Lignite Fuel Enhancement

Quarterly Technical Progress Report:

Period: April 1st, 2006 to June 30th, 2006
DOE Award Number: DE-FC26-04NT41763
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Reported by:

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Lignite Fuel Enhancement

Disclaimer

Abstract

This 8th quarterly Technical Progress Report for the Lignite Fuel Enhancement Project summarizes activities from April 1st through June 30th of 2006. It summarizes primarily the testing activity during that time period.

Acknowledgement

The authors wish to acknowledge the contributions and support provided by various project managers: Dr. Sai Gollakota (DOE), Matt Coughlin (Barr) Dave Rian (Barr), John Wheeldon (EPRI), Tony Armor (EPRI), Dr. Ed Levy (Lehigh), Dr. Nedad Saranac (Lehigh), and Mark Ness (GRE).

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Executive Report

Progress:

The Design Team continued conferencing this quarter, analyzing the early data, and making recommendations based on the results. One team meeting was held at Coal Creek to inspect the dryer and review the operation. By the end of June we had run 100,000 tons of lignite through the dryer.

”Pairs” testing continued this quarter. This is testing of Unit#2 at Coal Creek with seven Pulverizers running “wet” lignite and then that performance and emission data compared to a six “wet” and one “dry” pulverizer operation. Some of that data was included in the last report. Mercury analysis of the segregated material this quarter reveals between 30 to 50 % of the inlet mercury in the segregated mass and 20 to 30% sulfur reduction (see chart below). This quite significant and Dr. Saranac and Mr. Ness had a chance to optimize its operation before capacity testing was begun in June. Some problems with broken inlet airlock gearboxes as a result of material binding them due to liewell screen being out-of-service were rectified. Plant crushers were set tighter and throughput to the dryer was accomplished at 105 ton/hour.

Coal accumulation on the outlet of the 2nd stage was alleviated by air lances however the air pressure in combination with the coal wore a hole into the distribution plate and coal accumulated in the inlet plenum. The distribution plate was repaired and the design team is reviewing modifications to the inlet air distribution that will “sweep” the ledges clean without lances.

Great River Energy and Headwaters met to discuss the Commercialization Plan this quarter. A three tiered approach to utilities was set up and where implementation/marketing is planned. The final marketing strategy/approach is pending final data from the drying system. Discussions with local utilities are ongoing. Inquiries have come from Europe to Australia since the Clearwater Meetings.

Invoices #21 through #23 were completed and forwarded for preliminary review and final DOE approval. The Budget expended through June 30th was $10,856,518..

Charles Bullinger gave a presentation at the 31st International Clearwater Coal Conference. EPRI continues plans to “sunrise” a Dryer Interest Group in September of 2006.

Problems Encountered:

The drying systems main issues have been with the coal handling system not dryer or baghouse. Liewell pulley, bound air locks, and crusher throughput have all been issues although the dryer has performed and dried to 105 ton/hour. Air distribution improvements will be incorporated in the commercial dryers.

Plans for the next reporting period:

Capacity tests will complete. Some “life” data collected as the dryer continues to run through the summer. DOE project continuation application should be accepted. A “draft” of the Budget Period 1 report should be completed. Budget Period 2 and design of the Commercial System should begin in September.

Prospects for future progress:

The prospects are quite good that all the next Quarter deliverables will be met.

The expectation today, based on preliminary information, is that the project will continue to Phase 2.

Experimental Apparatus:

Details of the dryer and system, P&ID's, schematics, and drawings contain "Limited Rights" information which cannot be disclosed at this particular time.

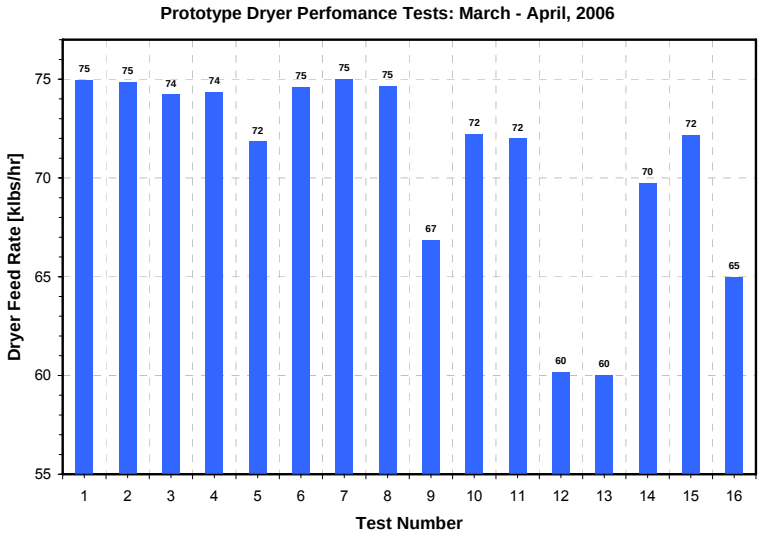
Experimental & Operating Data:

"Pairs" testing completed and results tabulated. Capacity testing begun.

