

Office Memorandum • UNITED STATES GOVERNMENT

TO : Acting Chief, Occupational Health Division DATE: January 26, 1960
Through: Acting Chief, Occupational Health Field Headquarters
FROM : Robert C. Keenan, Asst. Chief *RCX*
Analytic Services
SUBJECT: Report of Results of Experiments with TML and TEL Gasolines

In response to your instructions of January 21, 1960, a supply of white gasoline with a high octane rating and samples of tetramethyllead and tetraethyllead fluid were procured. Addition of the organic lead fluids to separate portions of the gasoline stock was conducted just prior to the experimentation described below.

TML Gasoline: 0.136 ml. of TML fluid was added to 250 ml. of white gasoline in a volumetric flask. This concentration corresponds to 2.06 ml. TML fluid per gallon of gasoline (3.7853 liters) or 0.323 mg. Pb per ml. of gasoline (TML fluid labelled purity = 98.4%).

TEL Gasoline: 0.20 ml. of TEL fluid was added to 250 ml. of white gasoline. Concentration corresponds to 3.0 ml. TEL per gal. or 0.634 mg. Pb per ml. of gasoline (TEL fluid labelled 98.4% pure).

Experimentation

Experiment No. 1

Distillation of 5, 5, 10, and 10 ml. quantities from 100 ml. of leaded gasoline. 0.2 ml. portions of distillate was added to 1.0 M solution of I_2 in 25% KI to convert organic lead to lead iodide by heating at 39° C. for 10 minutes. Analysis of aliquot portion of this solution, after destroying excess iodine with sodium sulfite, was made by USPMS Method for Lead in Air and in Biological Materials.

Experiment No. 2

Collection of samples of air, preheated to 100° F. and passed over surface of 100 ml. portion of gasoline in flask heated to 100° F. in constant temperature bath. Air samples were collected at intervals shown in table of results, using 10 ml. of KI- I_2 reagent (described above in Experiment No. 1) in midget impinger operating at 0.5 lpm for 2 minutes. Organic lead converted to lead iodide by heating collected sample at 39° C. for 10 minutes. Analysis of aliquot portion was then made by USPMS Method.

Experiment No. 3

1.0 ml. portion of leaded gasoline was added to flask heated to 100° F. in constant temperature bath. Draw 100° F. air through flask for 40 minutes. At this time gasoline had vaporized completely.

Experiment No. 1. Distillation of four fractions from 100 ml. portions of leaded gasoline.

(a) Gasoline containing TEL (0.828 mg. Pb/ml. or 2.06 ml. TEL of 98.4% purity per gallon).

Fraction	Boiling Range	Vol. (ml.)	Mg. Pb per ml.	Mg. Pb in fraction	Percent of Undistilled Pb Concentration
H-0	Undistilled	--	0.745	----	100%
H-1	43-50° C.	5.4	0.152	0.82	21
H-2	50-55	5.2	0.172	0.89	23
H-3	55-65	10.0	0.198	1.98	27
H-4	65-80	10.0	0.259	2.59	53

(b) Gasoline containing TEL (0.834 mg. Pb/ml. or 3.0 ml. TEL of 98.4% purity per gallon).

Fraction	Boiling Range	Vol. (ml.)	Mg. Pb per ml.	Mg. Pb in fraction	Percent of Undistilled Pb Concentration
H-0	Undistilled	---	0.701	---	100.0%
H-1	29-45° C.	4.9	0.006	0.029	0.9
H-2	45-55	5.1	0.006	0.031	0.9
H-3	55-63	10.0	0.015	0.15	2.1
H-4	63-81	10.0	0.015	0.15	2.1

Experiment No. 2. Vaporization of Leaded Gasoline into Air Stream Maintained Close to 100° F. Midget Impinger, KI-I₂ reagent
2 minute samples at 0.5 lpm

(a) 100 ml. of TEL Gasoline in Flask

Air Sample	Time of Sampling Min.	Flask Temp. °C.	Mg. Pb per liter of air
KI-1	2-4	38.0	0.13
KI-2	10-12	30.0	0.14
KI-3	22-24	36.3	0.06
KI-4	42-43	37.5	0.003

(b) 100 ml. TEL Gasoline in Flask

KI-1	2-4	31	0.007
KI-2	10-12	33	0.006
KI-3	22-24	33	0.007
KI-4	41-43	38	0.017

KE 0003007

Total kg. of collected = 0.458
Percent Recovery (0.458/0.711) = 64.4%

(b) The gasoline. Same sampling conditions as in (a).

Total kg. of collected = 0.711
Percent Recovery (0.711/0.711) = 100

(a) The gasoline. Drawn into 5 L. jar through filter of 0.5 µm for 10 minutes.

Experiment No. 3. Vaporization of 1.0 ml. of gasoline. Solids