

Issue No. 15 (December, 2001) Introduction

This issue of our newsletter offers a sampling of FAQ's from current and prospective customers. Some of the questions are very basic, while others lead to a deeper understanding of what our lab does and how it distinguishes itself from others. Feel free to contact us for additional information and clarification of topics important to you.

- 1. Where Should Samples Be Sent?**
- 2. How Does Clark Labs Evaluate a Coal's Coking Potential?**
- 3. How Much Sample Is Needed For Testing and How Much Will It Cost?**
- 4. How Often Should Coals Be Tested?**
- 5. What Makes Clark Labs So Unique?**

When submitting samples to our laboratory, use the following address:

Clark Labs Coal & Coke Laboratory
1801 Route 51 South
Building 9
Jefferson Hills, PA 15025

For coal samples:

Clark Labs
151 Eastern Dr.
Sophia, WV 25921

For coke samples:

Clark Labs
123 Pennsylvania Ave.
Charleroi, PA 15022

Sample shipment should be coordinated with the Lab Manager before it is sent. Samples should be packaged in sealed containers with proper labeling (sample ID, location, date taken, etc.). Instructions as to the required test analyses should also be included with the samples.

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2. How Does Clark Labs Evaluate a Coal's Coking Potential?

Blend formulation strategies used by Clark Labs include:

- The complete characterization of each individual coal under consideration
- Use of a computer model to optimize coke quality of blends
- Verification of model blends with 500 lb. Adjustable Wall Oven tests

The CEV data is entered into sophisticated computer models to assist in designing coal blends incorporating, among many other parameters, coke plant operating conditions and constraints and cost data. Once model studies and subsequent pilot-oven testing are completed, recommendations are made as to the optimum coal blend(s) for plant trials.

To fully characterize an individual coal, a CEV (coal evaluation) is performed. The CEV typically includes the following analyses: total moisture, sieve analysis, proximate analysis, sulfur content, ash composition, oxidation transmittance, Hardgrove Grindability Index, ash fusion temperatures, free swelling index, Gieseler plasticity, Arnu dilatation, petrography, non-maceral analysis, sole-heated oven testing, pressure testing (for medium- and low-volatile coals), and coke strength after reaction (CSR) after carbonizing the individual coal in a small pilot oven.

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3. How Much Sample Is Needed For Testing and How Much Will It Cost?

Make every effort to secure a representative gross sample, whether it be an individual coal, a coal blend, or coke, as per ASTM guidelines. Refer to ASTM D2234 and D346 for the collection of gross coal and coke samples, respectively. It must be emphasized that no amount of care and caution exhibited by a laboratory can make a sample representative if the gross sample was not taken properly in the first place.

After the original, representative coal sample is secured, it may then be subdivided through stages of crushing and riffing for the various required analyses. The following are guidelines for minimum sample weights needed based on the top size of the coal:

Top Size	Minimum Weight
1/4 inch	15 pounds
1/8 inch	1500 grams
8 mesh	500 grams
20 mesh	250 grams
60 mesh	50 grams

For example, if a customer wanted to submit a coal sample for petrographic analysis only, any of the following could be done:

- send the entire gross sample to the lab for preparation
- crush the gross sample down to a top size of 1/4 inch, mix, and riffle out 15 pounds of the material for submittal to the lab for final preparation
- crush the gross sample down to a top size of 8 mesh, mix, and riffle out 500 grams of the material for submittal to the lab for final preparation

- stage crush (with subsequent riffing) down to a top size of 20 mesh and then riffle out 250 grams for submittal to the lab

We prefer one of the first three scenarios since the fourth requires extra care to avoid over-crushing. Also, analyses in addition to petrography are typically requested so that a larger sample would be needed.

The quantity of coke sample needed depends on the size of the coke being sampled and the analyses required. For blast furnace cokes, the following minimum, gross sample weights are specified by ASTM for the various analyses listed:

Analysis	Minimum Weight
Sieve	400-500 pounds
Tumbler	125 pounds
Moisture	100 pounds
Chemistry	125 pounds

Always feel free to contact one of our representatives at Clark Labs for assistance in determining the size and amount of coal or coke sample needed for your particular application. With regards to prices, they range from a low of \$10 for a sulfur determination to over \$2000 for a large adjustable wall oven test. Consult with a UEC Labs representative for pricing for your particular test needs. Discounts are available based on volume of work submitted.

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4. How Often Should Coals Be Tested?

A variety of test programs can be developed which meet the specific needs of coal producers and cokemakers. For example, as described in Question 2, a CEV would be conducted whenever a new coal is under consideration for usage in a coke plant blend. Computer model studies and pilot-oven testing to simulate coke plant operating conditions would likely follow.

Monthly or quarterly coal evaluations are used to monitor long-term changes or shifts in the quality of a particular coal product, which may not be detected on a shipment-to-shipment basis. The test program is extensive and similar to that associated with a CEV in order to analyze certain properties not typically evaluated on a frequent basis.

Coal shipment testing by an independent, third-party test laboratory such as ours is used by coke plant operators to assure that incoming coals meet expected quality requirements. When performed far enough in advance, these evaluations may prevent serious deviations from coke quality and pressure targets. Corrective actions such as adjustments to blend proportions may be implemented to counteract negative effects from changing coal

quality. Tests on incoming shipments are typically limited to key parameters such as petrographic, rheological, and chemical properties.

Another type of test program includes inter-laboratory comparisons performed by an independent laboratory to audit coal suppliers' analyses for properties such as moisture, ash, sulfur content, oxidation, or free swelling index - all of which are specified by contracts.

Individualized test programs can also be developed for stockpile assessment, which allows coke plants to monitor their coals as they are reclaimed from stockpiles at any of the following locations: mine, transloading facilities, blending facilities, or coke plant. Depending on the length of stay in a stockpile, properties which are age-dependent may deteriorate, thus affecting resultant coke strength. Coals may lose their identity when stockpiled due to improper placement or labeling, inter-mixing with other stockpiled coals, and contamination.

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5. What Makes Clark Labs So Unique?

Capabilities of the Coal and Coke Laboratory include pilot-oven carbonization testing, petrographic analyses, rheological testing of coal, and standard chemical and physical testing of coal and coke. We offer customized training programs and seminars that may be presented at either the client's facilities or ours.

Our West Virginia-based Coal Quality Verification Services (CQVS) provides the following services:

- Coal Inspection
- Shipment Monitoring
- Supplier Quality Audits
- Test Laboratory and ISO 9000 Internal Auditing
- Sampling System Inspection
- Verification of Facility Operations and Product Quality
- Consulting

Our sister labs (analytical chemistry and fuels and lubricant) in Monroeville provide complementary services to support our customers.

As part of our quality objectives, the Coal and Coke Laboratory has been registered to the stringent ISO 9002 standard since 1996. With our highly experienced and very capable work force, we feel our laboratory is truly one of the most unique and comprehensive facilities in the world.

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Closing Remarks

If you require additional information or clarification, please contact us via the address information given above. Additional valuable information is also available throughout this website. Information available on this site includes: laboratory contacts, testing capabilities, newsletters, industry links, technical information, and announcements of upcoming short courses.