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Detroit

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Detroit

Engine Deposition

July 14, 1948

File R; 7G1-RDR6

In Test 7G1-RDR6 of the recent antiknock compound comparison at the Red Star Fleet, one vehicle which operated on G2 Mix "Ethyl" antiknock compound was studied carefully with regard to deposition. The vehicle in question was powered by a 1947 Dodge T-120 engine in heavy-duty truck operation for a total of 38,346 miles. The fuel was Standard Oil (Indiana) Red Crown Rouge base stock plus 3.0 ml/gal TEL. The lubricant was Socony-Vacuum RDS-197, SAE 30.

The question behind this brief additional study was the manner in which lead scavenging is accomplished in this type of operation. It had been known that the amount of lead, bromine, and chlorine not exhausted from an engine and remaining either in combustion chamber or exhaust valve deposits represented a very small amount of the total input. In 100-hour dynamometer tests under heavy-duty cycling operating conditions in a 1942 Plymouth P-14 engine, lead deposits in the combustion chambers represented about 3.3 percent of total lead input. Lead deposits on the exhaust valves represented about 0.5 percent of total lead input. It was further realized that these percentage values would decrease after longer periods of engine operation. Lead deposition beyond the exhaust valve was also an item of concern in more fully understanding the mechanism of lead scavenging.

During 38,346 miles of vehicle operation, 6,368 gallons of fuel were consumed by the engine. This amount of fuel contained:

19,098 ml TEL
20,200 gm Pb
7,800 gm Br
6,920 gm Cl

The amount of lead, bromine, and chlorine remaining in deposits in the engine and its exhaust system are shown as percent of input.

	Pb	Br	Cl	CUMULATIVE		
	Pb	Br	Cl	Pb	Br	Cl
Combustion Chamber	0.50	0.11	0.15	0.50	0.11	0.15
Exhaust Valves	0.16	0.00	0.00	0.66	0.11	0.15
Manifold	1.93	0.36	0.13	2.59	0.47	0.28
Exhaust Pipe	4.16	0.31	0.11	6.75	0.78	0.39
Muffler	2.22	1.63	0.54	8.97	2.41	0.93

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These deposits are listed in order of the route of exhaust gas exit. The data are shown cumulatively on the attached figure. Total deposition is small; lead is 9 percent of input, bromine 2 percent, and chlorine 1 percent.

Scavenging appears to deteriorate markedly just beyond the exhaust valve, chlorine showing an inferiority relative to bromine greater than that exhibited in the combustion chamber. Both halides tend to continue their exit without extricating lead in their passage through the exhaust manifold and the exhaust pipe. Muffler deposition indicates lead chloride present in an amount comparable to that in the combustion chamber, and lead bromide present in an amount considerably greater than that in the combustion chamber. Temperatures encountered certainly affect these observations.

J. A. Cipolla

JAC/dl

CC: Dr. G. Calingaert
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Mr. J. B. Macsuley

Comb. Ch = 148.87 grams / 6 cyl
= 24.81 " / cyl

Exh. valve = 44.90 grams / 6 cyl
7.48 " / cyl

KE 0013000

DISTRIBUTION OF LEAD, BROMINE, AND CHLORINE IN EXHAUST SYSTEM DEPOSITS

1947 Dodge T-120 Engine
Operated 38,346 miles on
Standard Oil (Ind.) Red Crown Base plus
3.0 ml/gal TEL as 62 Mix.
Lubricant - Socony-Vacuum RD8-197, SAE 30.

