



the **ENERGY** lab

## PROJECT FACTS

### Hydrogen and Clean Fuels

# Demonstration of Pressurizing Coal/Biomass Mixtures Using Posimetric® Solids Pump Technology

## Background

Gasification technologies provide an environmentally friendly and efficient way to utilize biomass and coal feedstocks. Gasification is the process of applying high heat to carbon containing materials, such as coal and biomass, within a pressurized reactor to produce a gas mixture of carbon and hydrogen known as synthesis gas (syngas). However, current dry conveyance methods lack the ability to deliver coal/biomass solids to the reactor in a cost-effective manner.

The U.S. Department of Energy (DOE) National Energy Technology Laboratory (NETL) is exploring affordable processes by which domestic coal and biomass are combined to co-produce power and high-quality liquid hydrocarbon fuels, chemicals, and hydrogen. In the past, the GE Posimetric® pump has delivered pure coal to reactors at pressures up to 1000 pounds per square inch gauge (PSIG). This technology now offers promise to deliver coal/biomass mixtures to pressurized reactors.

## Project Description

The DOE is partnering with GE Global Research (GEGR), GE Energy, and Idaho National Laboratory (INL) to demonstrate the use of the Posimetric pump for feeding mixtures of coal and biomass into a pressurized gasifier for a range of coal types (bituminous, sub-bituminous, and lignite) and biomass types (wood, corn stover, and switchgrass) at biomass loadings from 30 to 50 percent by weight.

Properties of the mixtures such as compressibility, friction factor, and gas permeability will be tested to obtain specifications for biomass pretreatment for pumping. Mixtures that meet specifications will be used to test the capability of the Posimetric pump on a pilot scale. The pump has been extensively tested on various coal types; this demonstration will provide data on its ability to feed mixtures of coal and biomass against a pressure gradient in the absence of a carrier gas.

## CONTACTS

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## PARTNERS

GE Energy

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## PROJECT DURATION

### Start Date

08/07/2009

### End Date

12/31/2012

## COST

### Total Project Value

\$1,108,309

### DOE/Non-DOE Share

\$622,316 / \$485,993

## NATIONAL ENERGY TECHNOLOGY LABORATORY

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## Goals and Objectives

The goal of the project is to demonstrate a technically and economically feasible method to use GE's Posimetric solids pump technology to deliver mixtures of coal and biomass to an entrained-flow gasifier. Project objectives include:

- Specifying biomass pretreatment methods.
- Obtaining and processing biomass and coal with desired specifications.
- Blending and testing properties of coal/biomass mixtures.
- Selecting appropriate biomass properties for Posimetric pump trials.
- Demonstrating pressurization of coal/biomass mixtures.
- Conducting a technical and economic analysis on the use of the Posimetric pump for dry feeding of coal/biomass mixtures.

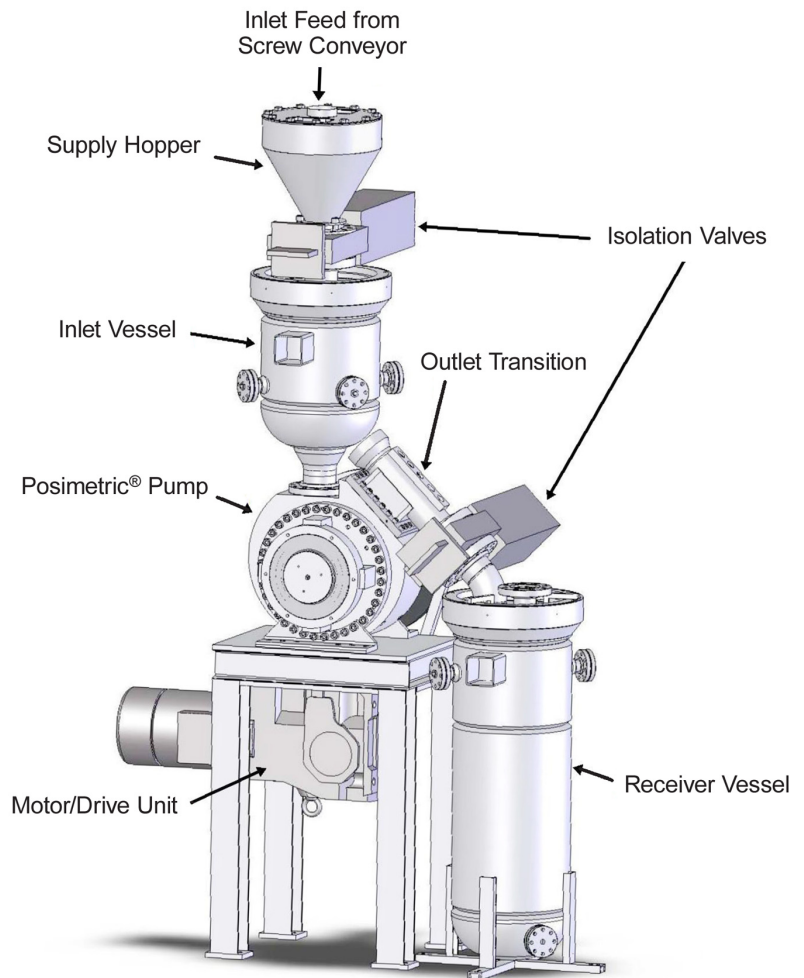
## Accomplishments

Project work has primarily concentrated on preparing and evaluating coal and coal/biomass mixtures. Pulverized samples of three types of coal to be used (bituminous, sub-bituminous, and lignite) were obtained and submitted for ultimate and proximate analyses. The analyses will determine the content of the materials necessary to find a proper mixture ratio for each coal type. Advanced experimental methods were used to determine the effect of wood particle size on critical material properties. The material properties of greatest importance are material friction force and gas permeability.

Preliminary test results show that pine may be a successful biomass option. The coal/pine mixture can be optimized for low permeability and the pine content does not affect the mixture's frictional properties. These results suggest that the pump may be as effective at feeding coal/pine mixtures into a gasifier as it is with feeding coal alone, thus providing a feasible option for further testing.

## Benefits

Interest in mixing biomass with coal stems from the growing need to increase domestic energy security and reduce greenhouse gas emissions in the United States. The successful delivery of a pressurized coal/biomass mixture into a gasifier would represent a significant advancement in low net-carbon fuels for use in pressurized gasification, and could reduce plant operating and maintenance costs while improving gasification efficiency. These results could reinforce the preference of pressurized, entrained-flow gasification over atmospheric gasification for fuel production due to its high efficiency, low tar formation, and lower capital cost at large scale. The use of coal/biomass mixtures to co-produce power and liquid fuels will allow a higher percentage of renewable fuels to be used to provide a more environmentally friendly solution for increasing energy needs.



*Pilot-scale Posimetric® Pump*