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Comparison of Isopropylbenzol with Other Mixture Components, Particularly Triptane, for High Test Fuel Mixtures.

By Dr. Bähr, Ludwigshafen, 28 June 1944
(From Dr. Pier's private file, marked "Geheim")
(See also T-376 & T-377)
(With 4 Sketches)

Synopsis.

The overload curves of pure isopropylbenzol as well as isopropylbenzol in a mixture with VT 702 at charged air temperatures (Ladelufttemperatur) of 100° C and 130° C showed a course similar to that of triptane, whereby an overload behavior similar to that of C3 fuel was observed with an addition of 25% isopropylbenzol to VT 702. By comparison, 30% isopropyl ether and 50% isooctane must be added to mixtures of equal power. Even with a charged air temperature of 180° C a high test fuel of type C3 is obtained with an admixture of 30% isopropylbenzol to VT 702.

These experiments also show the valuable motor properties of isopropylbenzol.

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The purpose of the experiments was to investigate pure isopropylbenzol, as well as a mixture component with VT 702, for its overload behavior, in comparison with other mixture components to high test fuels, such as triptane, isopropyl ether, and iso-octane.

The overload curves were taken at different temperatures, 100, 130 and 180° C, and compared to C3 fuel. The mean working pressure with an air:fuel ratio λ = 1.1 for pure fuels without leading at different compression ratios and charged air temperatures is as follows:

Compression Ratio	Charged Air Temp.	Iso-propyl-benzol	Trip-tane	Di-iso-propyl ether	C3	Iso-octane	B4	Motor Type
8	100°C	15.7	15.3	11.2	9.8	9.2	7.0	VM "K"
6.5	130	16.4	-	12.0	11.7	10.8	-	BMW 132N
6.5	180	10.2	-	8.7	-	7.8	-	BMW 132N

From this it may be seen that isopropylbenzol shows the best overload, even against triptane, at 100° C. At 130 and 180° C the working pressures drop, though isopropylbenzol is still the highest. (The table does not fully agree with this statement and may be in error; figures for 100 & 130° C should perhaps be reversed?) Unfortunately, triptane was no longer available for these experiments. Attached curves, figures 1 & 2, show the overload behavior in detail.

In another series of experiments the necessary admixture of the high test fuel component to the base gasoline with simultaneous leading with 0.12% tetraethyl lead was determined, to get a mixture equal to C3. Accordingly, mixtures with VT 702 at different temperatures with the following percentage content of the various high test fuel components must be made:

Compression Ratio	Charged Air Temp.	Iso-propyl-benzol	Trip-tane	Di-iso-propyl ether	Iso-octane	Motor Type
6.5	130°C	25	25	30	50	BMW 132N
6.5	180	30	--	30	50	BMW 132N

The details can be seen in the curves of Fig. 3.

The results indicate that, in spite of the high temperature sensitivity of the aromatics, an admixture of only 30% isopropylbenzol at 180° C will give mixtures equal to C3 in behavior.

In a further series of experiments, the influence of the added lead on a mixture of isopropylbenzol and VT 702 in comparison with C3, was to be determined. The experiments show that a drop in the leading from 0.12 to 0.09%/vol. already causes a drop of the overload curve to below C3. By increasing the isopropylbenzol admixture to 50%/vol, we get an overload curve approximately corresponding to C3, with a leading of 0.06%/vol. (See Fig. 4)

These experiments clearly show the good motor characteristics of isopropylbenzol as admixture component for making high test fuels. In particular, it was found that isopropylbenzol is fully equal, or even superior, to triptane. With the favorable raw material situation for making isopropylbenzol and the comparatively easy production of this product, large scale production, demanded by the Reich Air Ministry, would seem to be the proper development. The latest results also show that an additional source of high test fuel, based on propane and benzol as raw materials, could be of considerable importance.

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