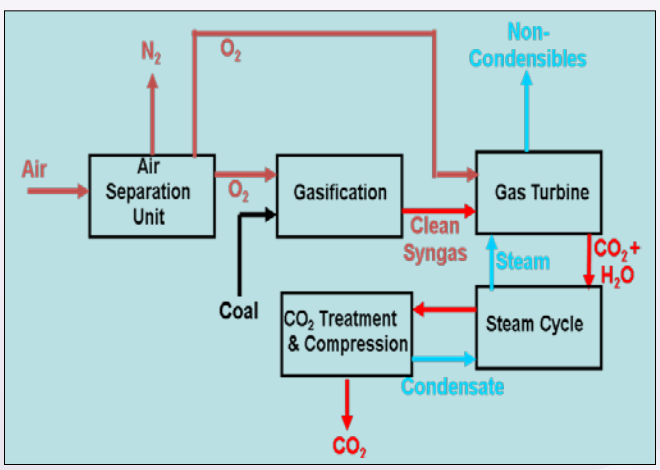
OXY COMBUSTION GAS TURBINE CYCLES FOR CO_2 CAPTURE

OVERVIEW

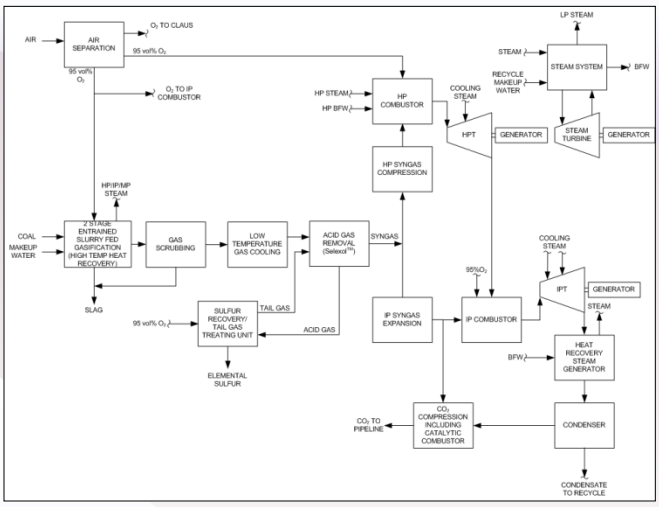
CO_2 is the primary constituent in earth's atmosphere that contributes to the greenhouse effect. As it becomes increasingly likely that CO_2 emissions in the future will be regulated from power plant sources, new processes are being developed to capture the CO_2 from flue gases ("post combustion capture") of fossil fueled power plants. In this approach consisting of post combustion capture, a fuel such as natural gas or coal derived syngas is first combusted in a gas turbine with nearly pure O_2 ('oxy combustion'). The resulting flue gas is essentially a mixture of CO_2 and H_2O without significant amounts of N_2, making it easier to separate out a relatively pure CO_2 stream for sequestration while emitting essentially no CO_2 to the atmosphere. Recycle of CO_2, steam and/or water to the combustor is required to control turbine firing temperature. A large air separation unit is required, however, to supply the required O_2 for combustion which tends to be capital intensive and also a major parasitic power consumer and advances in air separation technology will have significant impact on improving the economics of this approach of producing electric power with near zero emissions.



GAS TURBINE BASED COAL FUELED OXY COMBUSTION CONCEPT

GOALS

•Conduct concept feasibility studies to assess improvements to the gas turbine based oxy combustion process and asses its performance in natural gas and coal fueled power plants
•Identify technical issues associated with applying the oxy combustion concept



SYSTEMS INTEGRATION IN GAS TURBINE BASED COAL FUELED OXY COMBUSTION POWER PLANT

RESULTS

CO_2 capture approaching 100% is technically feasible. Due to the very large concentration of H_2O in the combustor of the gas turbine and use of a reheat combustor, NO_x formation can be minimized. Any pollutants formed during the combustion process are contained within the CO_2 stream and are not emitted to the atmosphere. Purity of the CO_2 produced by the plant is set by purity of the O_2 stream generated by the air separation unit (used in the combustor and in the gasifier in the case of a fuel such as coal). O_2 purity typically greater than 95% is required to meet the CO_2 specifications for enhanced oil recovery. Unless very deep CO_2 capture, in excess of 99% carbon capture is required to meet any stringent control requirements that may be imposed in the future, the concept does not show an advantage over other approaches such as post-combustion amine wash in the case of natural gas fired plants and pre-combustion carbon capture in the case of coal gasification based power plants utilizing current cold gas cleanup technology. The humid gas cleanup technology currently under development for coal gasification based plants can improve the thermal performance significantly for the oxy combustion approach and may be a key technology required to make the oxy combustion approach viable for such power plants.

RECENT PUBLICATIONS/PAPERS

A.D. Rao, "Oxy Fuel Technology," *presented at the International Colloquium on Environmentally Preferred Advanced Power Generation - ICEPAG 2008,* Newport Beach, California, January 29, 2008

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