Tractor testing in Australia

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AUSTRALIA is one of several countries that have set up “official” tractor testing schemes. These schemes mean testing stations that, while providing a testing service for both the manufacturing industry and the consumer, in effect mainly the farming industries, are independent of either.

Unless the tests are compulsory, as at Nebraska, they are better described as “formal” rather than “official.” The following paper sets out the origins and scope of formal testing of tractors, particularly in Australia. A second paper describes the test procedure.

ORIGINS OF TESTING SCHEMES—NEBRASKA, 1919

The origin of all the present tractor testing schemes can be traced back to the “Nebraska tests” of the U.S.A.

In 1919, the legislature of the State of Nebraska passed a law requiring anyone wishing to market a tractor in that State to have a sample stock model tested by the University of Nebraska; the Act also required that the test report be published.

The primary object was, simply, to provide a check against the extravagant advertising claims and correspondingly poor tractors being made by some makers who were cashing in on the new wonder—the “iron horse”—after World War I had shown these machines to be possible.

It will be recalled that the tractor only began to make its appearance in the years immediately following the war; many wildcat companies entered the field with little or no experience to back their products; many hopeless designs were put on the market. Farmers, of course, had no way of assessing these machines, whether the claims made for them were valid or outrageous.

The Nebraska tractor test law was designed to cope with this situation. The law soon effectively covered the whole of the U.S.A. since a manufacturer could not risk the obvious implication of selling everywhere but in Nebraska!

As time went by the bad were sorted from the good; the reputable makers were quick to see the advantage of being able to base their advertising on an attested report from an independent authority with the high standing of the University of Nebraska.

More than 700 separate makes and models have passed through the Nebraska tests since 1919. Although field-day tests of tractors had been organised in England in the early twenties and thirties, and indeed at Werribee in Victoria in 1918, it is obvious that the Nebraska law and the Nebraska test scheme effectively started the notion of tested and certified tractors.

AUSTRALIAN SCHEME LAUNCHED

Until World War II, most of the tractors used in Australia were imported from the
U.S.A., and so were in effect certified by the Nebraska test—for those who cared to read or use the certificate. But in the expansion of mechanised farming after the war, many tractors came to Australia from Great Britain and Europe unaccompanied by a test certificate.

Furthermore, even with the tested American models the amount of Australian content going into their assembly here was increasing, so that overseas tests were not always strictly applicable.

Besides these, some interest was being shown in the design and manufacture of tractors in Australia—Chamberlain being the notable example.

Taking all these factors into account, the Commonwealth Government sought to strengthen the interests of Australian farmers, and to provide itself with proper bases for such fiscal matters as duty and bounty, by setting up a tractor testing scheme in Australia broadly along the lines of the Nebraska tests.

At first the work was entrusted to the Aeronautical Research Laboratories of the C.S.I.R. at Fisherman’s Bend. Using test procedures exactly the same as those at Nebraska, the Aeronautical Laboratories tested 23 tractors between 1946 and 1951. But, as a result of departmental changes in the laboratories, the scheme was abandoned in 1951, and reconstituted on a new basis in 1954.

COMMONWEALTH-STATES CO-OPERATION

A scheme was worked out by the Commonwealth and State Governments, through the Australian Agricultural Council, that called for co-operation between the several Governments and the University of Melbourne (in the early stages the Bureau of Sugar Experiment Stations acted instead of the State of Queensland). Under the terms of this agreement, the Commonwealth was to meet half the cost, the States the other half (in proportion to their tractor population), while the professional services were to be provided by the University.

Among the conditions laid down by the University for its participation in the scheme was that it should have full discretion in all technical matters, and that its officers appointed to carry out the tests would not only be permitted, but should be expected to carry on research work on tractors and related matters.

The scheme was to be a voluntary one, as it is in England, and for that matter, in most other testing stations. That is to
say a testing service was set up: the companies would use it, and submit tractors for test, if they saw merit or advantage in it.

At the same time the scheme was expected to recoup some of its expenses by charging test fees (the Nebraska scheme runs itself on its income from test fees, which are substantial).

These principles having been laid down, the Tractor Testing Committee* was formed comprising an officer of the Commonwealth Department of Primary Industry as Chairman, an officer of the Victorian Department of Agriculture representing the interests of all the States, and an officer of the University of Melbourne.

The first tests were done in makeshift premises at Fisherman's Bend and the State Research Farm Werribee, starting in 1954. By 1957 a Testing Station was built on the property of the Research Farm. In all, some ten models of tractor have been tested, over 20 spark arresters, and a variety of other engines and tractor equipment.

Meanwhile, the test procedures themselves have undergone some changes, so that today the Australian test system is in some ways ahead of its colleagues overseas.

**NATURE OF THE TESTS**

It will be appreciated that the formal testing of tractors is in no sense a competition between rival makes; it is not a question of testing this model of tractor against that, but a measuring the performance of the given tractor in a standard manner.

Nor is there any law, regulation, rule, or industrial standard that says a tractor shall have this much power, or pull, or speed, or fuel consumption. The only limitations imposed on the tractor, the only standards to be reached, are those imposed by its own instruction book, and the claims made for it.

Each tractor under test goes through a certain standard set of procedures and inspections, that amount in the end to a measurement of the tractor and its performance and qualities.

The test procedures are described in the second article of this series. Briefly, they consist of, (a) a survey of the physical properties of the tractor, (b) the power capacity of the engine and of the p.t.o. and belt outlets, (c) the power in the drawbar in the several gears, and (d) observa-

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* The address of the Tractor Testing Committee is: C/o Department of Primary Industry, 301 Flinders Lane, Melbourne, C.I., Victoria.
tion of the tractor under test and detailed inspection afterwards.

