



EERC

Technology Demonstration

Providing commercial viability in real-world scenarios

WITH MORE THAN 54,000 square feet of technology demonstration facilities, the Energy & Environmental Research Center (EERC) brings together state-of-the-art equipment and the expertise of a multidisciplinary team to solve global energy and environmental issues. This synergy expedites the rapid development and demonstration of client technologies for commercial deployment.

The facilities contain a variety of space for a multitude of technologies, as well as room for construction of new components to fit client needs. Much of the design and creation of the equipment and machinery is done on-site, allowing the EERC to demonstrate technologies in a more rapid, cost-effective way.



COMBUSTION SYSTEMS

We have been performing controlled combustion tests using bench- and pilot-scale combustion systems for decades. The systems have been used for a wide range of testing applications, including the evaluation of technologies for emission control and to understand the impact of combustion on a wide range of fuels.

COMBUSTION UNITS TO FIT YOUR NEEDS

- Drop-tube furnaces (atmospheric and pressurized)
- Fluidized-bed combustors
- Combustion test facility (550,000 Btu/hr, 150 scfm)
- Conversion and environmental process simulator (4–6-lb/hr coal feed rate or bottled gas)
- Particulate test combustor (550,000 Btu/hr, 150 scfm)
- Slagging furnace system (2.5 million Btu/hr)
- Fuel-processing system (coal and biomass)

The units are equipped with state-of-the-art measurement capabilities and all types of pollution control equipment:

- Postcombustion CO₂ capture
- Selective catalytic reduction (SCR) reactor
- Electrostatic precipitators (ESPs)
- Baghouses
- Spray dryers
- Wet flue gas desulfurization (FGD) systems



GASIFICATION AND GAS CLEANUP SYSTEMS

The EERC has multiple gasification systems capable of gasifying coal, biomass, and other solid or liquid feedstocks at a wide range of temperatures and pressures. We will work with you to determine which gasification system is most useful for your specific project.

Our portable bench-scale warm-gas cleanup train can be placed on any gasification system to reduce sulfur levels to less than 0.001 ppm and particulate to less than 0.01 ppmw. Water-gas shift reactors (including sour, high-temperature, and low-temperature) can be inserted at any location in the cleanup train. A hydrogen membrane can also be inserted into any point to simulate desired operating conditions.

CHEMICAL- AND LIQUID-PROCESSING SYSTEMS

- Small continuous reactor
- Large continuous reactor
- Continuous tubular reactor
- Batch reactors
- Fischer-Tropsch reactor skid

MAIN GASIFICATION UNITS

- Continuous fluid-bed reactor (CFBR)
- Bench-scale hot-gas filter vessel
- Transport reactor development unit (TRDU)
- Entrained-flow gasifier (EFG)
- High-pressure fluid-bed gasifier (HPFBG)
- Carbonizer
- Advanced fixed-bed gasifier (AFBG)



Gasifier Name	Type	Scale	Feed Rate, lb/hr	Syngas Production, scfm	System Pressure, psi	Gasifier Nominal Temperature, °F	Warm-Gas Cleanup Capability
CFBR	Fluidized bed	Bench	4	8 on air 1.5-2 on O ₂	150	1525 (metal reactor)	Full stream
TRDU	Transport reactor	Pilot	200-500	400 on air 250 on O ₂	120	2000 refractory-lined	Slipstream, 5%
EFG	Entrained flow	Bench	4-16	16-20	300	2730 refractory-, ceramic-lined	Full stream
HPFBG	Fluidized bed	Bench	4-20	30-40	600-1000	1600 to 1800 depending on operating pressure (metal reactor)	Full stream
Carbonizer	Fluidized bed	Pilot	100-150	150 on air	150	1200 to 1800 refractory-lined	Slipstream
AFBG	Fixed bed	Pilot	33-70	35-75 on air	Ambient	1300-1550 (metal reactor)	Cold-gas cleanup train

For More Information, Contact:

John P. Kay

Principal Engineer, Emissions and Carbon Capture Group Lead
(701) 777-4580, jkay@undeerc.org

Jason D. Laumb

Principal Engineer, Coal Utilization
(701) 777-5114, jlaumb@undeerc.org

Joshua J. Stanislawski

Principal Process Engineer, Energy Systems Development
(701) 777-5087, jstanislawski@undeerc.org

Brian P. Kalk

Director of Energy Systems Development
(701) 777-5276, bkalk@undeerc.org

John A. Harju

Vice President for Strategic Partnerships
(701) 777-5157, jharju@undeerc.org

Energy & Environmental Research Center

University of North Dakota
15 North 23rd Street, Stop 9018
Grand Forks, ND 58202-9018

www.undeerc.org