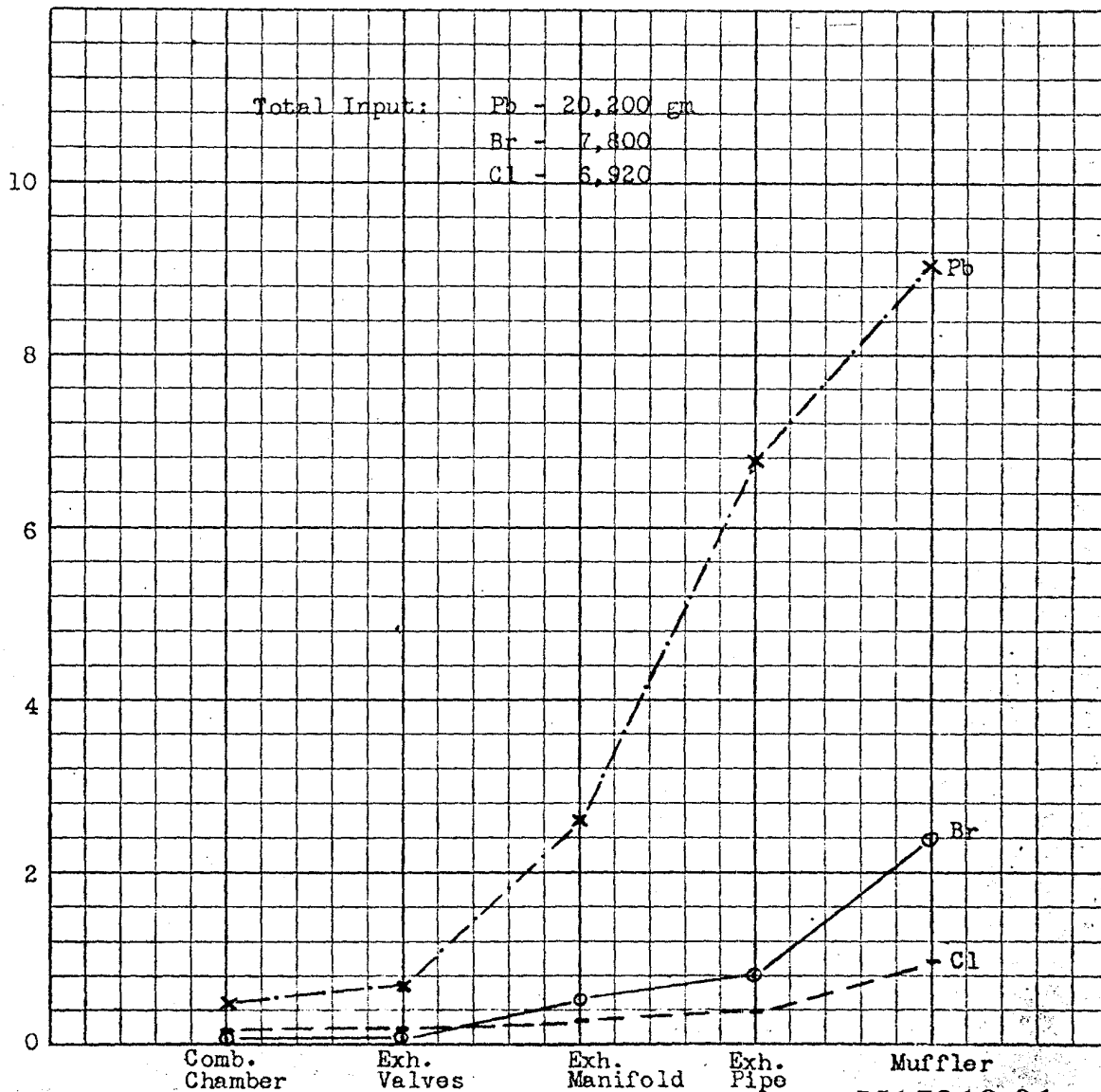
ORIGINAL? ☒ FIRST REPLOT? ☐ REPLOT? ☐
ETHYL CORPORATION ENGINEERING LABORATORIES AT
FILES G & H:

TEST DATES _____ DATA SHEET NO. _____
PLOT BY J. A. Cipolla DATE 7-13-48
WITNESSED BY _____ DATE _____

ECO-584
CURVE SHEET
REF. NUMBER

5949

LEAD/BROMINE/CHLORINE: PERCENT OF INPUT, CUMULATIVE



DEPOSIT LOCATION

N15319.01

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0013031