Oxyfuel Combustor Arrangements to Reduce Emissions (#4897)

An arrangement to improve combustion systems using controlled gas flows

Georgia Tech researchers have developed a combustor system and method for an oxy-fuel type combustion reaction. The system includes a set of nested cylindrical shells and strategically placed carbon dioxide, oxygen, and fuel inlets. The shells form separate mixing zones for first mixing oxygen and carbon dioxide and then for introducing fuel into the system. A combustion zone is also included, and a series of openings in the inner shell can be used to divert carbon dioxide from the inlet away from the first mixing zone to mix with and cool the combustion product prior to reaching the turbine inlet nozzle. The oxygen to carbon dioxide ratio can also be varied to increase flame stability and to control the combustion product temperature. The system is also compatible with a high-pressure oxygen stream, which reduces costs and assists in regulating pressure drops and improving gas mixing.

Benefits/Advantages

- Reduce carbon dioxide emissions
- Reduce costs
- Improves power production and fuel efficiency
- Carbon dioxide can be used to cool the combustion product

Potential Commercial Applications

- **Gas turbines**- aircraft engines and power plants
- **Turbines**- single and multiple shaft or a non-integrated turbine with an external burner
- **Standalone configuration**- furnace

Background/Context for This Invention

In efforts to reduce carbon dioxide emission, an oxy-fuel gas turbine has been proposed as a lower cost and more efficient alternative to fuel de-carbonization and post-combustion capture. However, the implementation of a commercial oxy-fuel gas turbine that utilizes carbon dioxide as the working fluid poses development challenges related to the combustor implementation. Therefore, there is a need for an improved system that maintains stoichiometric combustion in an oxy-fuel type combustion reaction.

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More Information

U.S. Patent Issued - 9353940

Publications

For more information about this technology, please visit:
https://licensing.research.gatech.edu/technology/oxyfuel-combustor-arrangements-reduce-emissions

Images:

The automated sequential delivery of multiple fluids. A varying number of delay gates imprinted in the branches are shown in the figure.

COVID-19 and flu saliva test on paper: (A) The automatic sequential delivery of multiple reagents required for virus test; (B) Water pouring into the device triggers the virus assay, allowing the presence of SARS-CoV-2 and influenza A & B viruses to be visually identified by the color changes in the corresponding detection spot