Reel 107 P.A.W. Item 15

reel 107

I.94

INVESTIGATION OF THE COMBUSTION PROCESS IN THE HESSELMAN ENGINE BY MEANS OF THE I.G. PIEZO-QUARTZ CATHODE RAY INDICATOR

Ref. No. I.94
Origin: I.G. Oppau
Date: 2.2.39

Report No. 370
Author: Dr. Witschakowski
Contents: 6 Text Pages
11 Figure Sheets

SUMMARY

Indicator diagrams with the piezo-quartz indicator have been obtained for fuels of different octane and cetane numbers used in a Hesselman engine at various compression ratios. The engine and experimental procedure were as described in Report No. 366 (our Ref. I.91 q.v.).

The indicator diagrams lead to the conclusion that the combustion pressure was very largely dependent on the time of beginning of injection and of ignition. If these took place too late the combustion pressure fell off extremely rapidly. The pressure lag (which is defined as a type of combustion without increase in pressure) was ascertained from the indicator diagrams for various fuels. The difference in pressure lag for the fuels tested was only small. Hence pressure lag was dependent only to a small extent on the type of fuel in comparison with the other factors. Similarly the time interval from the beginning of pressure increase to the attainment of the maximum pressure was insensitive to the fuel quality.

In a further series of experiments the compression ratio necessary for spontaneous ignition operation, and permissible for knock-free working, was measured for various fuels. The knocking-boundary could be very clearly deduced from the indicator diagrams by the high frequency oscillation which appeared in the vicinity of the maximum pressure. The high frequency oscillation did not occur when knocking was absent. Thus knocking could be detected without the specific use of a knock meter.

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INVESTIGATION ON AN INSERTION IN THE PRE-CHAMBER DEVELOPED FOR DIESEL FUELS OF LOW CETANE NUMBER.

Ref. No. I.95

Origin: I.G. Oppau

Date: 5.2.39

Report No. 371.

Author: Dr. Witschakowski

Contents: 5 Text pages
9 Figure sheets

SUMMARY

A pre-chamber insertion developed for diesel fuels of poor ignition quality was built into a Deutz single-cylinder diesel engine and tested. The engine differed from the standard model in that a Bosch pump (8 mm. plunger) and a Bosch pintle nozzle were fitted. The insertion in the pre-chamber consisted of an incandescent plate in which was a central hole of 8.7 mm. surrounded by a large number of smaller holes of about 2 mm. diameter.

The investigation was carried out, firstly with the standard pre-chamber and secondly with the pre-chamber insertion, on three diesel fuels:- Standard gas oil (cetane number 47), coal middle oil (cetane number minus 7) and coal tar oil (cetane number zero).

The tests showed that it is possible to operate the test engine down to zero load with coal tar oil and coal middle oil. Power performance and fuel consumption were somewhat less favourable than for gas oil using the standard pre-chamber. For gas oil there is no difference in performance using the pre-chamber insertion or the standard pre-chamber.

Pressure/time diagrams, obtained with the I.G. Cathode-ray Indicator show that the combustion process for coal tar oil and coal middle oil using the modified pre-chamber can differ from that which is usual for gas oil with the standard pre-chamber. With the help of the I.G. deflection apparatus piston-movement diagrams at different loads were also obtained.

It was not possible to start the engine from cold with the tar oil or the coal middle oil, nor was it possible to restart the engine after a 10 minute shut-down. Hence it was necessary to start the engine up with gas oil and then, after priming, to switch over to the less readily ignitable fuel. The starting tests were all carried out without heating the pre-chamber by means of a glow plug.

J.A.E.M.

TESTS WITH RCH-DIESEL OIL.

Ref. No. I.98 — Report No. 376

Origin: I.G. Oppau — Author: Dr. Köhler

Date: 31. 5.39 — Contents: 6 Text Pages, 7 Figure Sheets

SUMMARY

Since RCH-Diesel oil (prepared by the Fischer-Tropsch process) has a cetane number about twice that of Standard gas oil (ordinary commercial material from the German-American Petroleum Co.) it was decided to investigate whether the former fuel showed any particular advantage in the Diesel engine. Below are compared the analytical data for the two fuels:

