CleanAir

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CLEANAIR LABORATORY SERVICES PRICE SCHEDULE

The following fee schedule applies for analytical work performed by Clean Air Engineering Laboratory Services.

Organic Compound Analysis

Clean Air Engineering's organic laboratory specializes in the analysis of samples collected from source and ambient test programs. CleanAir uses gas chromatographs manufactured by Hewlett Packard, Perkin Elmer and MTI coupled with flame ionization, flame photometric and thermal conductivity detectors. CleanAir requests that all sample analysis be confirmed verbally before sending samples to verify that the analysis is within our capabilities. The price schedule for organic analysis per sample is as follows:

	First Compound	Each Additional Compound
Adsorbent Tube	$145/sample	$80/sample
Impinger Catch	$145/sample	$80/sample
Tedlar Bag	$145/sample	$80/sample

Coating and Ink Analysis

EPA Method 24 ..... $575/sample

Clean Air Engineering's organic laboratory regularly performs EPA Method 204f distillations on liquid coating and ink samples. Using a Roto-Vap, a liquid sample is generated that can be used to determine response factors for total hydrocarbon analyzers.

EPA Method 204a (Includes Response Factor) ..... $2,250/first sample
Subsequent samples $350/sample
EPA Method 204f (Generation of Extract only)..... $2,250/first sample
Subsequent samples $155/sample
EPA Method 204f (Response Factor) ..... $2,250/first sample
Subsequent samples $350/sample

Ten or More Samples ..... 10% Discount on Analysis

Inorganic Analysis

Clean Air Engineering's inorganic laboratory utilizes a Dionex Model ICS-90 ion chromatograph. All analyses are performed in accordance with procedures in US EPA Methodology. Full pre and post analyses calibrations are provided as part of the per project pricing. The price schedule for inorganic analysis is as follows:

Ion Chromatography - Cations

Lithium	$54/sample
Sodium	$54/sample
Potassium	$54/sample
Ammonium	$54/sample
Magnesium	$54/sample
Calcium	$54/sample

Ion Chromatography - Anions

Fluoride	$54/sample
Chloride *	$54/sample
Nitrite	$54/sample
Bromide	$54/sample
Nitrate	$54/sample
Phosphate	$54/sample
Sulfate	$54/sample

* Please note that BIF Method 9057 for HCl/Cl_2 calls for two sample analyses per run and would cost $108 per run.

Titration Analysis

Sulfur Dioxide (Method 6)	$64/sample
Sulfuric Acid Mist (Method 8)	$64/sample

Gravimetric Analysis

Clean Air Engineering's gravimetric laboratory performs analysis on particulate samples collected using federal and state test methods.

Gravimetrics - Method 5, Method 17, CARB Method 5

Front-Half Analysis

Filter[1] $18/sample

Probe Wash $48/sample

Back-Half Condensables

EPA Method 202 ..... $289/test run

Method 202 charges include all required extractions and titrimetric neutralizations. "Special" sample processing such as pressurized filtration would require extra charges.

Note: The separate pressure filtration analysis would be required for EPA Method 202 filter extracts if fiber filters are used instead of membranes for the ambient filter.

Gravimetrics - Road Silt Determinations

Road Silt determined in accordance with EPA Report 450/3-88-008 "Procedures for Sampling Surface/Bulk Materials" $140/sample

[1] Pricing for post-test analysis only. Tared filter media are priced separately.

Gravimetrics – Tared Filter Media

8.26 cm Diameter Filters

934AH Glass Fiber	$39/each
QAT UP Quartz Fiber	$46/each
Teflon Fiber	$59/each

4.7 cm Diameter Filters

934AH Glass Fiber	$39/each
QAT UP Quartz Fiber	$46/each
Teflon Fiber	$59/each

8” x 10” Filters (Hi-Vol Filters)

