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reel 108

C.85

THE INFLUENCE OF DECREASING SETTING POINT ON DIESEL OILS

Ref. No. C.85 Report No. 280

Origin: Technical Lab., Oppau Author: Penzig

Date: 22. 2.35 Contents: 7 Text Pages
4 Figure Sheets

SUMMARY

The diesel oil injection pump can continue to inject fuel in the neighbourhood of the setting point as long as there is no filter in the suction line. Injection begins to fail when the temperature is low enough for crystallisation to commence, if a filter is present.

Additives which lower the setting point have only a very small influence on the point at which crystallisation begins, although they have an undoubted effect on the setting point itself.

With and without filter it was found that the temperature at which the pump fails can be lowered by suitable additives.

The Bosch Diesel pump used was built into a refrigerated box. The inlet dipped into a flask containing the oil sample. The oil was pumped into a second container and the time to deliver 120 mls. measured at different temperatures and hence the delivery in mls./second.

K.G.G.K.

reel 108

L.3

POWER-PLANT MAINTENANCE.

Ref. No. L.3 Report No. VE6

Origin: Luftfahrt Ministeriums Author: Dr. Koppe

Date: 31.10.40 Contents:

SUMMARY

The maintenance of aero engines (internal combustion) is discussed from the point of view of running, cooling and lubrication and the consumption of fuel, lubricant and coolant. The various aero instruments, e.g., manometers, thermometers, gauges, etc., and their uses are discussed.

K.G.G.K.

Reel 108

L.16

THE SEPARATION OF WATER BY FUEL FILTERS IN AIRCRAFT AND TANK INSTALLATIONS.

Ref. No. L.16 Report No. III A.31

Origin: Luftfahrt Ministeriums Authors: Buschmann. Basilico.

Date: 1935/36.

SUMMARY

The construction and mode of action of the different fuel filters in use is described. The experimental results date from the years 1935/36.

K.G.G.K.

reel 108

THE IGNITION OF COMBUSTIBLE GAS-AIR OR VAPOUR-AIR MIXTURES BY SPARKS.

(Produced by Grinding)

Ref. No. U.1

Origin: Leuna Works

Date: 22.2.44

Report No.

Author: Dr. Gaulrapp

Contents: 4 Text Pages.
4 pages diagrams & tables

SUMMARY

The action of sparks on combustible Gas - or Vapour - Air mixtures was investigated using a specially constructed apparatus.

Ignition occurred with acetylene, ethylene, carbon monoxide hydrogen and carbon disulphide. No ignition occurred with benzine, propane, butane and a number of other materials tried. In the case of ethylene and carbon monoxide the ignition range is below the mixture with the greatest flame-velocity.

With the exceptions of methanol and ethanol, the mixtures tested were at room temperature. The apparatus was not suitable for tests at 200-300°C. which would give an approximation to conditions often met with in the chemical industry.

The sparks were produced by pressing a steel rod against a rotating emery wheel.

K.G.G.K.

reel 108

EVALUATION OF CAPTURED OILS & FUELS.

Ref. No. U.2. Report No. 33

Origin: Luftwaffe Author: Schwencke

Date: 15.11.44. Contents: 19 Text pages and 1 Figure sheet

LUBRICATING OILS.

The usual analytical data are given for various oils (colour and appearance, S.G., refractive index, Conradson %, ash %, nitrogen %, sulphur %, viscosity, etc.). Various comparisons are made with German lubricants.

Data are given for:-

Oil	Source	Shot Down
(1) Lub. Oil ex Bristol "Hercules XI"	Stirling Bomber	8/42
(2) " " " "Twin Wasp"	Liberator	8/43
(3) " " " Rolls Royce "Griffon"	Spitfire	8/43
(4) " " " Soviet Engine "M.82"	La - 5	1/44

100 OCTANE FUELS.

Analytical and test data are given for the following:-

Fuel	Source	Shot down
(1) Various from Cyclone 9	B.17	
Merlin 20	Halifax	
Merlin 21)	Mosquito	
Merlin 21)		
Merlin 22	Lancaster	
(2) ex "Twin Wasp"	Liberator	8/43
(3) ex Cyclone 9	B. 17G	3/44

130 and 150 OCTANE FUELS.