	RCH-Diesel Oil	Standard Gas Oil.
Specific Gravity	0.776	0.852
Viscosity @ 20°C. c.s.	2.86	5.51
Boiling range (5%-95% point)	218-318	235-350
Crystallisation point °C.	-8	-16
Flash Point, °C.	91	100
Fire Point, °C.	102	123
Elemental analysis:		
%C	84.28	86.36
%H	15.10	13.00
%S	0.01	0.35
Lower Calorific Value	10500	10200
Cetane Number	90	46
Conradson Test	0.0	0.014
Ash, %	0.0	0
Phenols, %	0.0	2.5
Aniline Point	86.6	71.5
Iodine Number (Hanus Method)	13.1	4.30

In the investigation in the I.G. Test Diesel, in which compression ratio, time of injection and pump-piston-size were altered, no significant increase in performance compared with the gas oil was established. However, the maximum performance for RCH-Diesel oil is attained at a compression ratio of 8½ : 1 which was about the same as that of aero engines for high anti-knock aviation fuel. In order that reliable starting is guaranteed, however, a somewhat higher compression ratio is necessary. By the use of low compression ratios an economy in weight can be attained; but using RCH-Diesel oil the Diesel engine will still remain heavier than an equivalent Otto-engine. No improvement in running at high speeds was obtained with RCH-Diesel oil in the Hanomag-Auto Diesel engine than with Standard gas oil. The performance was even somewhat inferior. It appears that in this case the ignition quality is not solely decisive, but that the velocity of combustion still plays an important part.

J.A.H.M.

mel 107

EXPERIMENTS ON THE CHANGING OF THE RESISTANCE TO FLOW OF VISCOUS LIQUIDS.

Report No: 377 I-99

Author: Kling **Origin:** Oppau.

Date: 17/3/39. **Contents:** 5 pages text and 7 sheets diagrams & tables

A thin oil is forced through porous stone so that it is regularly distributed round the circumference of the experimental tube. A very thin film is so formed, reducing the wall friction of the viscous oil and thus giving a higher flow velocity. Rates of flow at ~~various~~ pressures were measured. It was found that 2-3% o. thin oil was necessary to give a useful increase in delivery rate.

For comparison purposes, saturated steam at 1 atm. was led into a jacket surrounding the experimental tube so as to warm the oil.

Oils used:-

"Saturated steam" oil (Sattdampföl)	Kin.Visc. $m^2/sec.$	- 2603.0×10^{-6}
Refrigerator Oil	"	- 39.8×10^{-6}

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TESTS ON FOUR FUEL MIXTURES

Ref. No. I.100 Report No. 378

Origin: I.G.Oppau Author: Dr. Lauer

Date: 28.3.39 Contents: [illegible] Text Pages
1 Figure Sheet

SUMMARY

The four fuel mixtures consisted of:-

Fuel Ref.	Components, Wt. %				Density @ 20°C.	Lower Calorific Value K cal/Kg.
	Benzine	Benzene	Alcohol	Lead		
a	75	15	10	-	0.769	9,770
b	65	25	10	-	0.776	9,715
c	65	35	-	-	0.784	10.030
d	90	10	-	0.04 cc/l	0.729	10,440
d_1	90	10	-	-		
d_2	100	-	-	0 .04cc/l		

Properties of the components

	Lower Calorific Value	Density @ 20°C.
Benzine for mixtures a, b & c	10,250	0.742
Benzine for mixture d	10,500	0.719
Benzene	9,600	0.875
Alcohol	6,400	0.794

The knock rating of these fuels was determined by the Research Octane Number Method with the following results:-

Fuel Ref.	Base Benzine Research Octane No.	Research Octane No. of Mixture
a	64.3	73.5
b	64.3	83.8
c	64.3	77.0
d	67.7	82.4
d_1	67.7	71.3
d_2	67.7	81.7

Comparing fuels d_2 and d, it is seen that the presence of 10% of benzene only increases the research octane number from 81.7 to 82.4.

Tests in a 4-cylinder Mercedes-Benz engine type 170V showed the performance and fuel consumption at different throttle settings; and of fuel consumption at different speeds, with throttle fully open. It is concluded that under working conditions there is little, if any, difference between the fuels.

J.A.E.M.

reel 107

I.101

TESTS ON THREE TTH DIESEL FUELS.

Ref. No. I.101

Origin: I.G. Oppau

Date: 31.3.39

Report No. 379

Author: Dr. Köhler

Contents: 7 Text Pages
2 Figure Sheets

SUMMARY

Three TTH diesel fuels from Leuna have been tested for their engine performance. The first fuel (cetane number 30, I.B.P. 147°C., F.B.P. 348°C) was a fairly low boiling diesel oil; the second (cetane number 40, I.B.P. 180°C., F.B.P. 350°C.) was the above diesel oil with the addition of a spindle oil fraction, whilst the third (cetane number 42, 77% vol. to 350°C) was the diesel oil with a light lubricating oil fraction added.

