Modularization of Coal Gasification
University of Kentucky Center for Applied Energy Research

Staged OMB for Modular Gasifier/Burner
DE-FE0031506

Background
Why Entrained Flow Gasification?

- Dry coal consumption: 1 ton/day
- Gasification, quench chamber needed
- Especially suitable for small-scale modular application

OMB Technology

Technical Approach
Fuel Preparation Flexibility

Objectives
1. Modify existing OMB unit to a staged OMB gasifier
   - Demonstrate flexibility in fuel/load
   - In-situ WGS and partial sulfur removal
   - Improved T profile
2. Standardization
   - Modularize burner design
   - Match ASU, burner and syngas turbine.
3. Techno-Economic Analysis

Burner Standardization and Modularization

UKy-CAER Gasification Unit

- Residence time independent of the gasifier size
- Especially suitable for small-scale modular application
- Scale-up demonstrated but small scale modular study needed

Preliminary Results

Structure and Schedule

Schedule

Objectives
- FEED study for a 5 MWe equivalent polygenerating unit to be located at an Eastern KY utilizing nearby waste coal fines and biomass
- Identify technology selection and operating conditions

Background
Objectives
- Refuse coal impoundments are throughout the entire Appalachian Region
- Would benefit from local polygeneration units
- Encourage industry location in industrial parks
- Economic development
- Secondary environmental benefit of recovering coal fines
- Use local sites in Perry County as representative of sites throughout Appalachia

Acknowledgements

- DOE-NETL: Arun Bose, K. David Lyons, Steve Markovich
- UKy-CAER: Andy Placido and Don Challman
- ECUST: Qinghua Guo
- Trimeric: Andrew Sexton
- DOE-NETL: Trista Groppo, Heather Nikolic, Lisa Richburg

Cost Estimation

Table:

<table>
<thead>
<tr>
<th>Impoundment</th>
<th>Moisture (%)</th>
<th>VM (%)</th>
<th>Fixed Carbon</th>
<th>Ash (%)</th>
<th>H (%)</th>
<th>N (%)</th>
<th>S (%)</th>
<th>GCV (Btu/lb)</th>
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<tr>
<td>Impoundment 1</td>
<td>2.92</td>
<td>14.45</td>
<td>66.22</td>
<td>27.46</td>
<td>7.86</td>
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<td>Impoundment 2</td>
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<td>11.73</td>
<td>62.65</td>
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<td>10.04</td>
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<td>12.29</td>
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<td>Impoundment 4</td>
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<td>66.78</td>
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<td>Total</td>
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<td>14.14</td>
<td>65.42</td>
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<td>7.81</td>
<td>0.47</td>
<td>0.50</td>
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Preliminary Results

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Cost Estimation

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<thead>
<tr>
<th>Company</th>
<th>Coal Mine Employees</th>
<th>Total Cost (M$)</th>
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<td>SMG</td>
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<td>Blackhawk Brothers Lumber Corp.</td>
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<td>Tesora Wahoo Bonneyman</td>
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<td>KEM/Pads Branch Plant</td>
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<td>Hazard, Perry County</td>
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<td>Caldwell Brothers Lumber Corp.</td>
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