Dryer in operation: moisture leaving the drying system stack

Data Reduction:

Dryer Performance Testing: Dryer Coal Flow



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Prototype Coal Dryer Performance

- *Feed rate: **75 tons/hr (14% of total)***

Parameter	Feed TM %	Product TM %	Change TM % Abs	Change TM % Rel
Average Total Moisture, TM	36.78	28.55	8.23	22.4
Std. Deviation	1.26	1.00	1.07	
Std. Deviation of the Mean	0.34	0.27	0.30	

Parameter	Feed HHV [BTU/lb]	Product HHV [BTU/lb]	Change HHV [BTU/lb]	Change HHV [%]
Average HHV	6,290	7,043	752	12.0
Std. Deviation	159	121	131	
Std.Deviation of the Mean	43	33	37	

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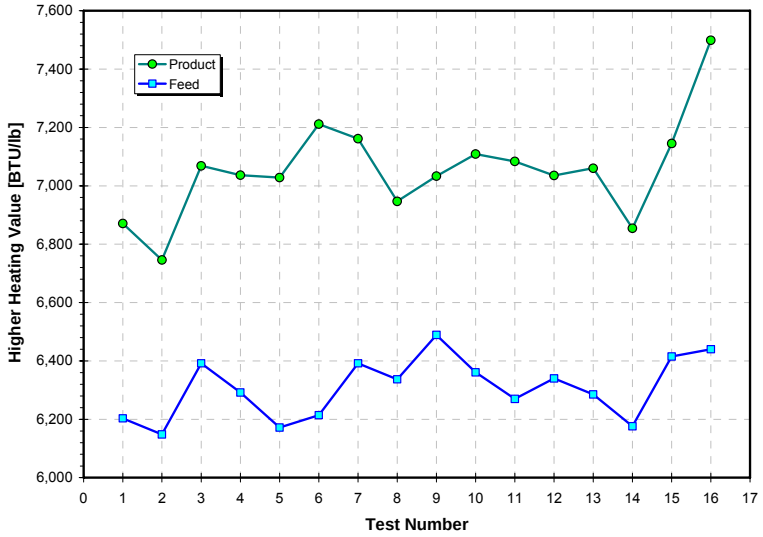
Dryer Performance Test Data: Total Coal Moisture



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Unit Performance: Summary

Parameter	Units	Coal Dryer in Service	Coal Dryer Out of Service	Change	Units of Change
Gross Power Output	MW	589	590	**NC**	
Throttle Steam Temperature	Deg. F	988	989	**NC**	
Reheat Steam Temperature	Deg. F	1,002	1,002	**NC**	
SHT Spray Flow	klbs/hr	46	52	**-6.4**	klbs/hr
Total Coal Flow Rate	klbs/hr	953	972	**-2.02**	%
Dried Coal	% of Total	14.62	0.00		
Stack Flow Rate	kscfm	1,611	1,626	**-0.96**	%
Specific Pulverizer Work	kJ/klb	4.09	4.29	**-4.65**	%
Total Pulverizer Power	kW	4,057	4,206	**-3.53**	%
NOx Mass Emissions	lb/hr	1,345	1,470	**-8.52**	%
SOx Mass Emissions	lb/hr	3,618	3,692	**-2.00**	%
APH 21 Gas Exit Temperature	Deg. F	353	362	**-8.6**	Deg. F
APH 22 Gas Exit Temperature	Deg. F	368	377	**-9.3**	Deg. F
Stack Temperature	Deg. F	180	184	**-4.2**	Deg. F