The tests were made at the Technical Establishment in a single-cylinder test engine, and on the road in a Junkers two-stroke engine. All three fuels in their overall behaviour were unfavourable compared with the Standard gas oil (cetane number 46), which was similarly tested. For operation in pre-chamber engines as compared with the direct injection engines examined, they should show no disadvantage.

Samples 1 and 2 without using aids to ignition, gave great starting difficulties in the Junkers engine. The running of the engine was not as smooth as with the gas oil, but the performances were the same. The engine could be easily started with fuel 3, but the performance - especially on steep mountain roads - was inferior to the gas oil and to the other two test samples. The engine smoked badly with this sample.

As none of the three fuels was completely satisfactory, it was proposed that fuel 2 be improved by increasing its I.B.P. and then be re-tested.

J.A.E.M.

reel 107

I.102

CORRELATION TESTS ON I.G. TEST DIESELS.

Ref. No. I.102

Report No. 381

Origin: I.G. Oppau

Author: Köhler

Date: 15.5.39.

Contents: 5 Text Pages and 6 Figure Sheets

SUMMARY

Co-operative tests were carried out on five I.G. test diesels, and, for comparison, on several other test engines. The agreement between the I.G. test diesels was completely satisfactory, the deviations being, in the majority of cases, less than ± 1 cetane number. The greatest spread was 2½ cetane numbers from a test in which the cetane number had to be calculated from that of a blend. The values obtained from the Delft Thomasson engine and an English Gardner engine agreed well with those from the I.G. test diesels. These seven engines had direct injection.

There were, in addition, 3 C.F.R. and 4 H.W.A. engines used in the tests. The C.F.R. engine at I.G. Ludwigshafen, which used the same ignited delay method as the I.G. test diesel, gave good agreement with the latter, while with the H.W.A. engines using the starting method the deviation was greater.

J.G.W.

reel 107

THE EXAMINATION OF BENZINES RICH IN OLEFINES, WITH SPECIAL REFERENCE TO THEIR AROMATIC CONTENT.

Index No. I.104. **Report No.** 383.

Author: Drs. Roth & Timm. **Origin:** I.G. Oppau.

Date: 1/6/39. **Contents:** 15 pages text & 5 pages tables. 2 sheets curves.

The method used at Oppau to estimate olefines by polymerisation with ice-cold sulphuric acid fails in the case of benzines rich in olefines. Such benzines also cause difficulties in the determination of aromatics plus olefines. The polymerised olefines are not completely dissolved by concentrated sulphuric acid, and nitration, according to Hess, suffers from the same drawback. The residues from both methods have aniline points indicating a too high naphthene content, which does not correspond to the specific gravity. Hence compounds which lower the aniline point must be present in the residues.

Ketones, alcohols and other compounds can also upset the estimation. Thus a benzine sample, when prepared by a new process, must be tested beforehand for such substances. The conclusions reached in the report are as follows:

In the cases of high olefine content it is advisable to compare iodine values obtained by several methods, e.g. Hanus & McIlhiney. For the estimation of aromatics plus olefines a modification of the method of Riesenfeld & Bandte is suitable (using 96% sulphuric acid).

For the estimation of the aromatic content, refractive index estimation within ± 4% is not accurate enough. It is only useful qualitatively for naphthenes.

Ultra-violet absorption is quite suitable for determination of aromatics of the benzene series up to C_9H_{12}.

Abnormal benzines should be thoroughly tested for ketones, alcohols, esters, peroxides and conjugated dienes. In the estimation of the latter by the maleic anhydride method, peroxides must be absent.

reel 107

I.106

THE SIGNIFICANCE OF THE CETANE NUMBER
(THE COMBUSTION PROCESS IN RELATION TO THE CETANE NUMBER)

Ref. I.106.
Origin: I.G.Oppau.
Date: 3.6.39.

Report No. 385
Author: Köhler.
Contents: 9 text pages and
8 figure sheets.

SUMMARY.

Tests were made on fuels from 20 - 90 cetane number (a) at constant compression and variable ignition delay and (b) at constant ignition delay and variable compression.

The ignition delay and rate of pressure rise at fixed compression ratio were not markedly affected by high cetane numbers above say 60 but were more noticeably influenced by lower cetane numbers. With variable compression there was always a region where the cetane number was important in its effect on combustion. The precision of cetane number determination was improved by suitable selection of compression ratio. The effect of cetane number on combustion was not linear, one cetane number in the region of 20 having about three times the affect of one cetane number in the region of 60.

