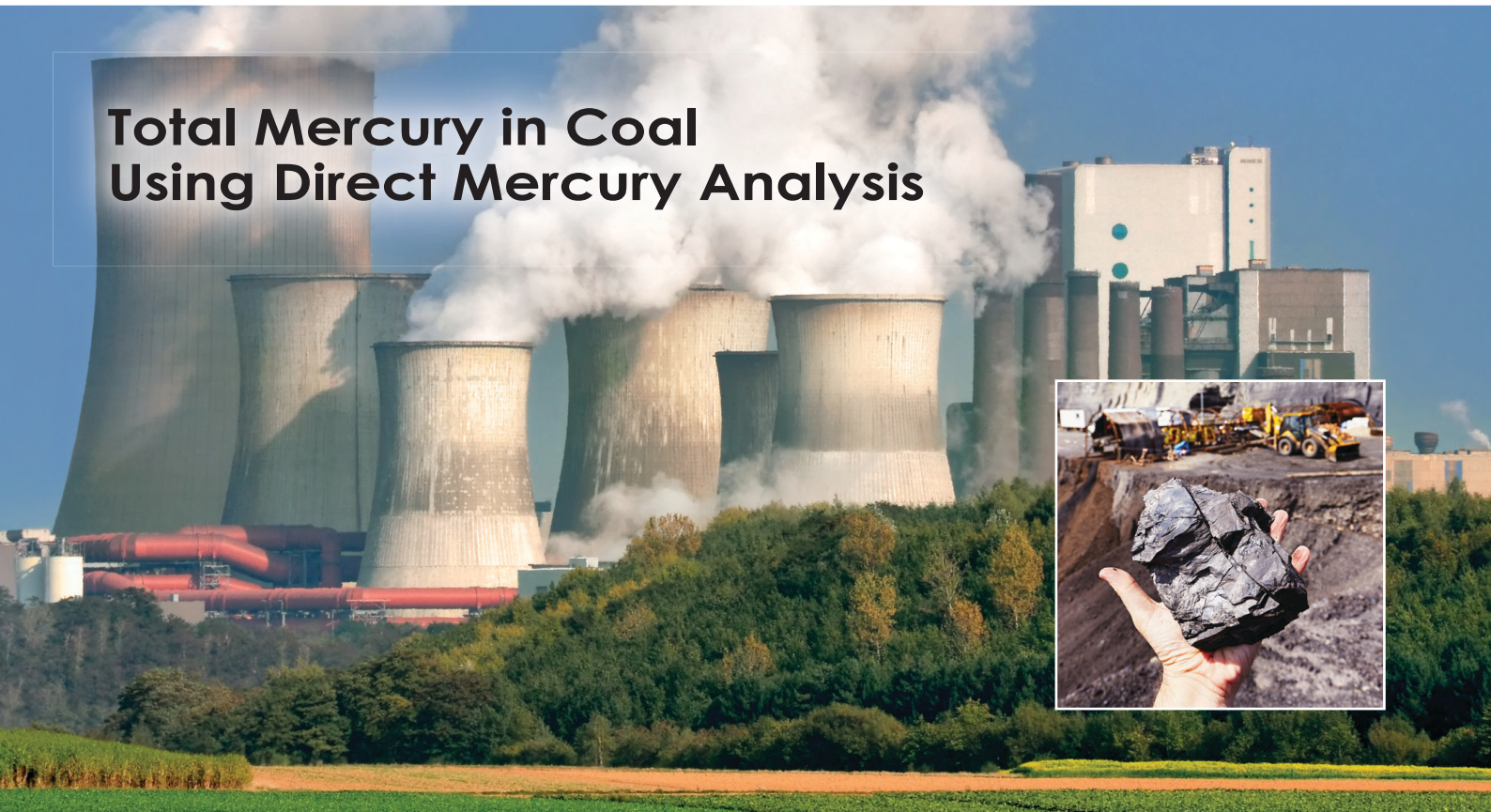# Total Mercury in Coal Using Direct Mercury Analysis

BACKGROUND

Since mercury occurs naturally in coal and other fossil fuels, when these fuels are burned for energy, the mercury becomes volatilized and airborne into the atmosphere. In the United States, power plants that burn coal to create electricity account for about half of all man-made mercury emissions. In nature, elemental mercury can go through a series of chemical transformations that convert it to highly toxic forms that are concentrated in fish and birds. The most toxic form of mercury is methylmercury, an organic form created by a complex bacterial conversion of inorganic mercury. Mercury from the food chain is known to bioaccumulate in humans, so bioaccumulation in fish and birds carries over into human populations, where it can result in mercury poisoning. Mercury is dangerous to both natural ecosystems and humans because it is highly toxic, especially because of its ability to damage the central nervous system. Mercury poses a particular threat to human development *in utero* and in early childhood. Thus, to prevent mercury poisoning, it is necessary to accurately quantify total mercury in coal so that mercury emissions into the atmosphere may be carefully controlled.

