Standard Oil Company (Indiana)

INFORMATION DIVISION TRANSLATION T47-2

API-TOM Reel 210
(Item marked "2", about 1/2 way through reel) October 9, 1942
"Knock Investigation with Aromatic Mixtures".

The results of the investigation of the first delivery of aromatics from Dr. Bahr/Corr are compiled in the accompanying numerical table, and in Figures 1 to 3. The aromatics were investigated in the CFR motor in 25% or 50% (volume) mixture with I.G. calibration naphtha (I.G. 9 with motor octane number of 43.5). The octane numbers (M.M.) of the aromatic mixtures are stated in the table with and without 0.12 vol.% TEL, the lead-sensitivity of the mixtures plotted in Figure 1. The computed mixture values* are to be seen from Figure 2. For the 50% mixture the octane numbers (M.M.) of the mixture are noted in Figure 3 with and without TEL. In the same figure are represented the minima (at about lambda = 1.1) of the supercharge curves found on the CFR supercharge engine. Thereby is indicated how much (delta p= mm Hg) the minimum of the supercharge curve lies under that of the standard CV2b curve.

The following results from the investigation are to be recognized in particular:

1) All of the investigated aromatic mixtures are more knock-resistant than the corresponding mixture with pure benzol (Figure 3).

2) Especially high knock resistance is shown by dipropylbenzol (8), tri-propylbenzol (15), ethyldipropylbenzol (24) and diethylpropylbenzol (25).

3) At the least seems the knock resistance of diethyl diisobutylbenzol (22 and 23) and surprisingly of monoethylbenzol, which according to earlier investigations (see Report De of Dec. 22, 1941) was better.

4) Regarding lead sensitivity, there are no essential differences (measurement precision ± 1 octane no.!); in general, the lead sensitivity is the smaller the higher the unleaded octane number of the mixture.

5) The mixture value of the 25% mixture is higher than that of the 50%, that is to say, therefore, that the investigated aromatics have a stronger effect in smaller admixtures (less than 50%) than one would expect from the mixture rule.

6) The supercharge ability on the CFR motor (height of the minima at lambda 1.1 of the supercharge curve) goes almost parallel with the octane number

*The designation "Mixture value = M.W." is now used generally in place of "mix octane value", and is referred to a 25 vol.% mixture with I.G. calibration naphtha. In the case of other mixture proportions this must be indicated, e.g. M.W.50.

of the mixture. This only obtains, naturally, as long as motor fuels of similar structure (same temperature sensitivity) are compared.

/s/ Dohn

Translated Feb. 11, 1947 - CCMiller
Requested by R.F. Marschner

"Klopfversuche mit Aromatengemischen".
Hochdruckversuche Lu 558.
Oct. 9, 1942.

Attachments on Original

Table: Octane Numbers of Aromatic Motor Fuels

Figure 1

Delta octane number plotted against sample no. for 25% and 50% mixtures by volume with I.G. reference naphtha. Sept. 26, 1942

Figure 2: Mixture Value of Aromatics

Blending value (Motor Method) plotted against sample no. Measurement precision ± 2 octane for 50% mixtures and ± 4 octanes for 25% mixtures.

Figure 3

CFR-M octane number of 50% blends leaded and unleaded; Together with delta p (mm Hg) for lambda = 1.1 and standardization fuel CV2b, against sample number.

from: API-TOM Reel # 210

Oktanzahlen von Aromatenkraftstoffen

(25%ige bzw. 50%ige Mischungen mit 10-Äthylen-in I.G. m. ROZ. 41,5)