934AH Glass Fiber	$54/each
QAT UP Quartz Fiber	$66/each

M17 Alundum Thimbles

Alundum Thimbles	$125/each

Sorbent Trap Mercury Analysis

Preparation of Sorbent Traps	$120/each
Trap Analysis	$125/each

Scrubber Slurry Analyses

Typical Lime Sample Analyses

Parameter	Suggested Method of Analysis	Description of Method	Suggested Frequency	Use of Data	Analytical Cost per Sample
Slaking Rate	EPRI Method B4	Rate of temperature rise	Start and finish of each performance test run	Temperature rise rate is related to reactivity and lime quality	$650
Grit (Inert Solids)	EPRI Method J1	Acid dissolution	Start and finish of each performance test run	High grit levels indicate poor lime quality	$50
Weight loss-on-ignition (LOI)	EPRI Method B2	Gravimetric	Start and finish of each performance test run	Weight loss is an indirect measure of lime quality via carbonate and hydroxide content	$75
Available lime index	EPRI Method B3	Rapid sugar test	Start and finish of each performance test run	Lime quality	$225
Calcium and Magnesium	EPRI Method J1	EDTA Titration	Start and finish of each performance test run	Analysis is required for processes producing a usable byproduct or high magnesium lime systems	$175
Lime slurry solids content (% by Wt)	EPRI Method F1	Gravimetric	Start and finish of each performance test run	Check density meter calibration and indicate slaker performance	$150

Typical Limestone Sample Analyses

Parameter	Suggested Method of Analysis	Description of Method	Suggested Frequency of Sampling	Use of Data	Analytical Cost per Sample
Limestone Dissolution Rate	EPRI Method B7	pH stat test followed by particle size measurement	Start and finish of each performance test run	Compared to reference to determine acceptability	$4,250
Grindability (Bond Work Index)	EPRI Method B5	Laboratory ball mill test	Start and finish of each performance test run	Limited by specification of wet milling system design	$1,250
Carbonate	EPRI Method N1	CO_2 evolution, $Ba(OH)_2$ absorption, Acid-base titration	Start and finish of each performance test run	Measure alkali loss in filter cake of mag-lime process; important for mag-lime or sodium systems.	$150
Alkalinity	EPRI Method N3	Titrimetric	Start and finish of each performance test run	Measure alkali loss in filter cake of mag-lime process; important for mag-lime or sodium systems.	$50
Inerts	EPRI Method J3	Acid dissolution - ASTM C471M can be substituted	Start and finish of each performance test run	Quality indicator; important for gysum systems	$50
Calcium and Magnesium	EPRI Method J3	EDTA Titration	Start and finish of each performance test run	Check reagent quality	$175
Limestone slurry solids content (% by wt)	EPRI Method F1	Gravimetric	Start and finish of each performance test run	Check density meter and indicate problems in milling circuit	$50
Limestone slurry particle size	EPRI Method G1	Wet sieve	Start and finish of each performance test run	Troubleshooting problems in milling circuit or process such as low utilization or poor gypsum quality.	$150

Typical Slurry Sample Analyses

Parameter	Suggested Method of Analysis	Description of Method	Suggested Frequency	Use of Data	Analytical Cost per Sample
pH	EPRI Method C1	2-buffer method calibration with pH meter	Start and finish of each performance test run	Troubleshoot pH meter and maintain process efficiency.	On-Site
Slurry suspended solids content	EPRI Method F1	Gravimetric - ASTM C471 can be substituted	Start and finish of each performance test run	Calibrate density meter and maintain process efficiency.	$50
Calcium and Magnesium	EPRI Method J3	EDTA Titration	Start and finish of each performance test run	To calculate stoichiometry and monitor process chemistry.	$175
$SO_4^=$	EPRI Method L2	Wet chemistry methods	Start and finish of each performance test run	To calculate stoichiometry and monitor process chemistry.	$125
$SO_3^=$, $CaSO_3 \cdot 1/2H_2O$	EPRI Method M1	Iodometric titration	Start and finish of each performance test run	To calculate stoichiometry and monitor process chemistry.	$75
Inerts	EPRI Method J3	Acid dissolution - ASTM C471M can be substituted	Start and finish of each performance test run	Quality indicator; important for gysum systems	$50
TDS (total dissolved solids)	EPRI Method E1	Gravimetric	Start and finish of each performance test run	Calibrate density meter for suspended solids; important for mag-lime, high chloride or suspended solids.	$75
Carbonate	EPRI Method N1	CO_2 evolution, $Ba(OH)_2$ absorption, Acid-base titration	Start and finish of each performance test run	Measure alkali loss in filter cake of mag-lime process; important for mag-lime or sodium systems.	$150
Chloride	EPRI Method I3	Ion Chromatography on Liquid Fraction	Start and finish of each performance test run		$55
Alkalinity	EPRI Method N3	Titrimetric	Start and finish of each performance test run	Measure alkali loss in filter cake of mag-lime process; important for mag-lime or sodium systems.	$50

