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U.S. DEPARTMENT OF ENERGY

Hydrogen

Gasification of Mixed Blends of Coal, Biomass, and Plastic Waste

George Booras, EPRI

Hydrogen Shot Summit

DOE Project Award Summary

- **Award Number:** DE-FE0032044
- **Project Title:** Performance Testing of a Moving-Bed Gasifier Using Coal, Biomass, and Waste Plastic Blends to Generate White Hydrogen
- **Funding:** $625k ($500k gov't, $125k cost share)
- **Period of Performance:** 7/1/2021–6/30/2023
- **DOE Program Manager:** Debalina Dasgupta
- **Applicant Name:** EPRI
- **Subs:** Hamilton Maurer International (HMI) and Sotacarbo S.p.A.
- **Principal Investigator:** George Booras

The project is just getting kicked-off

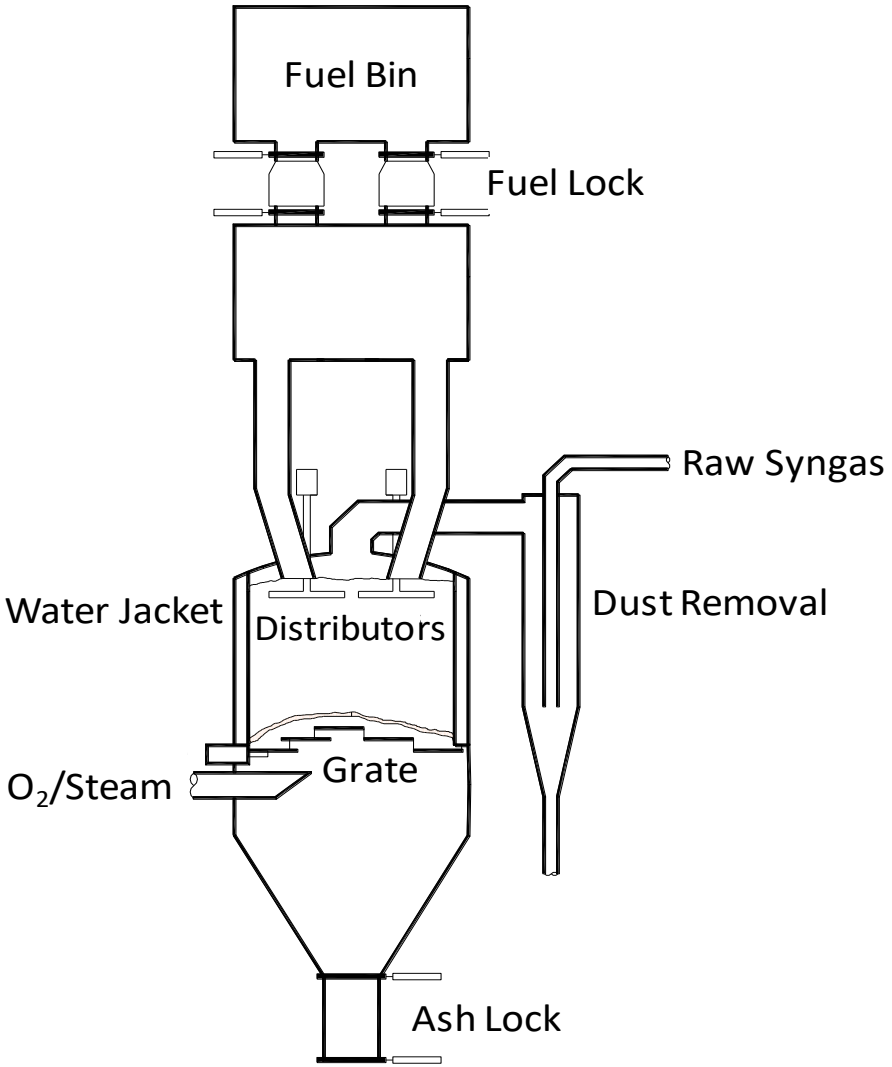
Project Objectives

- Qualify coal, biomass, and plastic waste blends based on performance testing of selected pellet recipes in a laboratory-scale updraft moving-bed gasifier
- Testing will provide relevant data to advance the commercial-scale design of the moving-bed gasifier to be able to successfully use these feedstocks to produce hydrogen
- Effects of the waste plastics on feedstock preparation (i.e., blending and pelletizing) and the resulting products (i.e., syngas compositions, organic condensate production, and ash characteristics) will be a focus