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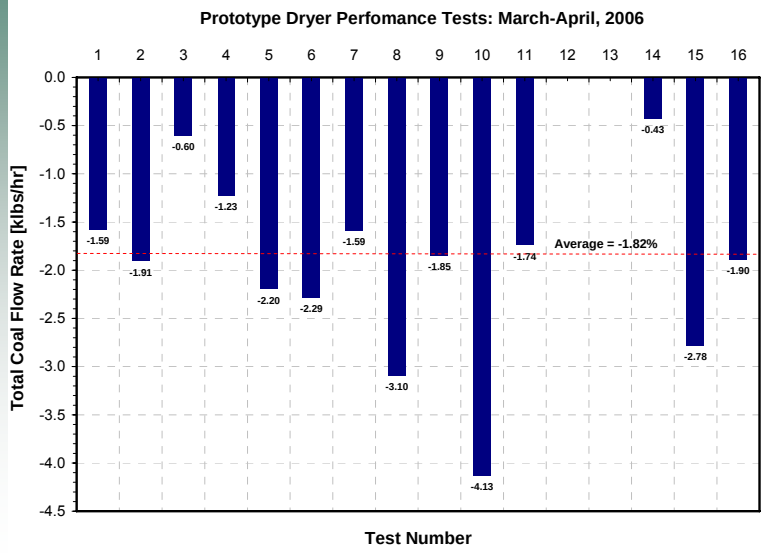
Performance Test Data: Total Coal Flow Rate Reduction



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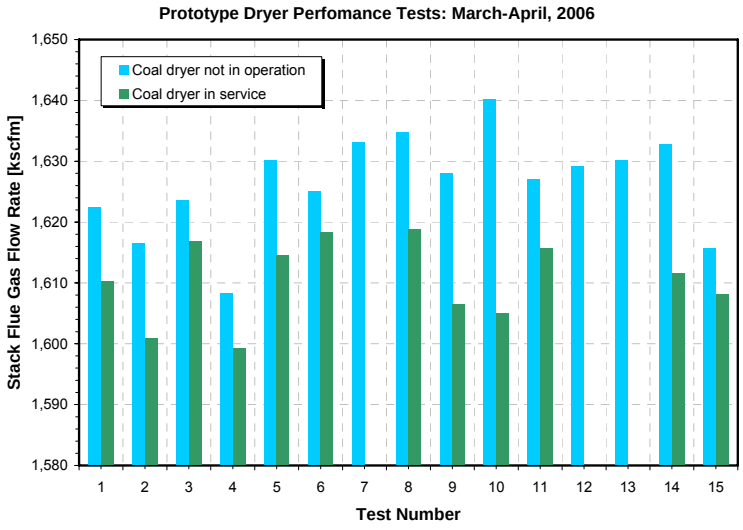
Dryer Performance Test Data: Stack Flow Rate



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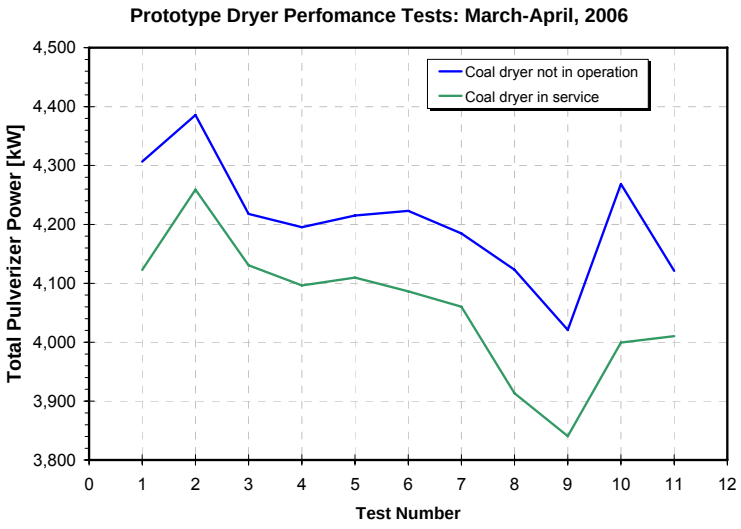
Dryer Performance Test Data: Total Pulverizer Power



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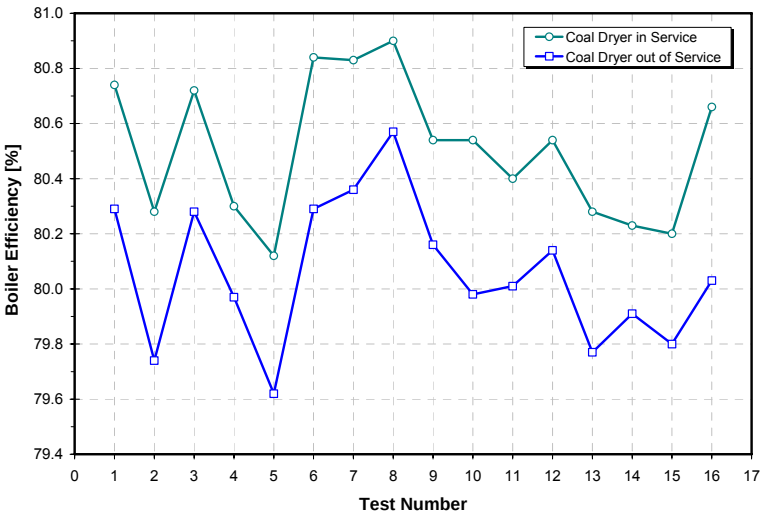
Performance Test Results: Boiler Efficiency



