
Oxy Fuelling Approach

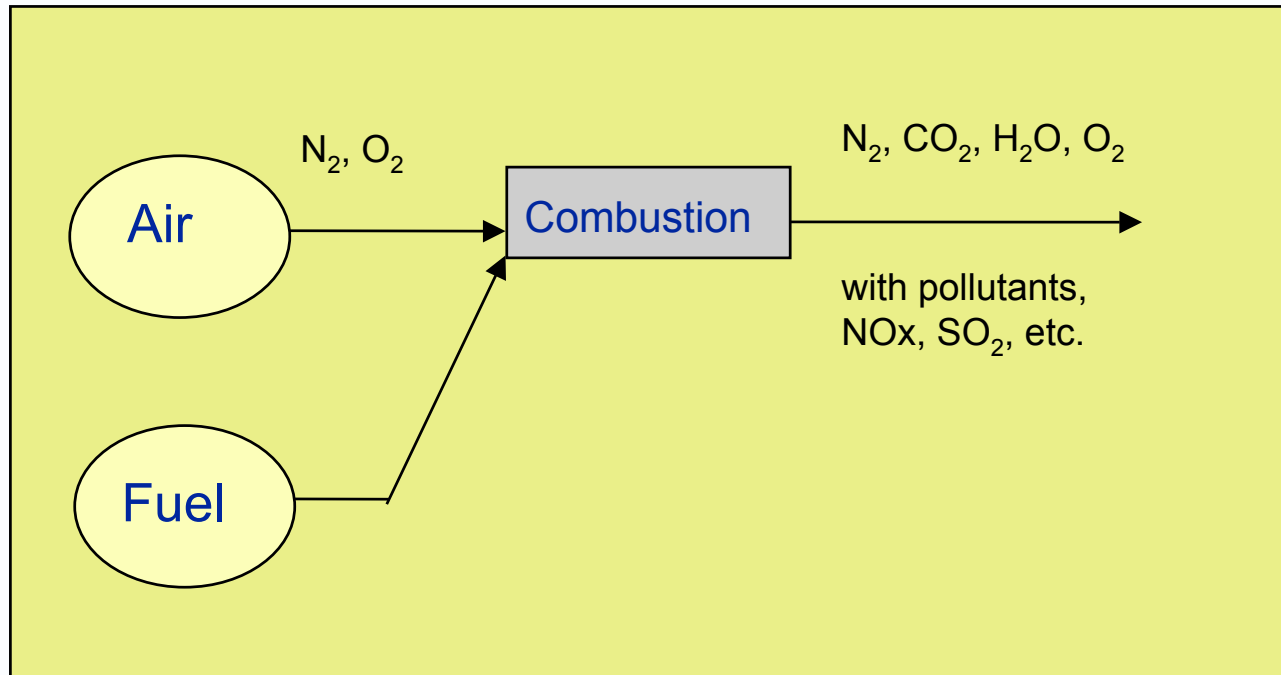
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Oxyfuel Firing - Introduction

- The combustion of fuel in an oxygen rich atmosphere, and/or where the Nitrogen in the air is replaced with CO₂
- Typical CO₂ concentration with conventional 'air' firing
 - Gas 4%
 - Oil 8%
 - Coal 14%
- Achievable CO₂ concentration with Oxyfuel 90+%

