

In considering the foregoing it should be noted that in the test runs the conditions, such as alignment of wheels and tires, were for the most part carefully controlled. Full standard inflation was used. The speed of twenty-five miles per hour is now probably too low to be considered as average. The tires were probably above average in quality and received more than ordinary care. None but dry pavements were used. Considering all such conditions it seems certain that the above figures are conservative.

Laboratory investigations are in progress to collect data upon the effect of inflation, temperature, moisture and tread rubber quality upon tread wear. While progress has been made in all these phases of the investigation it is not now possible to state even preliminary conclusions.

Investigations to be undertaken include the effect of speed, size and weight of vehicle upon tread wear, also roughness of road surface. The question of the relative wear of low, medium or high grade tires as affecting tire economy is an important one. Statistics are needed showing the numbers of tires used in various size and quality groups.

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INVESTIGATION OF TIRE WEAR

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The Engineering Experiment Station of the State College of Washington has been conducting a series of measurements of tread rubber loss from automobile tires that were operated on some of the standard roads in the vicinity of Pullman, Washington. Four different cars and four sets of tires were used so it is not possible to compare runs made with one car with those made with another. The following preliminary report of the results is not considered to be conclusive, but is indicative of the general trend and should be evaluated on that basis.

TIRE TEST HIGHWAYS

Location of Highway	Kind of surface	Length of test road	Distance run	Remarks
Pullman to Palouse	Macadam	<i>Miles</i> 16	<i>Miles</i> 65	Crushed basalt, some corrugations, loose material on surface, $\frac{3}{4}$ mile; roads with grades 4 6 per cent to 5 per cent, level for most part Two round trips constitute a "run" Road about 30 feet wide, some curves, dirt shoulders No rains during tests Frequently planed by maintenance crew
Pullman to Lewiston	Macadam	35	70	Crushed basalt, some rough places, and loose material Easy curves and grades, dirt shoulders, loose gravel at edges of road Lewiston Hill 8 miles long and average of less than 5 per cent grade Several hairpin curves on steep grade Test down hill, up hill, and on level highway 20 M P H Took all day for one test Temperature variation 10 to 15 degrees during day
Dishman to Coeur d'Alene	Concrete	36	150	Concrete in very good condition, in some places worn smooth, oily from oil dropped by passing cars No grades to mention, easy curves Two round trips per test
Dishman South	Macadam	10	80	Crushed basalt, medium size, some loose gravel on surface, easy curves, some easy grades Very little washboard, dusty, smoother worn track in middle Forest along part of route Several rail crossings
Portland to Gresham.	Bitulithic	22	17	Columbia River Highway, blacktop in good condition Some oil on surface, several easy curves, easy grades Road crowned a reasonable amount Turnout seldom requires travel on dirt or gravel shoulders Forest along part of route Test run both ways

TIRE TEST HIGHWAYS—Continued

Location of Highway	Kind of surface	Length of test road	Distance run	Remarks
Little Rock to Centralia and to Elma	Gravel	67	67	Water worn gravel mixed with sand and clay forming reasonably fine roadway with rounded gravel protruding from surface Test run one way
Olympia to Vancouver	Concrete	120	120	Concrete with average level grade Some easy curves and grades, dirt and gravel shoulders Concrete in good condition Forest along part of route All in good repair One test going up, second test returning

TIRE DATA AT START OF TESTS

Car	Size and location of tire	Air pressure	Age of tire	Remarks
Ford Touring	30 x3½ front	Lbs 55	15 mo 600 mi	Total mileage during test 1,127 Firestone Cord Tires Weight of Car 1,740
	30 x3½ rear	55	New 9 mi	
Nash Sedan	34½x4½ front	65	10 mo 9,000 mi	Firestone Cord Tires put on December, 1924 Put on February, 1925 Weight of Car 4,400 lbs
	34 x4½ rear	70	8 mo 7,000 mi	
Hupp Touring	34 x4 front	65	11 mo 8,000 mi	Goodyears transferred from rear } On coast run Riverside } Riverside } On Palouse runs Goodyear }
			2 mo 1,100 mi	
	34 x4 rear	65	18 mo 10,000 mi 10 mo 6,000 mi	
Dodge Touring	32½x3½ front	55	R F 2 years L F New	U S Cord Riverside Cord G and S Cord New Portage Cord Weight of Car, 2,750 lbs
	33 x4 rear	55	R R New L R New	

SUMMATION OF TIRE TESTS

Average tire wear in lbs per 1,000 miles at 30 M P H
 Average wear on concrete and black top pavement