The increase in rate of pressure rise with reduced cetane number is demonstrated. Further, fuels of lower cetane number are shown to give higher performance.

J.G.W.

reel 107

I.107

THE INFLUENCE OF INJECTION QUANTITY, COOLANT TEMPERATURE, SPEED AND TEMPERATURE AND PRESSURE OF THE AIR INTAKE ON THE COMBUSTION CYCLE IN THE DIESEL ENGINE.

Ref. No. I.107 Report No. 386

Origin: I.G. Oppau Author: Köhler

Date: 5.6.39 Contents: 13 Text Pages, 14 Figure Sheets

SUMMARY

The tests were carried out on the I.G. Test Diesel using different fuels and operating over a wide range of conditions. The work is an extension of that given in Report No. 363.

The injection quantity, with correspondingly varying injection period, influenced only slightly the delay ~~period, rate~~ of pressure rise and maximum pressure. The exhaust residual gases apparently did not have much effect, which was not surprising in a diesel engine with the usual high compression ratio.

Higher coolant temperatures reduced the ignition delay considerably; there was also a reduction in rate of pressure rise and maximum pressure; and the general running of the engine was improved.

The ignition delay in crankshaft degrees increased linearly with speed; in time the delay increased slightly with reduced speed. Rate of pressure rise and maximum pressure in general decreased with rise in speed. The conclusion was drawn that the combustion speed scarcely changed and was only little dependent on piston speed.

Increased air intake temperature and/or pressure enabled lower ignition quantity fuels to be used.

J.G.W.

reel 107

TESTS ON A SIX CYLINDER HESSELMAN ENGINE IN OPERATION ON THE ROAD.

Ref. No. I.111.
Origin: I.G. Oppau.
Date. 6.7.39.

Report No. 392
Authors: Witschakowski. & Lauer.
Contents: 15 text pages, 4 figure sheets.

SUMMARY.

Driving and continuous tests were carried out on the Reichsautobahns, ordinary roads and in traffic taking notice of fuel consumption, lubricating oil dilution and speed schedules.

There were only small differences in the consumptions of gas oil and a middle oil from coal but the consumption with benzine was extraordinarily high. Tests with the object of reducing the consumption with benzine were unsuccessful as the use of weaker mixtures resulted in stalling and poor acceleration.

The endurance tests showed that with gas oil the dilution was 5.7%, with hard coal middle oil 32.2% and only 1.9% with benzine. The influence of the boiling range of the fuels is clearly shown.

In regard to acceleration the test engine showed the characteristics of all injection engines, that is immediate response to the accelerator. Acceleration times from 30 - 70 km./hr. were 21 seconds for gas oil and 23 seconds for the coal middle oil.

The Hesselman engine did not run much noisier than a carburettor engine. With imperfect operation of the injection nozzles, fuel pump, sparking plugs, etc. the same unpleasant smoke and smell troubles were experienced as with diesel engines. These troubles also arose when the lubricating oil dilution exceeded a certain value.

Fouling of the injection nozzles and sparking plugs was not serious.

Starting difficulties were not encountered if the injection and ignition systems were in order. Benzine injection was, however, always necessary.

Handling and gear changing were comparable with similar duty carburettor and diesel engines.

J.G.W.

reel 107

KNOCK BEHAVIOUR OF LIGHT FUELS OF LOW OCTANE NUMBER IN AN ENGINE HAVING EXTERNAL IGNITION AND COMPRESSION STROKE INJECTION (HESSELMAN ENGINE).

Ref. No. I.113
Origin: I.G. Oppau
Date: 16.8.39
Report No. 395
Author: Witschakowski
Contents: 5 Text Pages and 4 Figure Sheets

SUMMARY

In the I.G. injection engine (I.G. test diesel with Hesselman-Nachbau cylinder head) the knock limit (octane number requirement) at a compression ratio of 6 : 1 was 74 octane number with carburettor operation; with injection during the compression stroke (Hesselman system) it was 42 octane number at an air excess fraction of 0.95, that is about theoretically correct.

With light fuels of lower octane number, knock-free operation was possible only by enriching the mixture strength. A diagram is given showing the effect of mixture strength on the limiting octane number together with the corresponding mean effective pressures, specific consumptions and exhaust gas temperatures.