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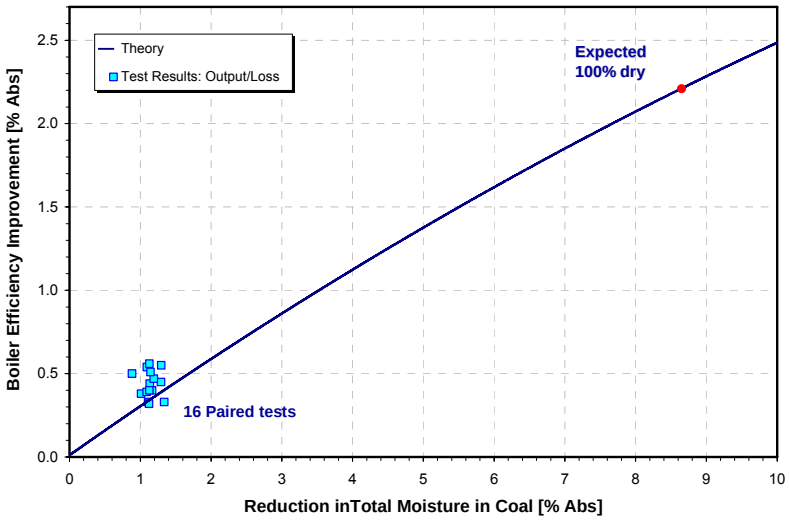
Performance Test Results: Boiler Efficiency Improvement



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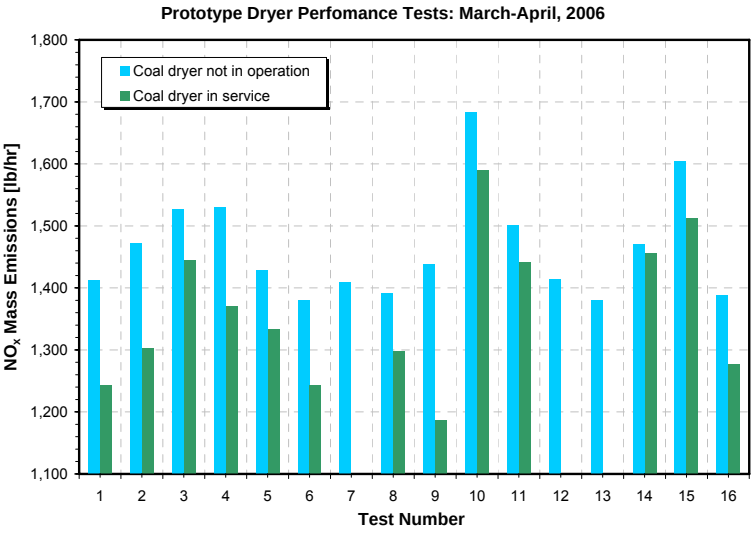
Performance Test Data: NO_x Emissions



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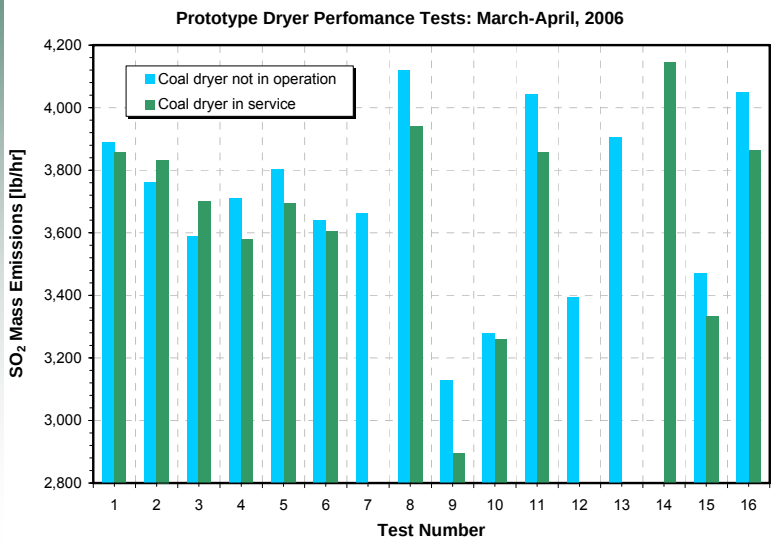
Performance Test Data: SO_2 Emissions