These fuels were first captured in July 1944. Analytical and test data are given. The reason for the use of these new fuels is discussed.

"BANKS" REPORT OF 1939.

An extract from this is given in connection with the 130 and 150 Octane fuels and the modified method of determining anti-knock properties.

The paper concludes with a general survey of fuels and lub. oils used in the British, American and Soviet Air Forces.

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U.8

REPORTS ON WORK CARRIED OUT AT THE TECHNICAL RESEARCH STATION, OPPAU.

Ref. No. U.8 — Report No.

Origin: I.G. Oppau — Authors: Various

Date: 18.7.42 — Contents: 55 Text Pages and diagrams

SUMMARY

A series of reports are presented on work carried out at Oppau. The list of contents is as follows:-

COMMENTS.

These articles appear to have been compiled and published with the object of giving a general survey of the work carried out at the Technical Research Station, and while well illustrated, they do not go into any great technical detail.

J.G.W.

reel 108

U.9

RESEARCH REPORTS OF THE MOTOR FUEL DIVISION OF THE NATIONAL RESEARCH COUNCIL.

Vol. III - Engine Section.

Ref. No. U.9. Report No.

Origin: Technical High School, Munich Author:

Date: May 1941 Contents: 113 Text pages, and diagrams

CONTENTS:

(1) SUMMARY: A general discussion is given on the evaluation of the engine behaviour of both spark and compression ignition engine fuels. The author favours the use of acoustic-electric knock measuring methods since they can be applied to normal engines operating under service conditions.

(2) SUMMARY: The factors influencing ignition delay are examined from the physical and chemical aspects, following which the available methods of rating diesel fuels are reviewed. The inter-relation of cetane number, rate of pressure rise and knock is discussed and supplemented by experimental data, including tests on fuel fractions. The author lays particular stress on direct knock measurements as opposed to ignition delay and gives knock oscillograms and other knock records to illustrate his views.

(3) SUMMARY: Improvements in the apparatus were a change in the type of microphone used and direct conduction of sound to the diaphragm by a metal wire. Frequency selective filters were used with different characteristics and a new design is discussed. Plans for future equipment both for laboratory purposes and operational use are outlined.

Ref. No. U.9 (Contd.)

(4) SUMMARY: The installation of the equipment in single and multicylinder engines and in cars is discussed. Tests on single cylinder engines are described and illustrated with knock curves. Some details of the microphones used are given.

Tests on a Mercedes and a Peugeot engine show the differences in knock between individual cylinders. Road tests were made on Peugeot, Renault, Citroen and Adler cars.

The construction of a crystal microphone and an ignition timing indicator are described.

Frequency characteristics of the amplifier and filter circuits and the frequencies of the knock noises are discussed.

J.G.W.

reel 108

U.10

THE CORRELATION OF FUEL RESEARCH AND SUPPLY PROBLEMS.

Ref. No. U.10 — Report No.

Origin: [illegible] Akademie der Luftfahrtforschung — Author: Philippovich

Date: 21.11.41 — Contents: 18 Text Pages

SUMMARY.

Requisites of fuels suitable for both civil and military aviation are discussed.

The production and properties of high octane fuels from gas, crude oil and coal are given.

PRODUCTION

It is pointed out that any change in the production or use of fuels should be planned far ahead. Maintenance of a certain minimum quality is the most important factor at the moment. In the future the reduction in prices of iso-paraffin fuels may be possible, also the development of certain suitable compounds for a dual fuel system (Zweikraft-stoffsystem). The production of stable aromatics should be further developed. Inhibitors should be added immediately after manufacture. Lead content should be decreased by improving the anti-knock qualities of the fuel.

USE

Engines should preferably be suitable for given fuels, but the possibility of using varying fuels should be examined. Variations of engines of the same type should be measured. The behaviour of fuels under extremes of climate must also be tested. Engines for use with pure aromatics should be developed.

RESEARCH

Chemical changes in fuel should be investigated, so that a scientific basis for the preparation of stable fuels can be established. Knocking behaviour should be further investigated in the laboratory (delayed ignition measurements)

Ref. No. U.10 (Cont..)

to throw light on the physical characteristics of the engine, from constructional as well as operational points of view. The properties of exhaust gases should also be examined.