Typical DeWatering Sample Analyses

Parameter	Suggested Method of Analysis	Description of Method	Suggested Frequency	Use of Data	Analytical Cost per Sample
Thickener or hydrocyclone underfloow solids content	EPRI Method F1	Gravimetric	Start and finish of each performance test run	Troubleshoot process and calibrated lime density parameters	$50
Supernatent, filtrant solids content (% by wt)	EPRI Method E1	Gravimetric	Start and finish of each performance test run	Monitor filter cloth status	$75

Typical Gypsum Sample Analyses

Parameter	Suggested Method of Analysis	Description of Method	Suggested Frequency	Use of Data	Analytical Cost per Sample
Calcium and Magnesium	EPRI Method J1	EDTA Titration	Start and finish of each performance test run	Product purities and properties	$175
$SO_4^=$	EPRI Method L2	Wet chemistry methods	Start and finish of each performance test run	Product purities and properties	$125
$SO_3^=$, $CaSO_3.1/2H_2O$	EPRI Method M1	Iodometric titration	Start and finish of each performance test run	Product purities and properties	$75
Moisture content	EPRI Method F1	Gravimetric - ASTM C471 can be substituted	Start and finish of each performance test run	Important for salable gypsum and monitoring dewatering system performance.	$50
Combined water	Gravimetric	Heat to 482°F (250°C) - ASTM C471M can be Substituted.	Start and finish of each performance test run	Gypsum purity	$50
Total water soluble salts	EPRI Method I1	Sum ($Na^+ + K^+ + Mg^{++}$)	Start and finish of each performance test run	Product purities and properties	$175
Inerts	EPRI Method J3	Acid dissolution - ASTM C471M can be substituted	Start and finish of each performance test run	Determined as acid insolubles along with silica (SiO_2) and other impurities.	$50
pH	EPRI Method C1	2-buffer method calibration with pH meter	Start and finish of each performance test run	Product purities and properties	$75

Laboratory Resistivity Determinations

Laboratory resistivity and particle size analysis of particulate can be determined to aid in improving control device performance.

IEEE Standard 548-1984
Round Trip - Resistivity measured as a function of ascending and descending test temperature between 85°C and 450°C in an environment of air containing one specified water concentration at an average electric field intensity of 4kV/cm $1,250/Sample

Complete Ash Characterization with Regard to Precipitator Performance $5,795/Sample
This would be a fully consultative characterization that includes:

- IEEE Standard 548-1984 Round Trip Resistivity Measurements.
- Resistivity measured as a function of Applied Electric Field in a simulated flue gas environment (a given concentration of sulfuric acid vapor present along with moisture). This measurement is performed isothermally at a minimum of two temperature points.
- An ash mineral analysis
- A computer modeled resistivity prediction.
- Particle size distribution.
- Ash Morphology using Scanning Electron Microscopy coupled with Energy Dispersive Spectrometry for chemical analysis.

Computer Model ESP Performance Predictions

Particle collection performance of an electrostatic precipitator is predicted using customer-supplied precipitator mechanical and electrical data as well as coal and fly ash compositional data. Model is described in EPA-600/7-84-069 a&b and is commonly referred to as the EPA/SRI computer model. In addition to modeling the existing precipitator performance, the effects of various changes (such as coal switching and gas conditioning) can be predicted. Priced according to scope and complexity.

Other Ash Characterization Services

Bahco particle size classification with density correction $595/sample
Bahco coupled with sample fraction retention.....$1,045/sample
Soluble sulfate analysis on ash $75/sample
Sieve analysis.....$140/sample
Loss-on-ignition (LOI) $75/sample
Designed resistivity tests, and consultation work are available and are priced according to scope and complexity.

The following services are sub-contracted through other laboratories:

Ash mineral analysis and loss-on-ignition (LOI) $450/sample
Short proximate, ultimate coal analysis $295/sample
Scanning electron microscopy (SEM), x-ray diffraction are available and are priced according to scope and complexity.

Rush Analysis Pricing

Analytical results will be issued 15 working days from the receipt of samples. Rush analytical results may be available at increased rates upon request. Rush charges for analysis will be applied in the following manner:

1-2 working days .....300% of set price
3-5 working days .....200% of set price
6-10 working days .....150% of set price

In any circumstance, a purchaser's request for rush analysis in a certain time frame authorizes all degrees of rush charges up to that extent. Rush charges on the final invoice will be reflective of when results were available and reported to the Purchaser. All days will be calculated on a five (5) day work week (except for holiday allowance).

All analysis will be performed in accordance with Clean Air Engineering's Terms and Conditions for Laboratory Work.