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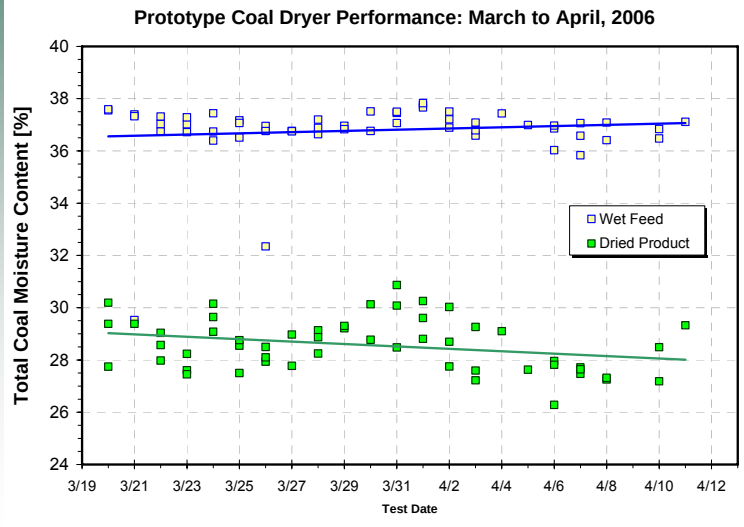
Prototype Coal Dryer Performance



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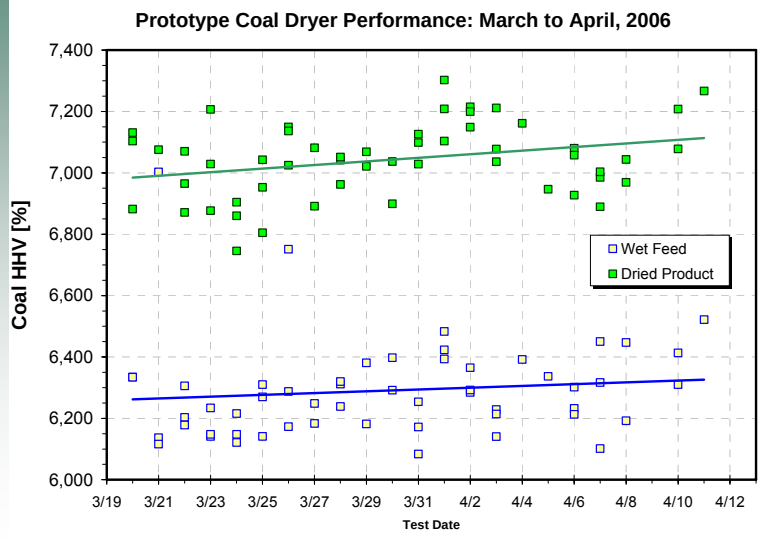

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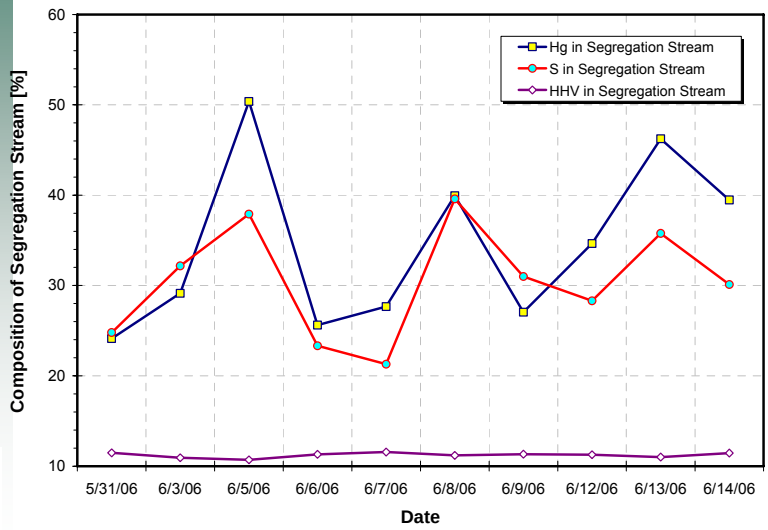
Segregation Stream



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Hypothesis & Conclusions:

Hypothesis remains the same. We will be able to dry lignite an increment to benefit the performance of and reduce emissions from a coal burning electric power generating station.