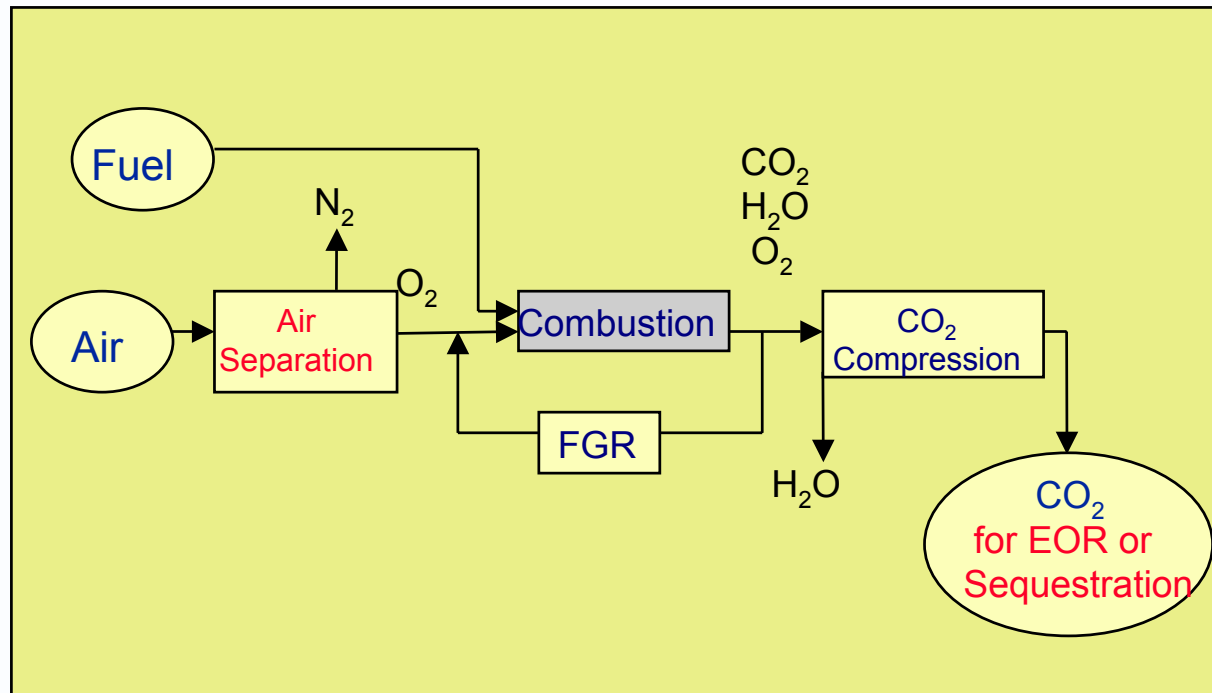
Introduction (2)

- Conventional air firing



Introduction (3)

- Oxyfuel firing



Flue gas composition CO₂ and H₂O

Introduction (4)

- Oxyfuel firing provides an alternative to
 - Pre-combustion IGCC
 - Post combustion alternatives of chemical absorption, physical adsorption, membrane separation and cryogenic separation, and future 'novel' technologies
- Produces a pure (or nearly pure) stream of CO₂ for storage/sequestration
- Can be applied as retrofit or for new-build

Oxyfuel firing Issues

- Boiler performance
- Air entrainment
- CO₂ Quality
- Auxiliary Plant power (ASU)
- CO₂ and pollutant removal

however...

- Oxyfuel fuel firing is a viable concept, with pilot plant test work already being completed in Canada and the UK, but requires demonstration

Operational & Practical issues

- In retrofit application, boiler plant performance has to match pre-conversion performance
 - O₂ concentration ~ 25-30% to burner (i.e. $\frac{2}{3}$ rds recycle gas rate)
- For new build O₂ level could be higher
- Boiler leakage (ambient air ingress) issues will dilute CO₂ concentration and increase duty on the CO₂ separation plant
- CO₂ quality according to sequestration/design of boiler plant

Operational & Practical issues (2)

- Additional auxiliary plant power consumption, for the ASU and compression plant, could be ~30% of the unit output. This issue in particular is a major challenge.
- CO₂ and pollutant removal – requirements depend upon the method of sequestration, however for aquifers, all pollutants could be sequestered with the CO₂, with savings on FGD plant

Progress in US

- The BP Carbon Capture project is one of many initiatives being supported by the DOE. This is a \$10m project (over 3 years).
- \$2bn DOE spending over 10 years - Clean Coal Power Initiative, to demonstrate emerging technologies. Precursor to Vision 21. For CO₂ capture it aims to have in 2004 an integrated 100MWe Power/sequestration project underway, and a portfolio of commercially ready technologies ready for 2012 assessment.

Progress in Canada

- Lead by the Canadian Clean Power Coalition (partnership between industry and Government, including US DoE)
- Aims to have
 - Full scale demonstration of CO₂ Capture (retrofit) by 2007 (Boundary Dam?)
 - New full scale CCP demonstration, with CO₂ capture by 2010
- For retrofit plant, choice is between Amine scrubbing and oxyfuel. Techo/economic review is due to report mid 2003, variety of coals, boiler designs

Canadian Initiatives

- Other projects, involve pilot testing of oxyfuel firing on a 300kW pilot plant
- Development of a oil/gas fired mobile oxyfuel fired boiler for testing of CO₂ sequestration at various sites



Summary

- US and Canada have demonstration projects planned for CO₂ capture from existing coal fired power plant, with oxyfuel firing as a serious option for the retrofit plant at least.
- Choice of capture technology will be very site specific, also the method of downstream sequestration.
- UK could benefit by helping to support UK industry involvement in the Canadian initiatives
- Oxyfuel firing is viable, needs demonstration.