Ford	0 0477
Dodge	0 0560
Hupp	0 1133
Nash	0 1183

Average wear on crushed basalt macadam

Ford	0 2972
Hupp	0 5260
Dodge	0 6616

Average wear on water worn gravel

Nash	0 4900
Hupp	0 6250

Gasoline consumption, gallons per 1,000 miles on the Lewiston Highway Level
 20 miles long, hill 8 miles long, gradient average is 4 2%, with a maximum of not to
 exceed 5% 20 M P H Crushed basalt macadam

Down Hill

Dodge	35 0
Hupp	36 0

On Level

Dodge	51 8
Hupp	62 8

Up Hill

Dodge	90 8
Hupp	104 8

TIRE TEST DATA

Test No	Car	Route	Type of Road	Speed miles per hour	Air temperature	Tire wear lbs per 1,000 M
8	Dodge Touring	Pullman to Spokane and return	Macadam	30	97 0	0 590
11		Pullman to Lewiston Hill	Macadam	20	88 5	1 122
17		Lewiston Hill to Pullman	Macadam	20	83 5	1 045
27		Pullman to Lewiston Hill	Macadam	20	80 5	1 456
33		Lewiston Hill to Pullman	Macadam	20	92 5	0 435
35		Dishman South ten miles and return	Macadam	30	81 3	0 618
41		Dishman South ten miles and return	Macadam	30	94 0	0 777
37		Dishman to Coeur d'Alene and return	Concrete	30	81 0	0 076
39		Dishman to Coeur d'Alene and return	Concrete	30	86 0	0 036

Test No	Car	Route	Type of road	Speed miles per hour	Air Temperature	Tire wear lbs per 1,000 M
1	Hupp Touring	Pullman to Palouse and return	Macadam	25	92 0	0 9110
4		Pullman to Palouse and return	Macadam	25	81 0	0 2710
6		Pullman to Palouse and return	Macadam	30	84 2	0 5730
9		Pullman to Spokane and return	Macadam	30	94 0	0 3080
18		Pullman to Palouse and return	Macadam	20	98 0	0 9650
20		Pullman to Palouse and return	Macadam	20	88 0	0 5280
22		Pullman to Palouse and return	Macadam	30	94 0	0 6970
24		Pullman to Palouse and return	Macadam	15	79 0	0 4530
42		Olympia to Vancouver	Concrete	30	65 0	0 1136
48		Vancouver to Olympia	Concrete	30	70 0	0 0960
44		Portland to Gresham and return	Black Top	30	63 0	0 1020
46		Portland to Gresham and return	Black Top	30	75 5	0 1890
50		Little Rock to Centralia	Gravel	30	64 0	0 7230
52		Centralia to Elma	Gravel	30	64 0	0 5270

Test No	Car	Route	Type of road	Speed miles per hour	Air Temperature	Tire wear lbs per 1,000 M
2	Ford Touring	Pullman to Palouse and return	Macadam	25	92 0	0 5420
5		Pullman to Palouse and return	Macadam	25	81 0	0 2710
7		Pullman to Palouse and return	Macadam	30	84 2	0 3600
19		Pullman to Palouse and return	Macadam	20	88 0	0 4180
21		Pullman to Palouse and return	Macadam	20	88 0	0 4330
23		Pullman to Palouse and return	Macadam	30	94 5	0 2750
25		Pullman to Palouse and return	Macadam	15	78 0	0 3430
34		Dishman south ten miles and return	Macadam	30	81 3	0 2900
40		Dishman south ten miles and return	Macadam	30	94 0	0 2440
36		Dishman to Coeur d'Alene and return	Concrete	30	81 0	0 0325
38		Dishman to Coeur d'Alene and return	Concrete	30	86 0	0 0629

Test No	Car	Route	Type of road	Speed miles per hour	Air temperature	Tire wear lbs per 1,000 M
43	Nash Sedan	Olympia to Vancouver	Concrete	30	65 0	0 208
49		Olympia to Vancouver	Concrete	30	70 0	0 057
45		Portland to Gresham and return	Black Top	30	64 0	0 117
47		Gresham to Portland and return	Black Top	30	75 5	0 091
51		Little Rock to Centralia	Gravel	30	64 0	0 533
53		Centralia to Elma	Gravel	30	64 0	0 447

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INVESTIGATION OF GASOLINE AND OIL CONSUMPTION

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In evaluating the relation between type of road surface and the cost of vehicle operation, the first factor to consider is the relative fuel consumption. The following tabulation represents an accumulation of data obtained in connection with the ordinary activities of the Quartermaster Corps, U. S. Army. It is presented herewith so that it will be generally available for reference.