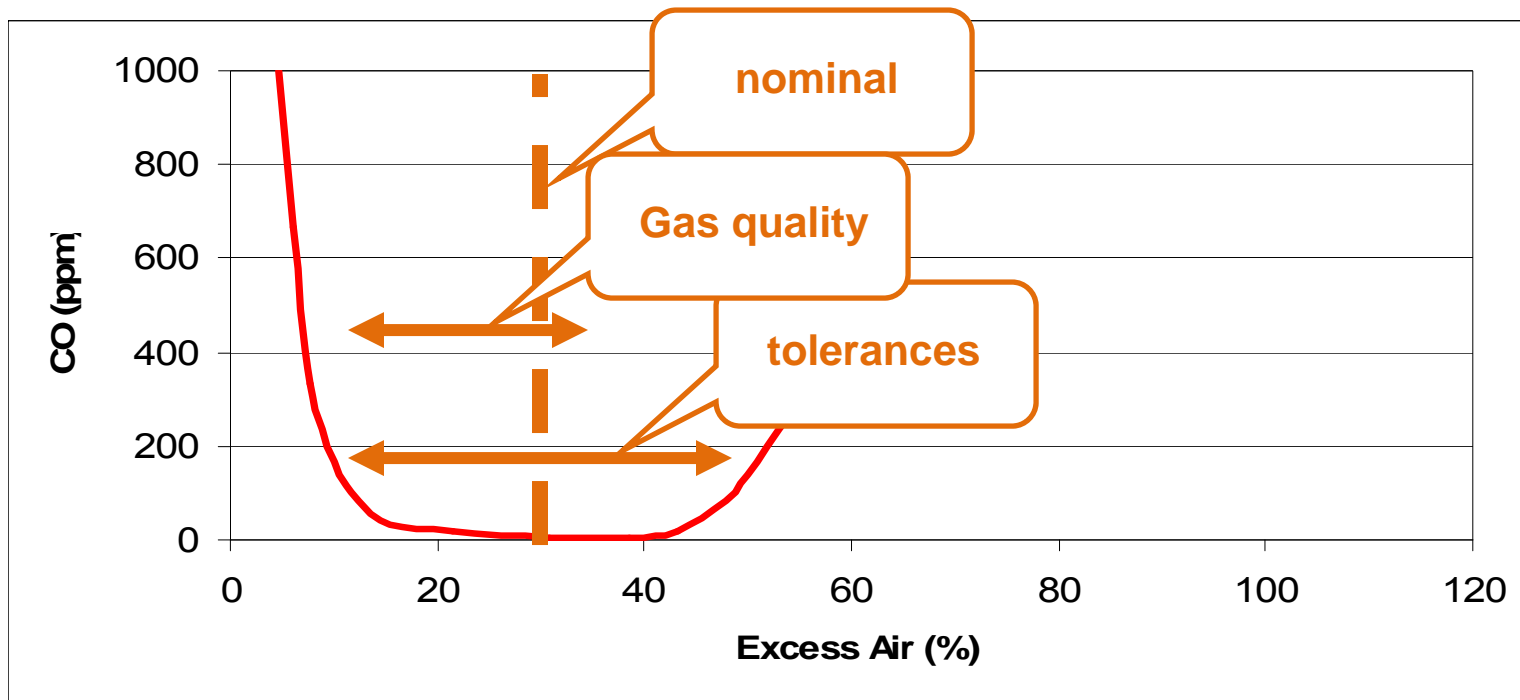
# Combustion Performance

## Partially aerated burner / Fully Pre-mixed



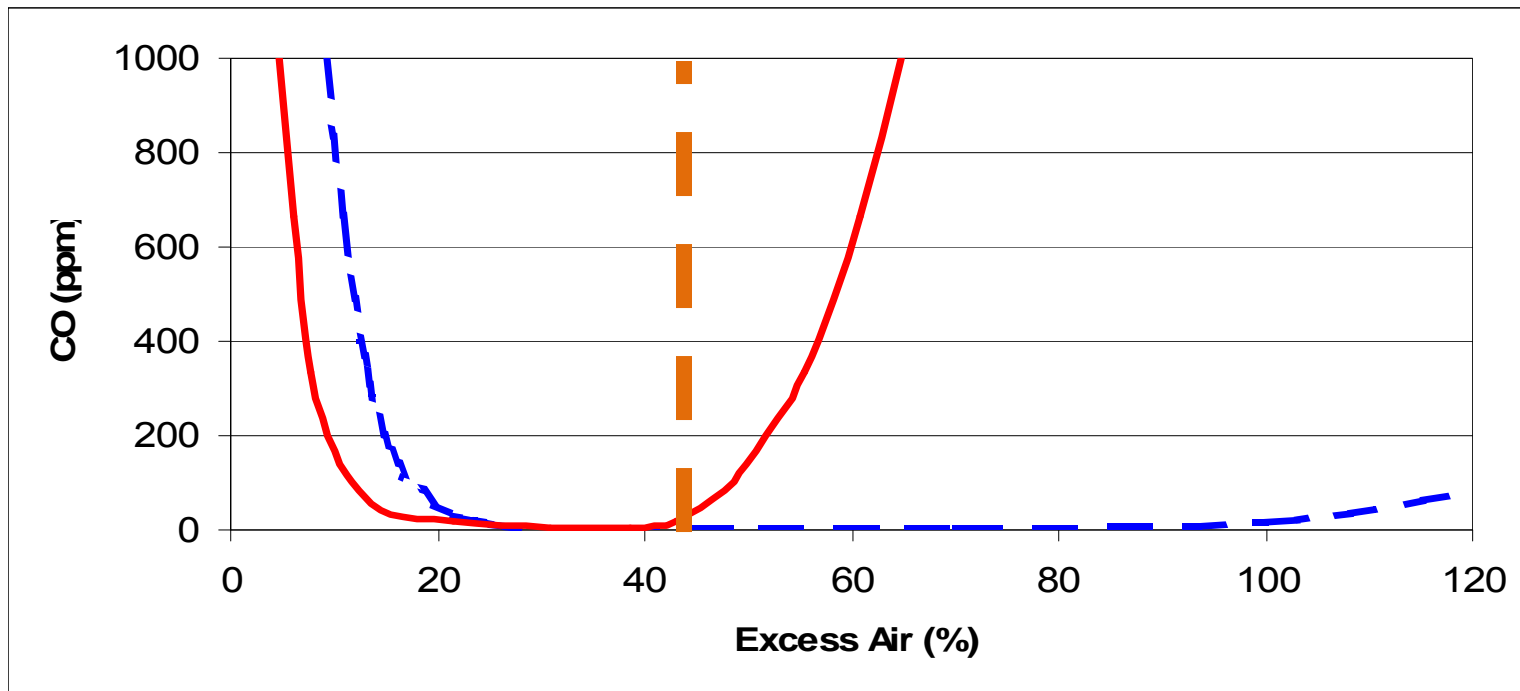
# Combustion Performance

## Fully Premixed