Developing data for unique blends for an established gasifier

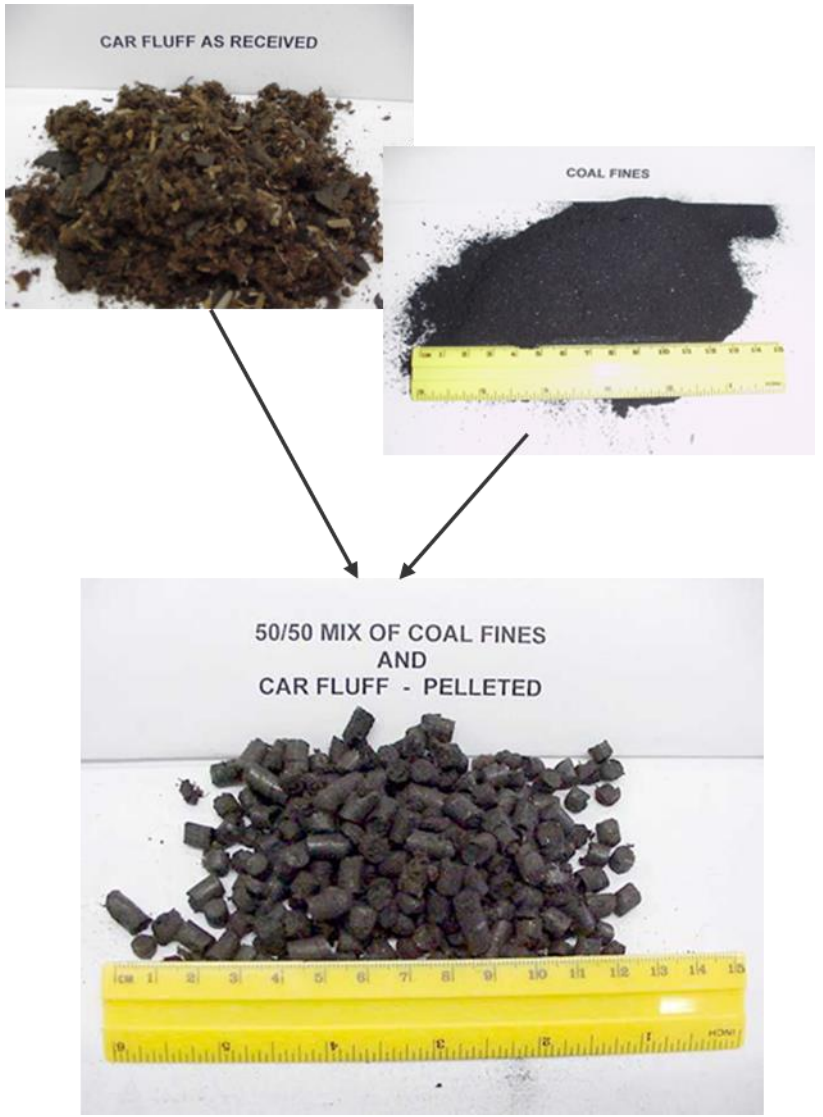
HMI Moving-Bed Gasifier

- Moving-bed gasification has demonstrated gasifying many coal ranks as well as biomass. Testing suggests that it should be well suited for blends of coal, biomass, and plastic waste.
- As the fuel descends, it is dried, devolatilized, and the resulting char is gasified. Ash is removed through a grate and collected in a lock hopper.
- CO_2 produced by combustion and the steam from the blast react with the char in the gasification zone to produce CO and H_2
- Streams leaving are ash out the bottom and dry gas/tar/water vapor/dust out the top



California Pellet Mill (CPM)

- CPM will do the blended feedstock preparation in the form of pellets
- In 1931, the company created its first pellet mill, the 30-hp flat bed with stationary flat die, and became CPM
- CPM has had considerable experience creating fuel pellets including ones using biomass and waste and has worked with HMI and Sotacarbo on prior projects
  - Presented results of pilot gasifier test runs with coal/car fluff pellets at the 2007 Clean Coal Technology Conference in Sardinia



Sotacarbo R&D Facility

- Sotacarbo and HMI have collaborated for 17 years on the installation, commissioning, operation, and automation for enhanced operation and control of updraft moving-bed gasifiers for industrial multi-fuel gasification processes
- HMI designed the pilot-scale 12” inner diameter (ID) updraft moving-bed gasifier for coal/biomass gasification installed at the Sotacarbo Gasification R&D facility that will be used for this project
- Significant testing has taken place on this test facility including the current project team members from both HMI and Sotacarbo

Sotacarbo Pilot Moving Bed Gasifier

Major Project Tasks

1. **Project Management and Planning:** Monitoring and project reporting.
2. **Feedstock Procurement and Preparation:** Finalize feedstock selection and pellet formulations. Prepare and ship pellets.
3. **Test Plan Development:** Specify test data to be reported, review facility instrumentation, and specify sampling procedures.
4. **Gasifier Testing:** Perform baseline coal gasification test, and tests for 9 different pellet formulations
5. **Data Analysis and Reporting:** Correlate gasifier performance with pellet composition, assess overall prospects for gasification of mixed blends, and prepare the final report.

Overall project schedule is two years

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