Pressure-time diagrams obtained with the I.G. Piezo-quartz Cathode Ray Indicator show up the knock as a pressure oscillation in the region of maximum pressure, and good agreement was obtained with knock ascertained ~~orally~~ *aur*.

J.G.W.

reel 107

I.114

THE "TIME MARKER" AS AN ADDITION INSTRUMENT FOR THE I.G. TEST DIESEL.

Ref. No. I.114

Origin: I.G. Oppau

Date: 1.9.39.

Report No. 387

Author: Singer

Contents: 4 Text Pages and 2 Figure Sheets.

SUMMARY

The apparatus consisted of crank and camshaft driven contact breakers arranged to produce a discontinuity in the pressure diagram by means of an induction coil, the high tension lead of which was located near to an unscreened section of the pressure pick-up lead. By means of a graduated scale the location of any event in the cycle could be obtained if one of the contact breakers were phased so that the discontinuity coincided with the event under observation.

In general the accuracy was of the order of ± 0.1 crankshaft degrees, and enabled greater accuracy to be obtained in the measurement of ignition delay.

J.G.W.

rell 107

I.116.

TESTS ON LEUNA-BENZINE AS A DIESEL FUEL.

Ref. No. I.116.
Origin: I.G.Oppau
Date: 21.9.39.

Report No.399
Author: Dr.Köhler

Contents: 2 text pages
1 figure sheet.

SUMMARY.

Fundamentally Leuna-benzine of cetane number 30 can be satisfactorily used in a Diesel engine. Difficulties are only met when (1) the injection-pump cannot satisfactorily handle the very fluid fuel, e.g. badly leaking pump plunger, and (2) when the benzine vapourises in the hot nozzle and can accumulate in the pipe.

The benzine was mixed with lubricating oil (Essolube 50) in the ratios 25:1 and 50:1, in order to give it some lubricating-quality.

Data on Leuna-benzine No. 5058:

Specific gravity at 20°C. = 0.750
Distillation test
10% Point = 65°C.
90% Point = 190°C.
Research octane number = 63.5

Data on Benzine-oil mixtures:

Benzine + oil - 50:1	Cetane number 29.	Viscosity.	---
" " - 25:1	" " 30.	"	0.8°E. at 20°C.
" " - 10:1	" " 30.	"	0.9°E. at 20°C.

Engine tests were carried out in the I.G. test diesel; MWM- Pre-chamber, single cylinder engine (1 litre swept volume); Deutz-Pre-chamber single cylinder engine (1.8 l. swept volume), and in a Hanomag Desel Truck with a 1.9 litre Auto-diesel engine.

J.A.E.M.

reel 107

THE VISCOSITY OF VARIOUS BENZINES AT LOW TEMPERATURES.

Report No. 328.

Author: Dr. Seidel.

Date: 7/8/42.

Index No: I.126

Origin: Oppau.

Contents: 7 text pages & 3 sheets diagrams.

A method is described whereby using an Ubbelohde viscometer measurements of viscosity down to −70°C. can be made. The apparatus is arranged to avoid interference by atmospheric moisture.

The values found for different benzines are discussed:

1. Theoretically, from the viewpoint of the validity of the Walter Formula, as well as the simpler expression $\log V = A + \frac{B}{T}$.

2. Practically, with respect to the possible interruption of fuel lines in very low winter temperatures.

The benzines investigated were:

FUEL.		NUMBER.
Leuna - Aviation Spirit	-	I.G. 81
Benzine - benzole mixture	-	I.G. 9c
Rumanian benzine	-	average sample
CV2b	-	2527
Et 110	-	2460

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I.134.

EXAMINATION OF AVIATION FUEL MA 1 ON ITS KNOCKING BEHAVIOUR IN THE 801 - SINGLE CYLINDER ENGINE (COMPRESSION RATIO 7:2).

Report No: 59/45.

Index No: I-134.

Author: Himmelbach (?).

Origin: (BMW (I.G.

Date: 2/2/45.

Contents: 4 pages text, 4 sheets.

It is required to know whether the aviation fuel MA 1 can be used in engine type 801 D/E/F & S instead of a C3 fuel Those conditions of temperature and pressure giving the most unfavourable results with the full size engine are to be determined. The examination, mainly of the fuels -

1. MA 1 = 78% B4 + 20% Aviation Benzole + 2% Aniline + 0.16% Tetra ethyl lead compared with C3 fuel and

2. Normal B4 + 0.12% vol. tetra ethyl lead

was conducted with reference to the influence of

(a) Temperature (b) Ignition Point (c) Revolutions p. minute.

