

COAL CAPABILITIES IN DELTA, BC

An Overview of the Delta, BC Laboratory



With initial roots in the city of Vancouver, our team has been providing the coal industry trust results since 1970. Our Canadian coal operations has been based out of Delta, BC for nearly 25 years. While constantly ensuring it is equipped with the most state of the art analytical technologies, our Delta laboratory provides the Canadian coal market with quality coal results.

We have issued certificates of analysis for over 500 million tonnes of coal shipped through Westshore and Neptune terminals in Vancouver and Ridley Terminals in Price Rupert, BC. Our With a wide range of equipment, expertise and ISO/IEC 17025 accreditation, we provide quality, rapid-turnaround analyses. The scope of accreditation for our Delta laboratory can be found at <http://palcan.scc.ca/SpecsSearch/GLSearchForm.do>. Our Delta laboratory provides the following capabilities for the coal industry:

PROXIMATE ANALYSIS

Proximate analysis provides a good initial indication of coal or coke quality and composition. Proximate analysis tests conducted at our Delta laboratory include:

Moisture

Moisture is the water that exists in the coal at the site, time, and under the conditions it is sampled. Our experts determine the amount of moisture in samples by measuring the loss in mass between an as-mined sample and a sample that has been heated under controlled conditions to drive off the water that is not contained within the chemical structure of the coal.

Calorific Value

The calorific value of coal or coke is the heat liberated when the solid fuel undergoes complete combustion in



oxygen. In order to obtain accurate results, we burn fuel samples in a bomb calorimeter and measures the total heat energy.

Volatile Matter

Volatile matter includes the components of coal, except for water, which are liberated at high temperature in the absence of oxygen. We determine the volatile matter in your coal sample by measuring the mass of volatiles before and after weight analysis under strictly controlled conditions.

Fixed Carbon

The fixed carbon content of coal is determined by subtracting the percentages of moisture, volatile matter and ash from the original mass of the coal sample: the solid combustible residue that remains after a coal has had the volatiles driven off. Our experts conduct a fixed carbon test to estimate the amount of coke your coal sample will yield.

ULTIMATE ANALYSIS

Ultimate analysis tests produce more comprehensive results than the proximate analyses. Ultimate analysis tests are used to determine the elemental composition of the coal including moisture, ash, carbon, hydrogen, nitrogen, sulfur, and oxygen (by difference).

Sulfur

It is important to measure the sulfur content in coal samples to evaluate the potential sulfur emissions from coal combustion, or for contract specifications.

THE HARDGROVE GRINDABILITY INDEX

The Hardgrove Grindability Index (HGI) is a measure of coal's resistance to crushing grinding studies, and the resulting HGI, allow many different types of coal users to evaluate how coals will perform in their mills, allowing them to estimate grinding power requirements and throughput

SGS

capacities.

HGI is determined through a multi-step procedure:

1. A 50-gram sample of prepared coal that is uniform in size is placed inside a grinding unit
2. The unit undergoes a standard number of revolutions under a specified pressure
3. Steel balls within the unit crush the coal sample
4. The coal fines are sorted and the quantity of coal less than a specified size is recorded and converted into a Hardgrove Grindability Index (HGI) value. Typical resulting HGI values lie between 30 (increased resistance to pulverization) and 100 (more easily pulverized).

ARNU DILATOMETER TEST

Coking coals possess the ability, when heated in the presence of air, to soften, swell and then resolidify to form a coherent, porous, hard coke structure. The Arnu Dilatometer is used to evaluate the swelling properties of coal when heated under standard conditions. A 60 mm coal pencil, formed under pressure from minus 60 mesh coal, is inserted into a precisely calibrated retort tube with a graduated piston on top. The sample is then placed in a furnace. The apparatus is heated at 3°C/minute and the movement of the piston, as the coal pencil shrinks and expands, is recorded.

The maximum dilatation value is the key parameter and for individual coals, the highest value possible is considered optimal:

- High volatiles: +50 to >300%.
- Medium volatiles: +100 to 250%.
- Low volatiles: <0 to 200%.

Characteristic Arnu Dilatometer curves are generated when the piston movements (taken as a percentage of the total original coal cylinder length) are plotted against the corresponding temperatures. These charts provide valuable information regarding the suitability of your samples for use as coking coals.

CRUCIBLE SWELLING NUMBER

The "crucible swelling number" (CSN), is also known as the "free swelling index" (FSI), determines the swelling properties



of hard coal when heated in a covered crucible.

ASH FUSION

Understanding the behavior of coal ash at high temperature is critical in determining ideal coals for steam power generation. Ash fusion temperatures are determined by heating a prepared sample of molded coal in a high-temperature furnace to temperatures exceeding 1,000°C in both reducing and oxidizing conditions. The cone or pyramid of molded ash is monitored as the temperature increases. The four-critical ash softening temperatures are determined by monitoring the increasing deformation of the sample as it is heated. Ash fusion testing provides you with a valuable tool to estimate and control the slagging potential of your coal.

BIOFUEL ANALYSIS

To meet the growing demand of biofuels, in 2016 our Delta, BC laboratory was awarded the ENplus designation becoming the first lab in Canada with this designation. This designation allows us to provide the proper certification requirements in regard to wood pellet testing services. The ENplus certificate with its strict requirements stands for excellent pellet quality. For the first time the whole supply chain is covered by a

single certification system. The ENplus quality seal accounts for the whole wood pellet supply chain – from production to delivery to the final customer, therefore, ensuring high quality as well as transparency.

COAL WASHABILITY

As we continue to expand our service offering to the Canadian coal market, we have recently introduced a full-service float-sink facility within our Delta, BC location. Washability characteristics are determined from float/sink analysis from either large coarse samples or small fine samples in order to determine the mineral impurities of any coal sample. This information is then used to improve preparation plant efficiencies or used to determine the recovery and quality of coal reserves. Our float/sink analysis can be completed on samples ranging in size from bulk washability samples (over 1 ton) to bench scale size samples. SGS conducts the tests over a range of densities (from 1.3 specific gravity up to 2.25 specific gravity) and a variety of sizes (from coarse to fine coal).

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WHEN YOU NEED TO BE SURE