

MINUTES OF THE MOTORCYCLE AND INDUSTRIAL
ENGINES DEVELOPMENT MEETING HELD ON
WEDNESDAY, 28TH, MARCH, 1963 AT 2.15 P.M.

Present: Mr. J.J. Booker - Chairman
Major V.T. Mountford
Mr. R.A. Wilson-Jones
✓ Mr. R.E. Thomas
Mr. G.L. Bromley

INDUSTRIAL ENGINES

1. OUTBOARD MOTOR

It was reported that the outboard engine had been assembled and run but difficulty was being experienced in obtaining sufficient flow from the centrifugal water pump although to all intents and purposes it was identical with the Seagull except for the passage from the pump chamber to the vertical copper pipe.

It was also reported that although the Seagull pump gave a better flow than the Enfield one at an engine speed of 1,800 r.p.m. no flow of water was obtained from the Seagull between 1,500 r.p.m. and 1,800 r.p.m. which appeared to be the minimum speed at which the engine would run without a propeller fitted.

The Seagull was run in its correct form, i.e., the whole of the shaft and reduction gear boss was submerged in a tank whereas the Enfield has to be run with a pipe feeding water to the pump from a tank in which the water was maintained at the correct level.

The size of this pipe was queried by Mr. Thomas and it was found that the type of inlet used on the Enfield engine on the brake gave 5 sq.in. area against the Seagull's .17 sq.in. It was pointed out, however, that when tests were carried out using electric and pneumatic motors to rotate the mainshaft, this difference in intake area did not matter because the tape, and also the union were removed from the cast aluminium housing on the Enfield which would then give considerably more sectional area of intake than the Seagull.

3. View of the difficulty we have experienced with the functioning of the propeller, although a further test is to be carried out with a different inlet for the pump, it has been decided to obtain an Evinrude outboard pump utilising a flexible impeller. Unfortunately, owing to the time which has been spent on the water pump, no power curve has been obtained.

1. Outboard Motor (Cont.)

Propellers - The type and size of propeller is still to be decided owing to there having been no specific data obtained on speed and power of the engine.

Complete costs have been prepared and these would appear to be favourable.

2. New Range of Air Cooled Diesel Engines

Preliminary enquiries have shown that the market up to 10 h.p. is the most favourable and that from 10 to 50 h.p. the next best. Enquiries made by Mr. Wilson-Jones, Mr. Booker and Mr. Bromley have elicited the information that there is a large demand in the 3 to 5 (or 6) h.p. bracket and it is considered that this could be covered by either a 350 cc or a 400 cc engine. The suggestion is that this bore and stroke, i.e. 80 x 80 forms a basis for a range of engines.

The first step is a single cylinder, followed by a parallel twin of about 700 cc - 800 cc, and then either a three or four cylinder in line, or possibly only a four cylinder to give 1,600 cc with approximately 25 h.p. As the engines are to run at 3,000 r.p.m., considerable experimental work will probably be required to reduce to the minimum vibration.

It was agreed that, in view of the fact that the vast majority of manufacturers are now using direct injection, engines should be designed from the start with this type.

The order for a Petter P.J.1. has been changed to an order for a P.C.2. which is their high speed 700 cc parallel twin. It is hoped that this engine will be in the Works in two or three weeks' time for examination and test. It is suggested that when the Petter engine is received, normal power tests are carried out and also if possible vibration readings are made by means of the Dawes vibration meter which Mr. Wilson-Jones has undertaken to obtain from Westwood.

In view of the fact that a 180° crank has been suggested as a possible improvement to vibration troubles, a short cut could be made by having a special crank made to enable comparisons between the 180° and 360° shaft to be made.

It was stated that the desirability of an automatic de-compressor was frequently being put by customers. If this could be incorporated cheaply in any future designs, it should be.

3. Experimental Valve Tappets and Cast Iron Cylinder Barrels.

Cast Iron Cylinder Barrels - Mr. Bromley reported that owing to the test

3. Experimental Valve Tappets and Cast Iron Cylinder Barrels.(Cont.)

bed having been used for other experimental work, this test was unfortunately not completed. The engine was now running again and will continue to do so until the test is completed.

Tappets - Mr. Bromley expressed fears that the oil grooves in the new tappet might not be deep enough to enable sufficient oil to reach the tappet foot or the push rod end cap. It was decided, therefore, to have a set of tappets produced with considerably deeper grooves and that these should be put on for further test at the first opportunity. In view of this, the adoption as standard of this type of tappet will be deferred.