burner



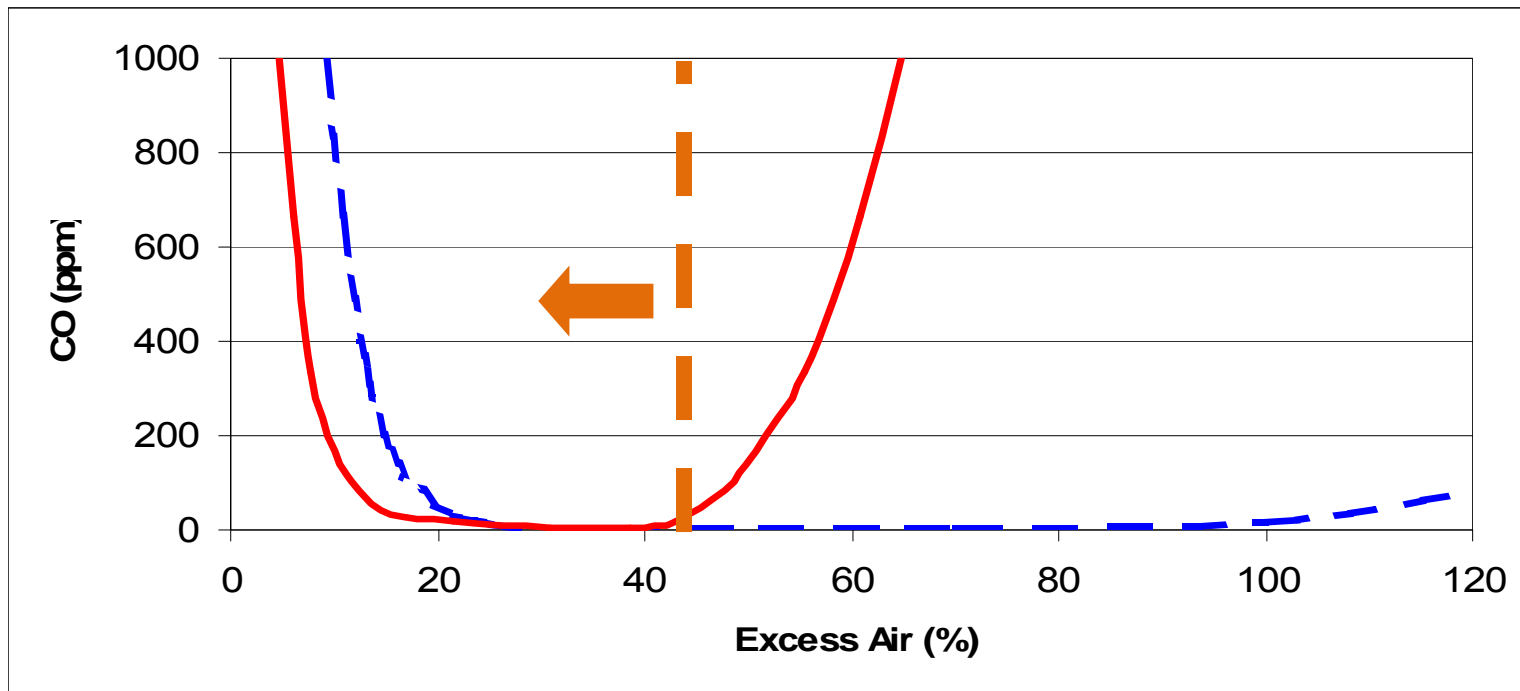
# Combustion Performance

## Partially aerated burner / Fully Pre-mixed



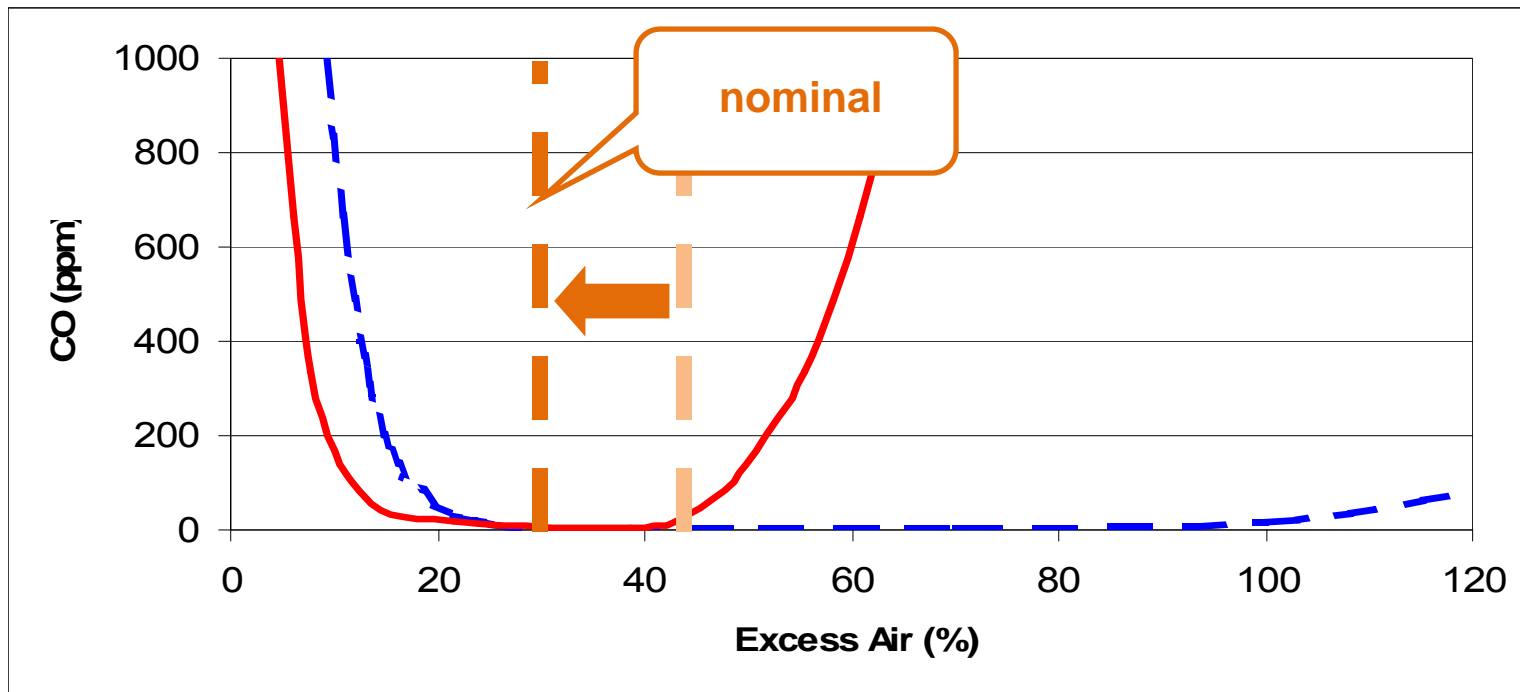
# Combustion Performance

## Partially