Nr.	Pr.Nr. T.Pr.Op	Produkt		hergest. mit	Siede-bereich	H_2 %	Oktanzahlen (Mot-Meth.) 50%ige Mischung ohne 0,12% b.T.A.	50%ige Mischung mit 0,12% b.T.A.	M_{50}	25%ige Mischung ohne 0,12% b.T.A.	25%ige Mischung mit 0,12% b.T.A.	M_{25}
0		Reinbenzol			80,4°	7,7	69,0	84,0	95	58,0	76,0	25,
1	2346	Monoäthylbenzol		Al Cl_3	130°-140°	9,67	73,8	87,8	104,0	58,8	80,2	104,5
2	2437	Monopropylbenzol		Al Cl_3	159°	10,90	77,7	90,6	112,0	61,4	81,9	115,0
3	2351	Diäthylbenzol		Al Cl_3	175°-185°	10,47	79,6	91,2	115,7	61,5	82,1	115,5
4	2438	Äthyl-iso-butylbenzol	+)	Al Cl_3	160°-200°	10,85	76,5	89,8	109,6	60,8	81,4	112,5
5	2442	Äthyl-n-butylbenzol		Al Cl_3	190°-220°	10,96	79,0	91,8	114,6	62,2	81,7	118,0
6	2463	Äthyl-n-butylbenzol		H_2SO_4	170°-220°	10,83	76,3	89,3	109,2	61,6	81,0	119,5
7	2348	Triäthylbenzol		Al Cl_3	210°-220°	11,29	76,6	88,4	109,5	60,8	81,0	112,5
8	2349	Dipropylbenzol	+)	Al Cl_3	200°-215°	11,07	82,7	94,8	122,0	65,0	83,1	129,8
9	2445	Äthyl-di-iso-butylbenzol		H_2SO_4	200°-230°	11,91	76,9	88,5	110,5	61,5	79,6	115,8
10	2447	Äthyl-iso-butylbenzol		H_2SO_4	200°-230°	11,12	77,1	90,6	111,0	61,4	81,2	119,4
11	2446	Äthyl-di-iso-butylbenzol	+)	Al Cl_3	200°-240°	11,52	76,9	89,6	110,5	60,8	80,8	113,0
12	2444	Diäthyl-iso-butylbenzol		Al Cl_3	200°-250°	11,48	77,4	90,6	111,5	61,8	81,5	117,0
13	2443	Diäthyl-iso-butylbenzol		H_2SO_4	200°-250°	11,47	77,2	89,4	111,0	60,8	80,9	113,0
14	2350	Tetraäthylbenzol	+)	Al Cl_3	245°-255°	10,91	77,6	88,7	111,5	62,0	80,8	117,8
15	2347	Tripropylbenzol		H_2SO_4	227°-243°	11,66	83,6	94,0	123,5	66,0	85,2	133,8
16	2440	Äthyl-n-butylbenzol		Al Cl_3	220°-250°	11,38	79,0	92,3	114,3	64,8	85,0	129,0
17	2461	Äthyl-n-butylbenzol		H_2SO_4	220°-250°	11,44	76,3	90,0	109,2	62,5	81,0	119,8
18	2465	Diäthyl-n-butylbenzol		Al Cl_3	220°-250°	11,38	79,5	91,8	115,5	63,7	83,0	124,6
19	2462	Äthyl-di-n-butylbenzol		H_2SO_4	220°-260°	11,59	75,0	89,0	106,5	60,8	80,2	113,0
20	2464	Diäthyl-di-n-butylbenzol		Al Cl_3	250°-280°	11,38	77,2	89,6	111,0	61,4	81,7	115,5
21	2441	Äthyl-di-n-butylbenzol		Al Cl_3	250°-280°	11,95	79,0	91,2	114,6	63,1	82,7	122,2
22	2448	Diäthyl-di-iso-butylbenzol		H_2SO_4	250°-330°	12,06	73,0	85,8	102,5	58,6	78,0	104,2
23	2433	Diäthyl-di-iso-butylbenzol		Al Cl_3	250°-330°	12,18	72,5	85,8	101,5	58,4	78,9	103,4
24	2356	Äthyl-di-propylbenzol		Al Cl_3	210°-230°	ca.9,7	82,2	94,8	121,0	65,5	84,0	131,8
25	2357	Diäthyl-propylbenzol		Al Cl_3	220°-240°	ca.10.5	81,7	92,4	120,0	65,3	82,9	131,0
26	2358	Diäthyldipropylbenzol		Al Cl_3	229°-258°	11,86	78,8	88,4	114,0	61,2	80,2	114,5

+) Die Proben wurden zurückgezogen (Siedeverhalten!)