4. Valve Springs

Mr. Bromley reported that tests run on a single valve spring only were not entirely satisfactory. There appeared to be some doubt as to whether the engine had the correct valve timing. It appears desirable that the test should be repeated after having made sure that everything is correct before starting the test.

5. Excessive Oil Consumption on 85 Twins.

Mr. Bromley reported that the latest test with the slotted scraper ring used in conjunction with the drilled piston, had given considerably improved results. These tests were carried out on engines which had been returned from Messrs. Wales & Edward's Vehicles who had complained frequently about excessive oil consumption on these engines fitted to dairy delivery vehicles.

The engine will be taken off the bench and returned to Messrs. Wales and Edwards so that they may confirm the results which we have obtained during bench tests. This engine is also fitted with valve stem seals. These are to be left on the engine when it is returned. Mr. Bromley mentioned that under over-load conditions there was a tendency for the valve stem seals to harden when the temperature rose. Investigations are to be carried out with the suppliers to obtain a better heat resisting quality rubber. Either Mr. Wilson-Jones or Mr. Bromley will attend to this.

Expander Type Rings: In view of the improved results obtained with slotted scraper rings and the possibility of cylinder bore wear of the duoflex rings, it is decided not to pursue tests with the duoflex rings any further.

6. Crankshaft Failures

Mr. Bromley said that the preparation of the crankshaft having increased diameter outside the bearing had been unfortunately delayed but

6. (Crankshaft Failures)Cont.

the drawings were now in the Tool Room and a shaft is to be produced as soon as possible.

7. Rear Bearing Housing Failure

Mr. Bromley reported that action had been taken and alteration notes had been issued. At the moment jigs are being altered to accommodate the revised studs.

MOTORCYCLE ENGINES

8. 750 cc Engine

5-Speed Gearbox - We now have a road tester but he is at the moment fully occupied in putting in miles on the 175 cc. As soon as circumstances permit, miles will be put in on the 750 cc machine with the 5-speed gearbox.

Automatic Advance - A sample sprocket assembly has been obtained and tested. It was found that the automatic advance springs would not overcome the contact breaker and magneto drag of the K.2.F. mag., which meant that when the engine was slowed down, the timing was not retarded proportionately to the speed. Although in starting, the first movement pushed the control to retard, the idling was uncertain because of too much advance. Messrs. Lucas then sent us another unit having stronger centrifugal springs. These proved to be too strong because the timing was not advanced until too high a speed had been reached. Mr. Cook of Lucas suggested that we fit one weak and one strong spring. This is at the moment being tested.

9. Connecting Rod Bolts

As a result of two connecting rod bolt failures on machines supplied to Messrs. Cooper Motors of Los Angeles, considerable investigations have been undertaken. As an intermediate measure, Mr. Cooper has been asked to obtain as quickly as possible in America sufficient quantities of high fatigue bolts to cover his immediate requirements. He is also to send us a supply so that any future assemblies will include this type of bolt. In the meantime, supplies of high fatigue bolts are being ordered from Unbrako.

However, tests have shown that a possible cause of the failure of the present type of bolt is a bending load which is brought about by distortion of the big end eye under inertia loading. Tests carried out at High Duty Alloys show that when a load equivalent to an engine speed of 8,000 r.p.m. is applied, the big end eye distorts across the cap face

9. Connecting Rod Bolts (Cont.)

to the extent of .004", i.e. .002" each side.

A drawing has been submitted by Westwood at our suggestion showing how extra metal can be allowed outside the bolt. Westwood have been asked to produce two connecting rods to their new drawing as soon as possible. When received these will be tested at High Duty Alloys in the same manner as the standard. Mr. Thomas has designed a steel connecting rod cap and it is intended to see whether this can be machined practically.

10. 350 cc Bullet

As trouble has still been experienced with the alignment and fit of the driving side outrigger bearing it has been decided to increase the clearance of this bearing by means of reduction in size of the steel bush, and also to revise the method of reaming the bronze bush. Assembly of the first 10 to 12 engines since these modifications has been facilitated and no seizures of the bearing were reported during the testing of these machines.

11. 175 cc Model

The engine on the bench has now completed a total of approximately 220 hours, having run at speeds between 6,000 r.p.m. and 7,000 r.p.m. The primary chain shed its rollers after approximately 120 hours. This was probably caused by the breaking of the steel part of the chain tensioner, and the disintegration of the rubber facings probably followed this breakage. Trouble has also been experienced with fine shreds of rubber from the chain tensioner pads circulating with the oil and eventually choking the oil filter. This has occurred twice.

Experiments are to be carried out with a nylon tensioner.

