



CARBON CAPTURE

The effects of global warming, caused by carbon dioxide emissions, are well known and a source of international concern. Carbon Capture and Sequestration (CCS) and other approaches to limit emissions of carbon from power generation and industrial production are of major importance to the world economy.

Technology choice and plant integration are key issues for both retrofit and greenfield designs. Costain has experience of a range of carbon capture technologies, particularly low temperature separation, and is continuing to develop innovative processes.



EXPERTISE IN A RANGE OF CARBON CAPTURE TECHNOLOGIES

EXPERIENCE IN CO₂ RECOVERY, PURE CO₂ PRODUCTION AND CONDITIONING FOR TRANSPORT

PROPRIETARY TECHNOLOGY FOR EXCELLENT PERFORMANCE AT MINIMUM COST

COSTAIN'S CAPABILITY

Costain has a wealth of experience in the design of systems for carbon dioxide production, including recovery, purification, compression, dehydration, liquefaction and underground gas storage. Along with our knowledge of the different routes to capture, this puts us in a position to be an overall project integrator, delivering a complete solution from source to sink.

The unusual physical behaviour of high pressure carbon dioxide is a particular consideration in design of these systems. We can design systems for carbon dioxide conditioning for both pipeline and tanker transport. We are also familiar with the use of carbon dioxide for enhanced oil recovery (EOR) and have experience in the underground storage of gas in depleted oil and gas reservoirs and salt caverns.

PROPRIETARY TECHNOLOGY

We continually improve our technologies to optimise the performance of our processes. Recent patents include CO₂ removal from oxyfuel flue gas, synthesis gas and natural gas with high CO₂ content.

Our technology development is underpinned by experience, which covers a number of different carbon dioxide capture technologies, including:

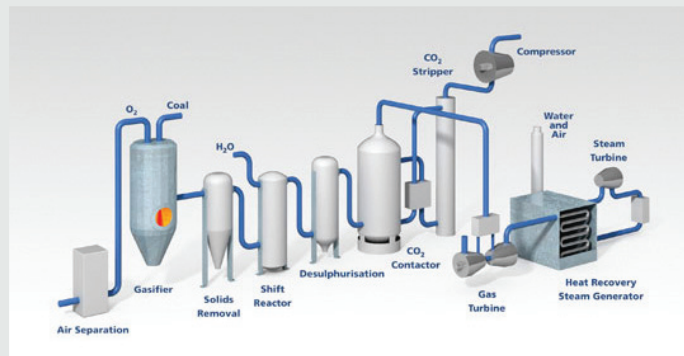
- chemical and physical absorption systems
- adsorption (molecular sieve)
- semi-permeable membranes
- cryogenic gas processing
- hybrid schemes

This enables us to take an independent view on process options, offering process selection, conceptual design and assessment of investment opportunities.

RELEVANT EXPERIENCE

Next Generation Capture Technology (NGCT)

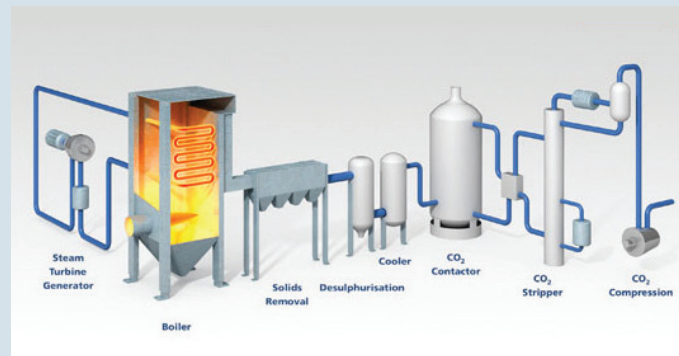
Pre Combustion



- Low temperature capture of CO₂ (>95%). Produces high pressure CO₂
- Fits into a typical Integrated Gasification Combined Cycle (IGCC) capture scheme by adding a stage that liquefies the CO₂ and removes it by phase separation
- Reduces the capital and operating costs of the solvent absorption unit and the CO₂ compressor
- Costain has patents for this solution and has completed a concept design for a pilot plant installation with support from the Energy Technologies Institute

Reduced Elevation CO₂ Absorber Programme (Recap)

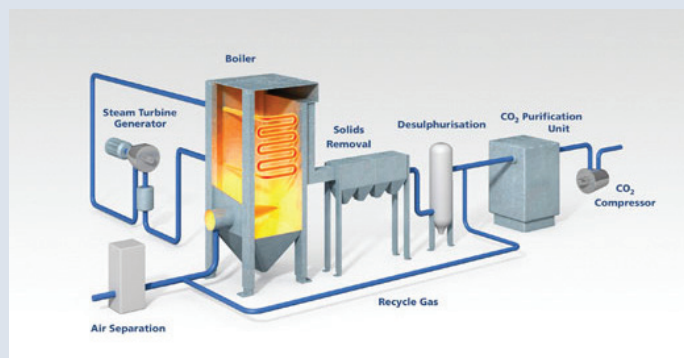
Post Combustion



- Design of a novel absorber column to capture CO₂
- Novel way of contacting flue gases and chemical solvent in a cross-flow system
- Reduces construction time and cost as well as visual impact. Improves operational flexibility and potential for upgrading
- Costain has developed the basic design together with University of Edinburgh, with funding from the Department of Energy & Climate Change (DECC)

Oxyfuel Penalty Reduction Option Programme (Oxyprop)

Oxyfuel



- Application of Costain patented CO₂ separation and compression technology; low temperature processing with close heat integration to capture CO₂
- High thermodynamic efficiency, close integration of CO₂ purification with compression train, no use of process solvents/sorbents or external refrigeration
- Costain has developed the basic design together with Universities of Edinburgh and Leeds, with funding from DECC

Statoil Kårstø, Norway

Carbon Dioxide Recovery Screening



- Study for EOR project at Europe's largest natural gas processing plant
- Recovery and purification of 1 million tonnes per annum of CO₂
- Evaluated technologies include chemical and physical absorption processes, cryogenic and extractive distillation, molecular sieve adsorption, membranes and modification of the NGL extraction plant
- Costain identified suitable technologies and optimal locations for the unit and investigated the possibility of ethane co-extraction