The testing procedure eliminates as far as possible matters of opinion; it concentrates attention on those things that can be measured. On some things, e.g., comfort, the opinion of the testing officers may for the time being play a part, but engineering studies are slowly reducing the guesswork even in these fields.

Although the tests conducted at other centres permit and, in effect, expect the companies to submit a selected and prepared sample tractor for test, the objective in the Australian test is to work on a sample of the stock model that has been taken at random from the run of production or stock. Such a tractor is presumed to be representative of all the tractors of that make and model currently being offered for sale, such as any buyer might buy.

REPORT OF TEST: TEST CERTIFICATE

The full technical report of the test, in its several sections, attempts to describe the tractor and its response to the checks, measures and tests put on it, and to describe them in such a way that the information is complete in itself, with no loose ends that are doubtful or uncertain.

For example, as the British test code says, no drawbar results can have any meaning unless they are clearly related to the weight of the tractor in the tests, not only total weight, but front and rear axle weights also, and for that matter the height of the drawbar.

Likewise it is not sensible to give any power values for the engine without naming each time the engine speed.

For these reasons, and so that the company's and other technical officers, including extension officers and research workers, can get full sense out of the results, the reports are at some length and in some detail. For the farmer, the physical properties and the summary of results may be sufficient.

On the power tests, the report gives a table of results for full power on the engine, the p.t.o., the belt, and the drawbar. For the rest, including the intermediate values, the story is told in two series of graphs, one set for the engine itself as the source of power, and another set for the drawbar tests.

From these, any professional reader will get a complete picture of the tractor's total performance; from them he can make what comparisons and judgments he pleases.

The last section of the report is devoted to a fairly thorough specification of the main features of the tractor, the statement being supplied by the manufacturer. Nevertheless, the testing officers will have checked most of these details (at any rate
those that are observable from the outside) because, of all people, the testing officers must be sure that the tractor they have tested is the tractor described in the specification.

For the farmer reader the report is also issued in a shortened form, with all the description as it affects the operation of the tractor, and with a useful summary of the results, but with much less tabular and graphical detail.

Whereas some hundreds of the Technical Report are issued to trade, professional and overseas bodies, some thousands of the Farmers' Edition are distributed for issue to farmers, if they want them, all over Australia.

A tractor that has gone through the tests, and for which a report has been issued, may well be called a certified tractor. To bring this point home, to both users and prospective users of the tractor, a certificate is issued to the company saying that a stock model of this tractor has been tested, quoting the test number and the date, over the testing officer's signatures.

This certificate is in the form of a transfer to be affixed to every tractor of the model in stock, so that the certificate may fairly be said to be attached to the tractor.

**INTERPRETATION OF TEST**

There is no difficulty in interpreting the results on the engine: there is its full power output that drives everything else in the tractor; there are its torque and fuel consumption, at all speeds and loads, especially of course maximum power at the defined rated speed.

Likewise there is no difficulty about p.t.o. and belt power values; the tests show what the user can expect on p.t.o. drive and on belt drive from a typical tractor of this model; not that a difference of 2 or 3 h.p. one way or the other makes a lot of difference; no user is able, except rarely, to say what power he wants precisely for this job or that.

The physical properties of the tractor are described, and that is all there is to that: heights, lengths, weights, turning circles, p.t.o. and belt speeds, instruments and controls. They may suit him, or they
may not, but there is not much room for argument about them.

It is only when we come to the drawbar tests and to the question "What will this tractor do on my paddock, with my cultivator?" that difficulties of interpretation arise.

The difficulties are threefold:

(a) as a rule no one knows what pull is required to work that plough, or any other machine;

(b) no one can say how the tractor will perform on surfaces other than the test track;

(c) both the pull required to work the plough, and the performance of the tractor's wheels will vary from soil to soil and, even on the one paddock, with the day to day and seasonal variations in the soil.

It is a matter for regret that a lot more is not known about the pull, and the p.t.o. power in some machines, required to work the different classes and makes of machine on the different types of soil, or even on a standard soil, if there was such a thing.

It will be a very long time indeed before the soil engineers will be able to relate machine and tractor performance, even on the one soil type, to the differing conditions that can arise in a given soil: differences in the states of tilth (from pasture, through stubble, to rough cultivated land), and differences in the moisture conditions of the soil.

As to (b), one can say that, compared with the hard dry test track, a tractor in the field will deliver less pull, and will suffer more slip, and so will run at slower speed, and deliver perhaps a lot less power, even though the engine may be fully loaded. As the soil conditions get looser, rougher and/or wetter the difference between test performance and field performance gets worse.

It is perhaps possible to say that, for tractors of comparable weight and power capacities, the field performances are likely to be as much alike as the test performances are, but at some undecidable lower value.

It is hoped that, in due course, even this awkward question can be answered: but the answer is not yet in sight.

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1½ lb. flour
1½ lb. dates
1½ lb. raisins
¼ lb. chopped almonds
1¼ lb. brown sugar
1 teaspoon spice
1½ lb. butter
1½ lb. sultanas
1½ lb. currants
¾ lb. mixed peel
1 dozen eggs
½ teaspoon carbonate soda dissolved in a wineglass of brandy

Method.

Cream butter and sugar, add eggs, two at a time, and beat well. Stir in fruit, almonds, peel and spices. Then sift in flour, and, lastly add brandy and carbonate of soda. Beat well. Bake in well papered cake tins for 6 to 7 hours if in one loaf, reduce baking time if mixture is divided. It is best to make this cake one month before Christmas.

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