The general applicability of the rich mixture test (Überlaste Prüfung) should be improved. Fuel deposits and the action of various fuels on engine components should be investigated.

K.G.G.K.

reel 108

U.11

RESEARCH ON THE QUESTION OF THE MODE OF PASSAGE OF FUEL THROUGH AN INJECTION NOZZLE.

Ref. No. U.11
Origin: German Power Vehicle Research Vol. 57
Date: 1941.

Author: Werner Oschatz
Technical High School, Dresden.
Contents: 28 Text Pages

SUMMARY

For the investigation of liquid jets a method of research is used which permits the individual factors exerted on the jet in part separately and in part relative to one another, to be grasped. In this way a comparative estimation can be undertaken.

The basis of the method, on which all further research should be built up, is the form of flow of the jet. It is shown that the form of flow of the jet, moving in air, in the vicinity of the nozzle is a function of the initial turbulence; and that it is possible to differentiate between "continuous" and "dispersed" flow. The initial turbulence is also determinative for the liquid distribution in the jet, whereas the external air forces determine the specific dissolution of the jet and drop formation. Hence it can indeed be correctly postulated that the spray itself does not atomize.

The viscosity of the liquid influences the retarding and stopping of jet-formation and the decomposition of the jet, whilst surface tension in conjunction with the air forces promote the dissolution of the jet and drop formation. The formation and decomposition of thin films also proves favourable to the production of drops.

By far the most powerful influence on the formation and dissolution of the jet is attributed to air density, or the back-pressure of the air. With continuous and also dispersed flow a compression of the jet appears, under vacuum or on increasing the air density. For a gas oil jet the maximum compression is reached at about 5 ats. air pressure. If the amount of liquid present in the jet nucleus increases, dissolution of the jet (apart from a little drop-formation on the border of the jet) does not take place.

Only at 5 ats. or on further increasing air density are produced even greater air forces affecting dissolution of the jet, through the relative jet/air velocity, thereby leading to an increasing dissolution of the gas oil jet.

Ref. No. U.11 (Contd.)

The fundamental cause of this phenomenon is to be looked for in the ratio of the magnitude of the internal liquid forces of the gas oil jet to the magnitude of the external forces acting on the jet, which are varied with the increasing air density. These forces acting on the jet have been carefully considered.

The influence of air density on the jet is made clear through the "Plastilin" prints and quantitatively illustrated by the receiver measurements taken on the jet-nucleus. It is evident, accordingly, that the jet-injection in the Otto engine (benzine injection) is carried out under the most unfavourable air conditions, compared with which the prevailing air density in the diesel engine during injection offers far better suppositions for the dissolution of the jet.

Further, the quantitative measurements made at equal quantity injected every stroke show that the initial turbulence of the spray had a decisive influence on the fuel distribution in the jet. For example, in the case of a gas oil jet the quantity of fuel collected under the most unfavourable air density (5 ats.), but otherwise equal conditions in the jet-nucleus, amounted to about 68% for continuous flow and to about 23% for dispersed flow.

The actual remainder of 32% and 77% respectively is to be found in the form of already separated liquid droplets in the shell of the jet, and can in general be regarded as a scale for the estimation of the division of the fuel in the cross-section of the jet.

However, at constant air density, collecting measurements carried out at different velocities show that there is for continuous flow a most favourable jet velocity for the dissolution of the jet. This fact is illustrated by the transition from dynamic to static surface tension, and, thereby, the displacement of the ratio of internal to external jet-forces occurring with increasing velocity. For dispersed flow this relationship between jet-dissolution and jet-velocity is not present, since this form of flow brings with it far more favourable suppositions for jet-dissolution than is the case for continuous flow.

In comparison with the investigation undertaken in air, the injection research with a gas of lower viscosity permits the conclusion that the prevailing air viscosity in the diesel engine during the injection process retards the jet-dissolution considerably.

The investigations on drop-size in the moving jet confirms essentially earlier measurements.

The investigation and its results show the fundamental importance of spray characteristics in the problem of attainment of good mixture formation in the engine.