Nylon Tensioner

Messrs. Nylonic Engineering have agreed to supply us with a piece of nylon from which a tensioner can be machined to take the place of the present primary tensioner. The only danger would appear to be the fact that the Nylonic representative informs us that the nylon loses its resilience at approximately 300° - 320°F. It appears a worthwhile experiment and the tensioner is unlikely to reach this temperature.

Cam-shaft and overhead rocker - A satisfactory type of rocker follower with the original cam shaft is obtained either by a roller type follower or by a follower faced with a Nickel-Chrome - Boron sprayed surface. The Nickel-Chrome sprayed surface may be considerably cheaper than a roller. Mr. Wilson-Jones is obtaining quotations from Messrs. M.E.I. However, we have now on test on the engine on the bench, Mr. Thomas' second design of cam shaft and rocker gear with revised geometry and smaller diameter cam shaft. This has completed to date, 47 hours at speeds of

11. 175 cc Model (Cont.)

6,000 r.p.m. - 7,000 r.p.m. with standard hardened cam followers, and appears to be satisfactory. This has completed a considerably longer period than was achieved with the original geometry and cam diameter with standard hardened rockers. It seems that we should certainly be safe in using the revised geometry with rocker followers faced with nickel-chrome, subject to prices being reasonable.

*Ind. Part of
Cam Gear*

The 175 cc machine which is being tested on the road has completed 1,500 - 2,000 miles, and at this mileage the exhaust rocker broke. It would appear that the heat treatment of the rocker is at fault, but Mr. Wilson-Jones is returning this to Messrs. Kayser Ellison for their comments. It should not be necessary at this stage to undertake any redesign of the rocker. Mr. Thomas suggests that if the cam follower pad is faced with hard material which will prove satisfactory, it is not necessary to make the rocker of KE.41 and he would be quite happy utilising EN.24 which would give a greater core strength and consequently less liability to fracture.

In view of the improved results, the design of the engine will be adopted to accommodate the new valve geometry and cam shaft.

Outside quotations are still being awaited to enable the cost of the engine and machine to be estimated. It was pointed out that a decision was urgently needed as to whether the machine was technically right for production. Apart from the rocker difficulties which appear to be largely overcome and the chain tensioner troubles, the rest of the engine can be said to be satisfactory. It is estimated that within a month both these problems can be resolved.

12. Batch Tests

A batch test was recently run on a 350 cc Bullet in conjunction with further carburettor tests which were required on this model. Mr. Wilson-Jones will report on these tests.

13. Over-oiling on 250 cc Machines

No further progress has been made with this problem, but a test is to be run using smaller diameter flywheels and a deeper sump.

See Charlie

14. Lucas Self Starter

Completion of tests on the Lucas Self Starter is still being awaited.

15. Shorter Brake Linings

Tests are still continuing on the Super-5 machine. Mr. Baker is to be again approached regarding the finish of brake drums.

16. 75 cc Machine

Mr. Davenport is to contact Mr. Geoffrey Jones regarding the long awaited 75 cc Villiers engine. Rims and tyres have been obtained and the frame is nearly complete.

17. Nodular Iron Clutch Centres

Both the 250 and 350 clutch centres in nodular iron have been machined and are at present fitted in an experimental machine undergoing mileage tests.

18. Larger Registration Number Plates

No action need be taken for the time being.

19. Small Diameter Valve Stems on 250's

With a view to standardising for 1964, a light valve for all 250's except the Clipper was agreed upon. Mr. Thomas is to produce two sets of parts so that they can be tested both on the bench and on machines.

20. Continental Tank

It was emphasised that whilst embellishment might be desirable, the most important thing was to lower, if at all possible, the height of the filler cap. This is being investigated with the tank manufacturer.

21. Morse Chains

In view of the considerable saving in cost by fitting Morse chains it has been decided to equip 50 250 cc machines with them, and the Service department will be asked to keep a check on performance of these chains in use.

22. Guy Rope Cleaning and Greasing Appliance

Mr. Thomas is investigating the possibility of producing a guy rope cleaning and greasing appliance. Work on the design is proceeding.

23. Manual Hoist

A sample of a French designed and produced winch has been submitted so that we may draw up a design with the possibility of producing these in quantities of up to 200. It is emphasised that none of the mechanical dimensions must be altered in any way otherwise it has been proved from past experience that the winch does not operate satisfactorily. Mr. Thomas is proceeding with dimensioning and drawing of the parts of the winch.

24. 21-2N Valves

Mr. Wilson-Jones mentioned that we have some valves made from 21-4N material on test, without Stellite tips on the end of the stems. He pointed out that these are cheaper proved that no ill effects are noticed from the lack of Stellite tipping. Report next meeting.

J. J. Booker
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