It is attempted to approximate the single cylinder experiments as far as possible to full size engine conditions so that comparison may be made between the single-cylinder and multi-cylinder engine results. For this purpose, some experiments were made with the multi-cylinder 801E engine.

CONCLUSIONS.

(1) MA 1 Fuel.

Comparison with Standard C3 fuel shows that the knock rating of MA 1 fuel is almost as high. It was found however that the knock-rating is somewhat smaller in the weak region.

MA 1 fuel is suitable as a replacement for C3 fuel in the engine types 801 D/E/F and S. The extent to which the injectors and spark-plugs suffer from lead deposition remains to be investigated.

(2) Normal B4.

This is unsuitable for use in the engine types mentioned since it has a pronounced knock tendency under the prescribed working conditions.

KNOCKING EXPERIMENTS USING FUEL B4 IN THE BMW 801 E Engine.

Index No: I.134 — Report No. 1116/44.

Author: Füchsel. — Origin: (BMW (I.G.

Date: 12/1/45. — Contents: 2 pages text and 9 sheets diagrams.

This paper is complementary to the previous one, No.59/45. Fuel B4 was tested in the BMW engines, 801 D,S and E. Boundary knocking curves for the boundary pressure P_L and the mean indicated pressure, Pmi are given.

CONCLUSIONS.

Fuel B4 can be used in the engines mentioned only under the performance conditions indicated in the accompanying graphs.

Results in the notice of 4/9/44 and in the diagram K 801 - 311 are hereby rendered obsolete and inapplicable.

Note:

Various diagrams, correspondence and manuscript notes are included in the folder mainly concerning knock rating tests of fuels with various additives.

mil. 107

I.135 (i) & (ii)

REPORT ON THE INAUGURAL SITTING OF THE RESEARCH GROUP FOR "MEASURING INSTRUMENTS".

Report No:

Index No: I 135 (i)

Author: Birmelin.

Origin: Stuttgart-Unterturkheim.

Date: 18/5/44

Contents:

This report with I.135(ii) - see below - gives details of the inaugural meetings of a research group whose aim is to consolidate the two research groups "Measuring Instruments" and "Test Installations".

The field of the former group is:

1. The organisation of the large number of special measuring installations, used at different research centres, for general use. Many of these installations are not generally known because of an imperfect reporting system.
2. The second aim is the collection and standardisation of measuring instruments. This applies to mechanical as well as optical and electrical properties.

The importance of close collaboration between the research group, instrument manufacturers and the various branches of the armed forces is emphasised.

A list of experts present at the meeting follows the report.

I.135 (ii)

REPORT ON THE INAUGURAL MEETING OF THE RESEARCH GROUP FOR "TEST INSTALLATIONS".

References as above. **Author:** Schmid.

The work of the group is:

1. The unification & completion of test installations for engine and automobile research.
2. Creation of an exchange system for results of research and, in some cases, for instruments.
3. The standardisation of methods of measurement.

A list of experts concerned follows the report.

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SPECIAL MEETING FOR THE STANDARDISATION OF ENGINE TESTING OF DIESEL FUELS BY THE D.V.M.

Ref. No. I.136
Origin: I.G. Oppau
Date: 14-15.4.42

Authors: Various
Contents: 26 Text Pages

AGENDA FOR THE 14.4.42.

(1) Talk on Methods of Measurement by Dr. Wiedmaier.

(2) Talks on Instrumentation:

(a) The Starting Method, by Weber.
(b) The Ignition Delay Method, by Köhler.

(3) Talks on the Engines and their Operation:

(a) The H.W.A. Engine, by Weber.
(b) The I.G. Test Diesel, by Penzig.

(4) Inspection and Operation of the Engines in the Laboratory.

(These talks are given in full in the text).

Before the Inspection the Chairman (Kessler) asked Dr. Neumann to give a talk on his inertia indicator and its present status (also included in text).

AGENDA FOR THE 15.4.42.

Discussion on the above subjects.

In conclusion, the following recommendations to the D.V.M. were agreed on:-

(1) The ignition delay method should be the basic method.

(2) The ignition delay should be maintained constant.

(3) The H.W.A. or the I.G. Test Diesel should be used.

(4) The ignition delay should be kept constant either by throttling or variable compression.

(5) The inertia indicator, the piezo-quartz indicator or the photo-cell indicator could be used.

(6) In the range 30-70 cetane number, the H.W.A. engine could use the limiting throttle method (e.g. I.P. Method 2).