aerated burner / Fully Pre-mixed



# Combustion Performance

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# Gas Adaptive Controls

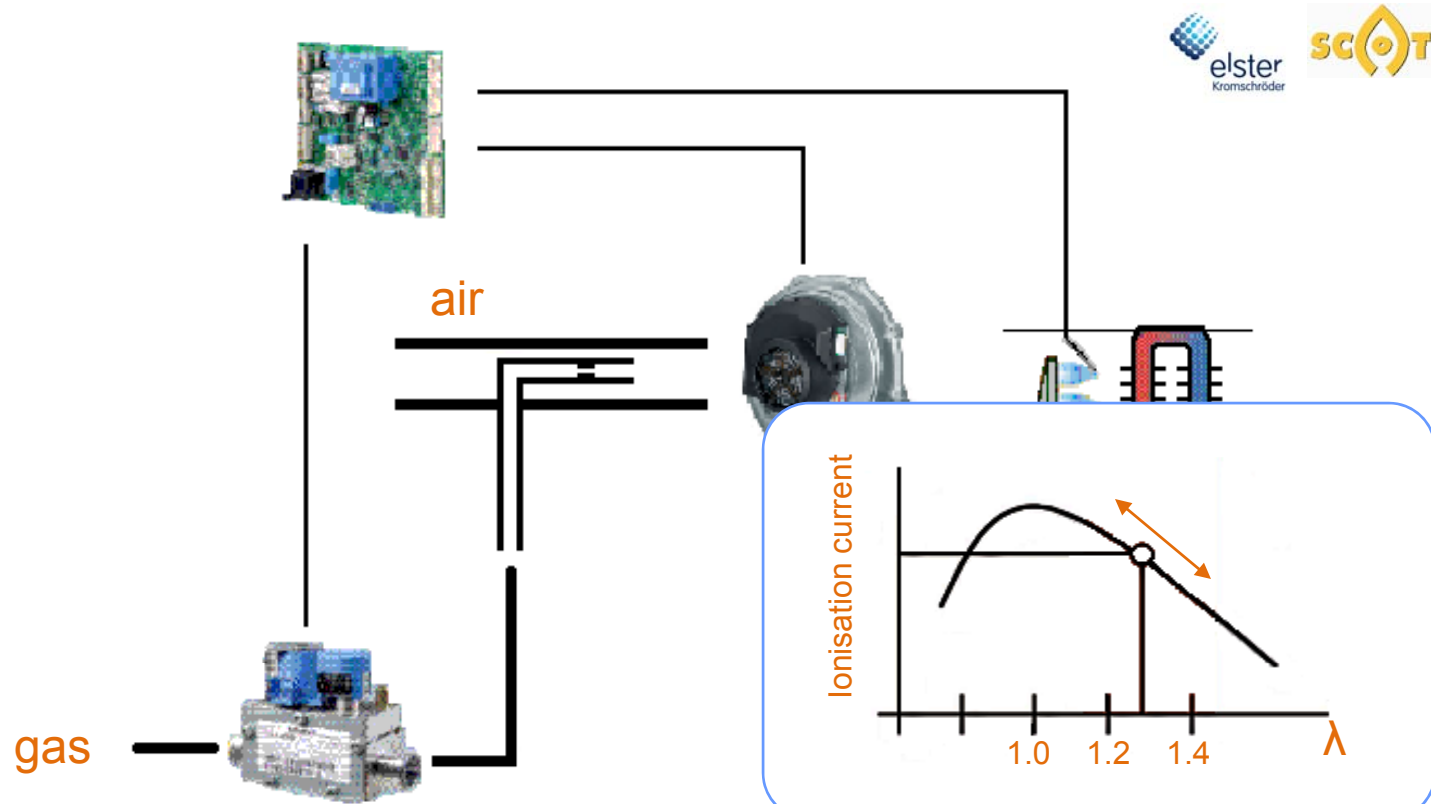
- Modify gas rate & aeration to match changing gas compositions
- Still under development
- Reached application stage
- Long term performance unknown
- Current developments reduce ability to meet other key requirements

