CO_2 Capture Project®

CCP PROJECT FACTSHEET

OXY-FUEL – ONCE-THROUGH STEAM GENERATORS (OTSG) PILOT TEST

OVERVIEW

The CO_2 Capture Project (CCP), joined by Cenovus Energy, Devon Canada, Praxair and Statoil, is piloting oxy-fuel combustion technology to reduce CO_2 emissions from once-through steam generators (OTSG). OTSG boilers are the primary source of CO_2 emissions from in-situ production of heavy oil.

The demonstration is part of the CCP's work to develop next generation technologies that will make CO_2 Capture and Storage a practical and cost effective option for reducing CO_2 emissions from fossil fuels.

THE PROJECT

Goals

The main goals of the project are:

- To evaluate the integration of oxy-fuel combustion and CO_2 capture technology into the operation of a OTSG boiler to enable CO_2 sequestration
- Provide design and cost estimates for a commercial-scale OTSG boiler with CO_2 capture, purification and compression

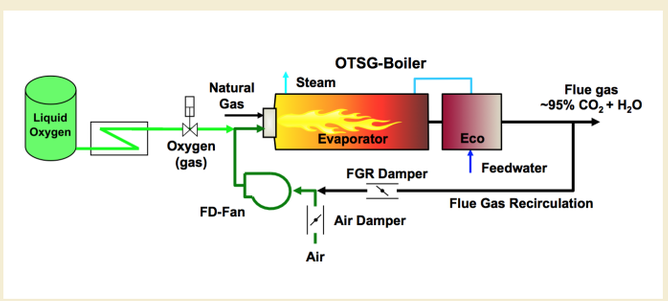
Oxy-fuel combustion in OTSG is expected to have several advantages over post-combustion capture with amines, including:

- Ability to capture up to 99% of the CO_2 emissions
- Lower levelized capture costs
- Lower total energy and operation and maintenance costs
- Significant reductions in emissions of air contaminants, specifically oxides of nitrogen
- Recovery of water from the flue gas, thus reducing or eliminating the need for boiler make-up water
- No requirements for amine or ammonia solvents, which may pose operational and environmental challenges
- The potential for improved boiler efficiency as there is no nitrogen present in the combustion process.

Oxy-Fuel Combustion to Reduce OTSG Emissions

Once-through steam generators (OTSGs) burn large amounts of natural gas, and are the primary source of GHG emissions from the in-situ production of bitumen from Canada's Athabasca oil sands. OTSGs are used in steam-assisted gravity drainage (SAGD) operations; these types of operation will be the primary source of growth in heavy oil activities for the foreseeable future, as upwards of 85% of bitumen resources in Canada can only be extracted through in-situ production methods. This is an important area of development which could help significantly reduce the greenhouse gas emissions of these operations.

The CCP identified oxy-fuel combustion as a leading candidate for OTSG boilers. Oxy-fuel technology uses nearly pure oxygen instead of air for combustion. By eliminating nitrogen, a flue gas with concentrated CO_2 is produced, which requires minimal clean-up prior to compression and transport to long-term geological storage.



Three Phase Project:

The project is being carried out in three phases; the first has been completed:

Phase I – Design basis for pilot and commercial-scale OTSGs (Complete)

Phase I, at an approximate cost of CAD$1 million, was completed in 2010 and optimized the design and costs of both a pilot-scale and commercial scale boiler. This phase included the establishment of the design basis for a commercial scale boiler system as well as a test sized boiler.

The results of this phase indicate that the costs of capturing CO_2 with oxy-firing will be in the range of CAD$125-150 per tonne CO_2 avoided, which is significantly less than post-combustion capture technologies for this application.

Phase II – Pilot test of oxy-fuel combustion on test boiler (2011-12)

Phase II of the project, at an approximate cost of CAD$5 million, will pilot oxy-fuel combustion on a 50 MMBTU/hr OTSG unit at Cenovus Energy's Christina Lake in-situ site. This phase will modify and operate a OSTG for oxy-fuel combustion, without capture and compression, for several weeks to demonstrate feasibility and provide essential data to design a full scale system. The oxygen for the test will be provided by trucking liquid oxygen from an existing air separation plant.

The project participants were awarded a $2.5 million grant from the Alberta Climate Change Emissions Management Corporation (CCEMC) to partially offset the costs of the pilot programme; final approval to proceed with this Phase is expected in the fall of 2010.

Phase III – Addition of purification, compression and sequestration to pilot

Phase III would convert the oxy-fuel test completed in Phase II into a long term pilot by adding permanent oxygen supply and a CO_2 Processing Unit. Cost estimates and test plans developed in Phase I along with a successful Phase II will be used when making a decision whether to proceed with Phase III.

Project Participants

The project participants include the CO_2 Capture Project, Devon Canada, Cenovus Energy, Statoil ASA and Praxair, Inc. Cenovus Energy is hosting the test at their Christina Lake in-situ site, and Praxair is the prime technology provider. Suncor is the project lead.

The Climate Change and Emissions Management Corporation (Alberta) has awarded the team CAD $2.5 million in funding.

ABOUT THE CO_2 CAPTURE PROJECT

The CO_2 Capture Project (CCP) is an award-winning partnership of several major energy companies working to advance the technologies that will underpin the deployment of industrial-scale CO_2 capture and storage. To find out more visit www.co2captureproject.com