Brigham Young University

DE-FE0029157 Program Manager: Arun Bose

Technology Development for a Pressurized Dry Feed Oxy-Coal Reactor

Team: **BYU, Reaction Engineering, CPFD Software**

Objective: **Develop technologies and data that will enable successful design and operation of a pressurized oxy-coal combustor**

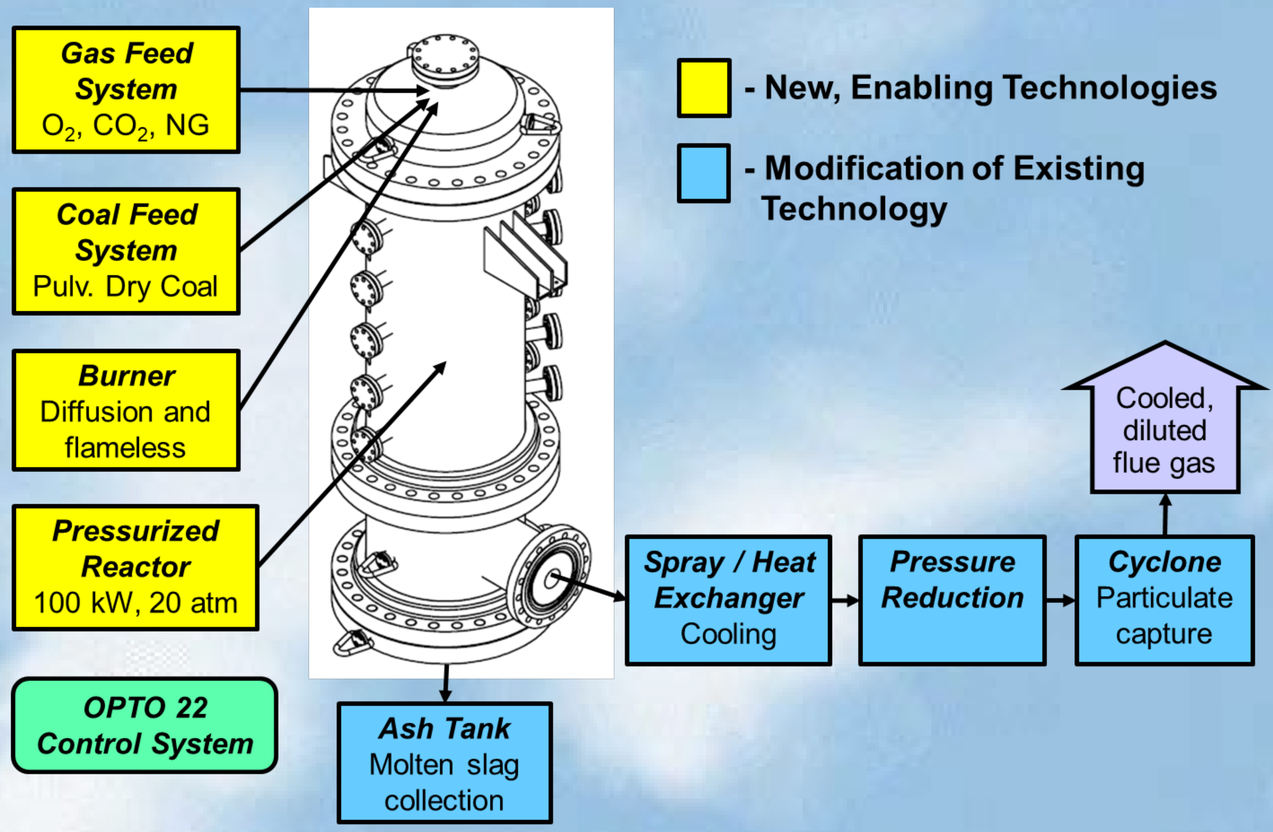
Key Technology Development:

- **100 kW 20-atm pressurized oxy-coal reactor**
- **Scalable pressurized, continuous dry coal feed system**
- **Scalable O_2-CO_2-coal firing systems for diffusion flame and flameless combustion**
- **Mechanistic-based hybrid process model to guide reactor scale-up and plant integration**

Key Research Tasks:

- **Evaluate high pressure dry coal feed system design and performance**
- **Measure impact on combustion and heat transfer characteristics from:**
  - **Diffusion flame and flameless combustion**
  - **System stoichiometry changes**
  - **System pressure changes**
  - **Flue gas recycle properties**
- **Use modeling to design and evaluate:**
  - **Process conditions (FENICS, SGE process models)**
  - **Dense flow feed system (CPFD's Barracuda CFD)**
  - **Burner design/reactor combustion (REI's Glacier CFD)**
  - **Reactor scale-up/cycle efficiency (PCHT hybrid model)**

BYU Pressurized Oxy-Coal Reactor



Key Measurements:

- **Reactor wall temperature (embedded TC)**
- **Heat flux profile (embedded TC)**
- **Radiation intensity (NA radiometer, optical pyrometer/FTIR)**
- **Gas and particle temperature (optical pyrometer/FTIR)**
- **Flue gas properties at reactor exit (suction pyrometer)**
- **LOI/Particle burnout (slag tank and cyclone samples)**

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