# Gas Adaptive Controls

- Options based on:
  - Oxygen sensors
  - Ionisation current
  - Micro-bridge mass flow sensors

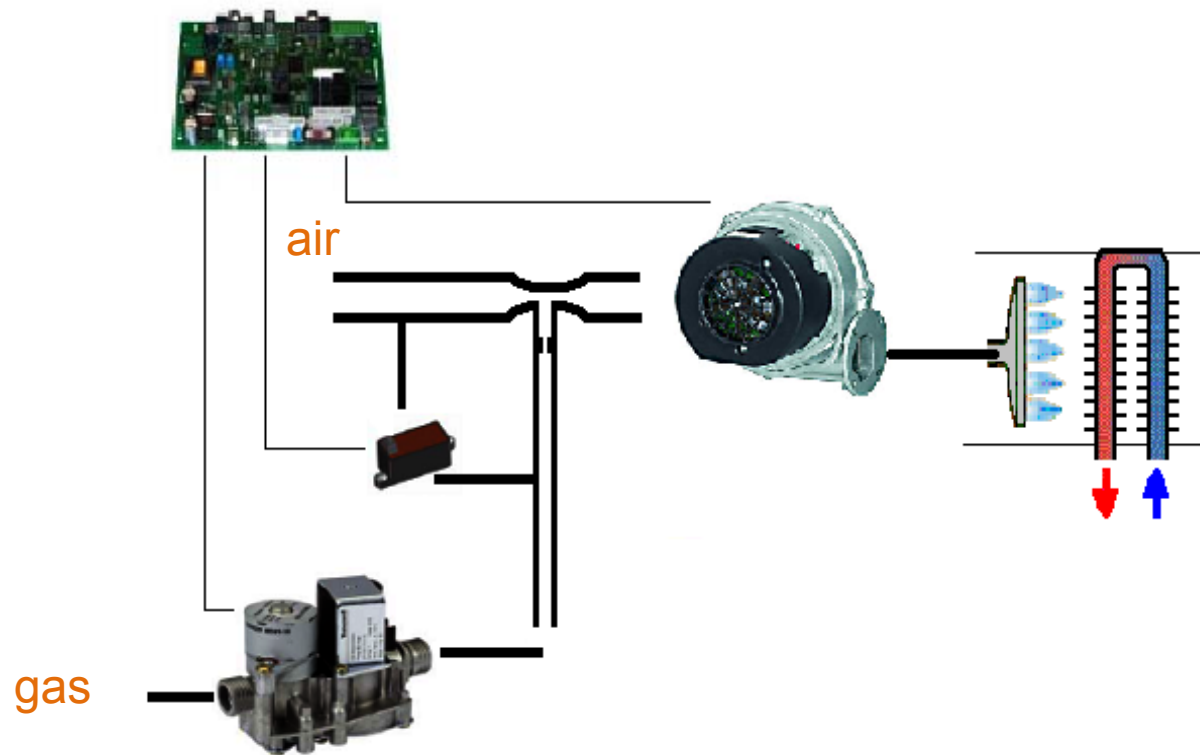


# Gas Adaptive Controls



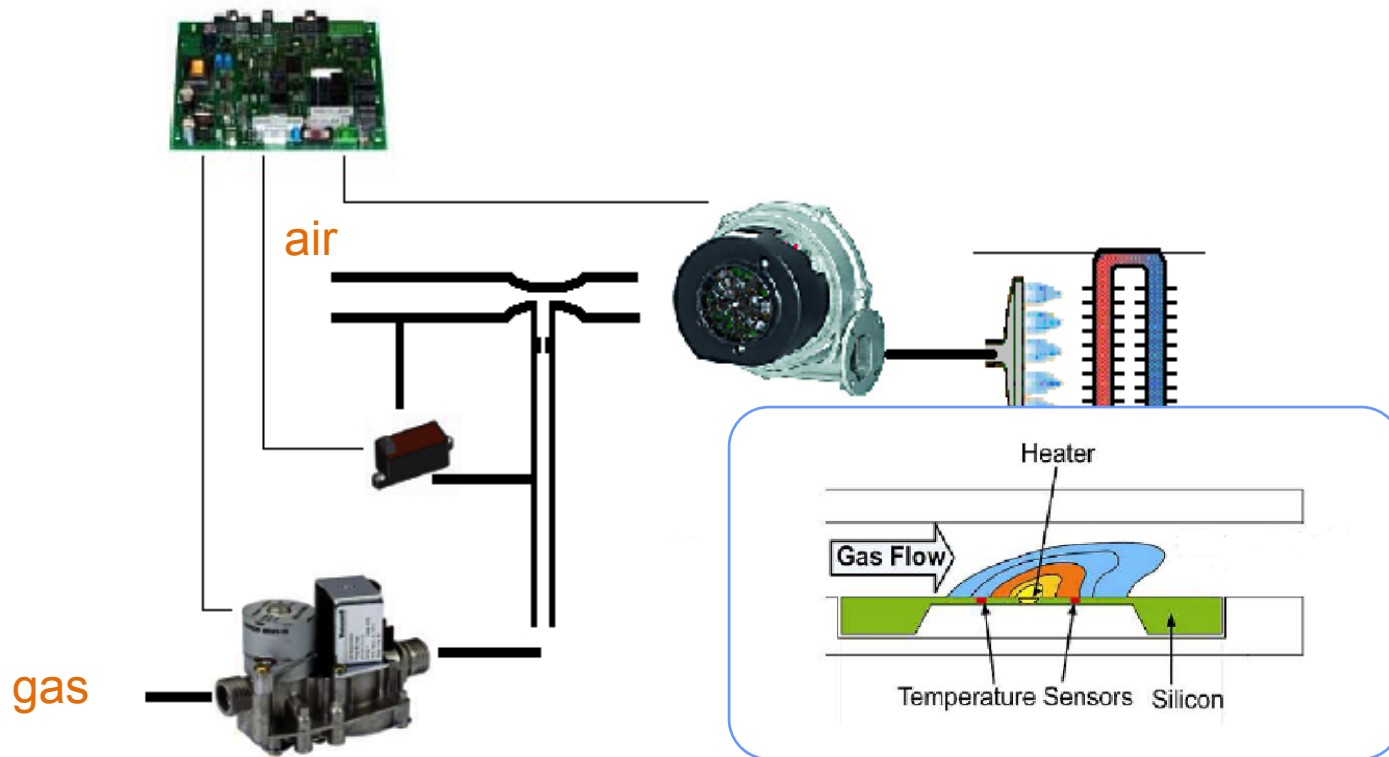
# Gas Adaptive Controls

Honeywell



# Gas Adaptive Controls

Honeywell



# Conclusions

- GAD compliant appliances are not required to operate over a wide range of gas qualities
- Modern high efficiency appliances are less tolerant to wide variations in Wobbe No.
- Technologies for gas adaptability are appearing
- Increasing range of conflicting requirements have to be met

