

OSU bench scale (2.5 kWth) syngas chemical looping (SCL) unit

Advanced Energy Job Stimulus Program

A key component of Ohio's program to create new jobs and encourage economic development, the \$150 million Advanced Energy Job Stimulus Program is designed to support new technology projects on a fast track toward commercialization. As part of the \$1.57 billion job stimulus package signed into law by Governor Ted Strickland in June 2008, the goal of the program is to employ Ohio workers in the advanced energy jobs of the future.



Project Name:

Pilot Scale Demonstration of the Carbon Negative Syngas Chemical Looping Process

Project Location:

Columbus, Franklin County

Applicant Information:

The Department of Chemical and Biomolecular Engineering at The Ohio State University is one of the nation's oldest and most respected programs in its field.

The principal investigator for this project will be Dr. Liang-Shih Fan of the university's Department of Chemical and Biomolecular Engineering. Dr. Fan is a Distinguished University Professor and the C. John Easton Professor in Engineering. His groundbreaking work in the area of chemical looping has received funding from the Ohio Coal Development Office (OCDO) since 1996. In its recommendation to OCDO for funding of a recent project proposed by Dr. Fan, the Ohio Coal Research Consortium wrote that his work in chemical looping – which indirectly converts coal into carbon-free energy carriers such as hydrogen and electricity – “has the potential to change the paradigm for power and chemical production from coal.”

In 2008, the American Institute of Chemical Engineers named Dr. Fan as one of “One Hundred Engineers of the Modern Era” for his professional achievements and contributions to his profession and society.

The university and OCDO are joined in this project by the United States Department of Energy, various industrial partners and other stakeholder organizations.

Project Description:

This pilot project's primary goal is to demonstrate a method utilizing chemical looping* for producing hydrogen and heat from coal-derived syngas** and a stream of carbon dioxide (CO₂) suitable for sequestration. The process converts coal (or biomass) into electricity or hydrogen while efficiently capturing almost all CO₂ emissions. The coal can become the feedstock for grid-scale electricity generation, fuel cells or liquid fuels.

The OCDO grant provides matching funds for a \$5 million U.S. Department of Energy American Reinvestment and Recovery Act grant through the ARPA-E program and builds on previous investments in related projects conducted by Dr. Fan.

*Chemical looping is a technique that uses dual reactors to create pure streams of hydrogen and CO₂ during coal combustion

**Syngas is a gas mixture that contains varying amounts of carbon monoxide and hydrogen.

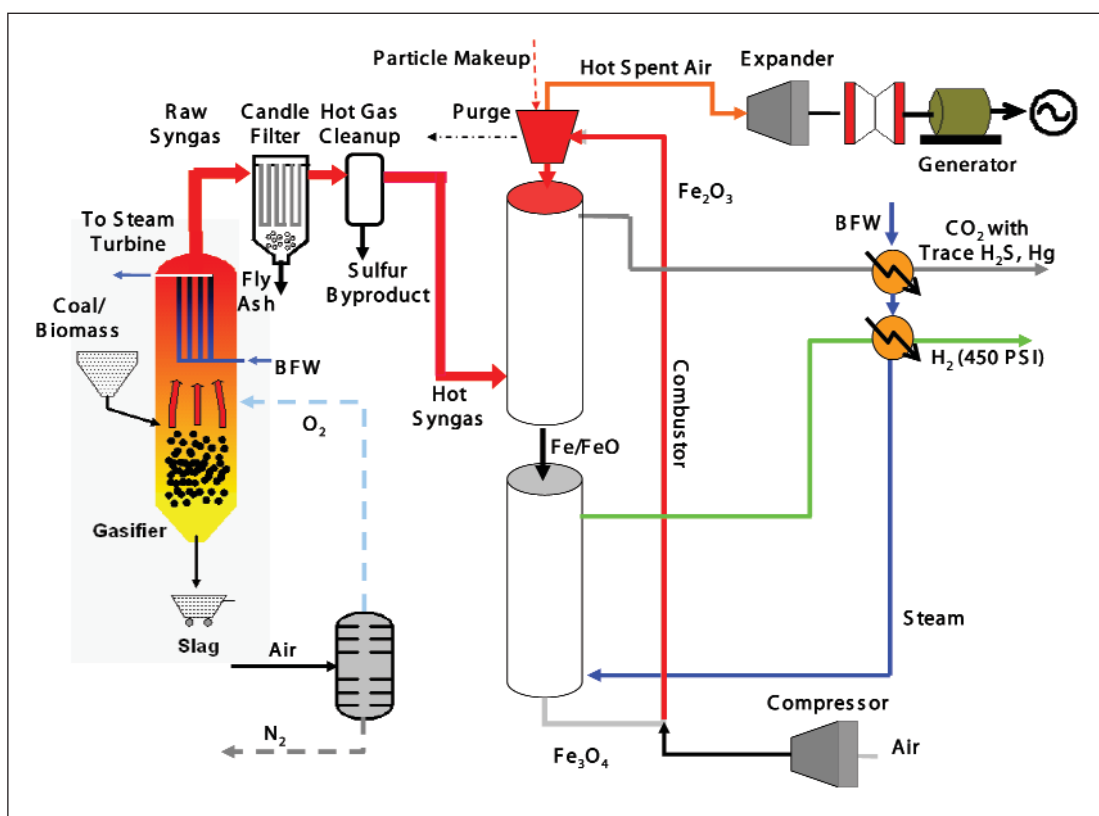


OSU sub-pilot scale (25 kWth) SCL unit. The proposed pilot plant is a 10 time scale up from the sub-pilot unit shown above.

Funding Request: \$3.2 million
Approved Funding: \$3.2 million
Total Project Investment: \$9,935,555

Jobs Created: 3 full-time jobs and 5 part-time jobs for graduate students;
 5 additional full-time positions will be created indirectly by the subcontractor

Primary Application of Technology: Mitigation of carbon dioxide emission,
 electricity and hydrogen generation, development of clean fuel sources



Schematic of the SCL Process



Mark R. Shanahan
 Governor's Energy Advisor and
 Executive Director, Ohio Air Quality Development Authority
 Ohio Air Quality Development Authority
 50 W. Broad Street, Suite 1718
 Columbus, Ohio 43215
 614-224-3383



Liang-Shih Fan
 Distinguished University Professor
 The Ohio State University
 Department of Chemical &
 Biomolecular Engineering
 125 Koffolt Laboratories
 140 W. 19th Ave.
 Columbus, Ohio 43210
 614-688-3262