REFERENCES

- WHO HP: http://www.who.int/ipcs/assessment/public_health/mercury/en/
- US EPA: https://www.epa.gov/air-emissions-inventories/2011-national-emissions-inventory-nei-technical-support-document
- USGS: https://pubs.usgs.gov/fs/fs095-01/fs095-01.html

INSTRUMENT

NIC MA-3000 is a dedicated direct mercury analyzer that selectively measures total mercury by thermal decomposition, gold amalgamation and cold vapor atomic absorption spectroscopy, on virtually any sample matrix – solid, liquid, and gas. The MA-3000 offers quick results without any tedious, time-consuming and elaborate sample preparation process. It is a perfect solution to today's increasing laboratory demand for easy, fast and accurate mercury measurements.

## REGULATION

Compliance with ASTM D -6722-01.

CALIBRATION

Calibration is done using certified aqueous ionic-mercury standard solution diluted to the required concentration. The least-squares regression method is used to create and complete the calibration curve.

SAMPLE CONDITION

Coal samples are ground with a mortar to avoid segregation effect.

MA-3000 CALIBRATION DATA

⟨LOW⟩
$y=ax+Blank$
$a=6.17188365E-01$
$b=6.45000000E-03$
$r=0.9998$
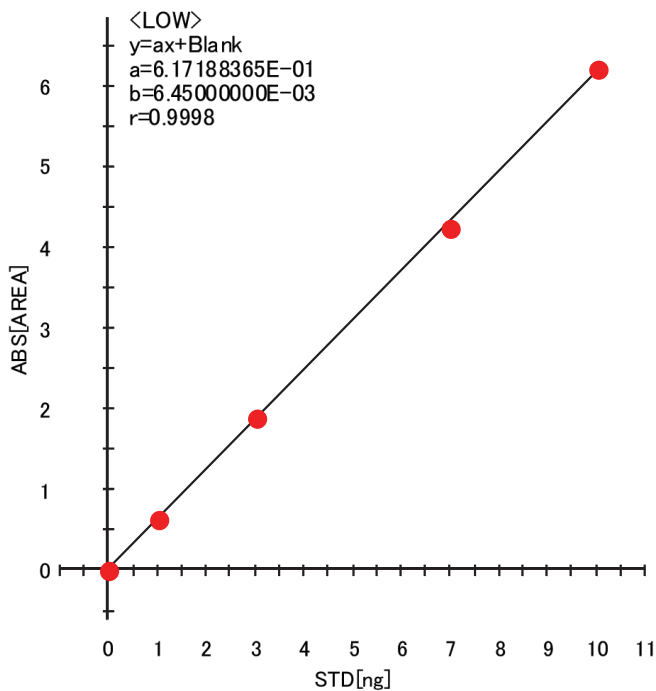
No.	STD [ng]	AREA [ON]	MEAS [ng]	DEV [%]
1	0.000	0.00645	0.000	–
2	1.000	0.62914	1.009	0.9
3	3.000	1.90707	3.079	2.6
4	7.000	4.24295	6.864	1.9
5	10.000	6.22174	10.070	0.7

METHOD

(Decomposition conditions)
Carrier gas: O_2

Sample	Conditions
STD solution	Atomize1: 150°C, 1 min Atomize2: – , – Atomize3: 800°C, 2 min
Coal	Atomize1: – , – Atomize2: 180°C, 2 min Atomize3: 850°C, 2 min

RESULT

Sample	Sample size (mg)	N	Conc. (µg/kg)	CV (%)	STD addition Recovery (%)
Sample	42 ~ 44	3	31.9	7.7	103

CONCLUSION

- **NIC MA-3000** is able to reproduce good STD addition recovery of coal.
- **NIC MA-3000** analyzes coal samples with accuracy and precision.

Identify the right mercury analyzer for you
http://www.hg-nic.com

Distributors