
Research Report
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UTILIZATION AND COST EFFECTIVENESS
OF RETREAD TIRES

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INTRODUCTION

This report discusses the possible utilization and cost effectiveness of using retreaded tires on state vehicles in Kentucky. Included is information obtained from a telephone survey of local companies and two state DOT agencies. Information was also obtained from a survey conducted on the AASHTO-VAN computer network. This report also contains a cost comparison of retread prices versus new tire prices.

COMPANY SURVEY

Approximately eight local companies and two state DOT's were contacted during a telephone survey about the use and effectiveness of retreaded tires within the company or agency. These are discussed below.

United Parcel Service of Lexington (UPS): UPS indicated the cost savings of using retreaded tires were appreciable. It was indicated UPS used only five types of tires in their fleet operations and have very strict rules on casing types. UPS officials indicated they had problems with retreads in the past, but recently it appears they have corrected the problems. Most problems were attributed to the braking system on the trucks, lower profile trucks, and grass skirts around the fender wells, causing retreads to fail due to heat.

UPS officials indicated they get approximately 30 percent less mileage from a retread tire than a new tire. The use of retreads on the vehicle varies depending on the type of truck and distances traveled on a daily basis. Local package trucks that travel 50 to 60 miles a day usually have retreads on the front and back. Retreads are used on the front of these vehicles since they travel at fairly low speeds and the sidewall of the tires wear out where they frequently scrape curbs. Package trucks that average 100 to 150 miles a day usually are equipped with new tires on the front and retreads on the back. Tractor trailers are equipped with new tires on the front and approximately 60 percent new tires are used on the drive axle. Retreads are used almost exclusively on the trailers. These numbers may vary depending on the number of casings that are available to retread.

Lexington Cartage Company: The Lexington Cartage Company only uses steel belted tires. They use first time virgin retreads on the tractor and second time retreads on the trailer. They get approximately 30 percent less mileage from retreads.

Oliver Trucking: Oliver trucking uses retreads on the drive axle of the tractor and on the trailer. They use all steel belted tires and get approximately 30 to 50 percent less mileage than from a new tire.

Lexington Fayette Urban County Government: The city of Lexington uses

retreaded tires on garbage trucks and dump trucks. Ninety percent of the steering axles equipped with retreads. The Lexington Fayette County Government does not keep records of mileage performance of a retreads versus new tires. Lexington officials indicated that most of the truck tires are damaged at the dump before the tread wears out.

Overnight Transportation Company: Overnight Transportation Company has a retread facility in South Carolina. They use retreads on the trailers only. The company only uses steel belted tires. Overnight will retread a tire up to four or five times depending on the casing. They also purchase casings to be retreaded. Every 30 days the tires are inspected.

Lexington Postal Service: The Postal Service uses retreaded tires on the trailer and drive axle of their tractor trailers. The retreads cost approximately half as much as a new tire and they report approximately 25 percent less mileage from a re-tread versus a new tire.

Carrier Service, Truck Leasing Inc.: Carrier Service uses only top-of-the-line casings. They retread only one time. Carrier Service indicated there is a great difference in tire casing and the performance of a retread will depend greatly on the original tire. Carrier Service average about 25 percent less mileage out of a retread.

Avis: Avis does not use retreads. The maintenance foreman expressed concern about potential hazards from throwing treads.

BFI Waste Systems: BFI uses retreads tires on all their trucks. They do use new tires on the steering axle. BFI officials indicated they get the same mileage or slightly more mileage out of a retread tire versus a new tire. BFI indicated 20 to 40 percent of their tires are destroyed due to running over sharp objects at the land fill.

New York DOT: The New York DOT has been using retreaded tires for several years. They do not have any mileage comparison data. They indicated most of their tire failures are due to running over sharp objects on construction sites. Their cost for retreads is approximately one third the price of new tires.

North Carolina DOT: North Carolina DOT indicated they get as much, if not more, mileage from a retread than a new tire. The NCDOT's recapping is handled by White Tire and Rubber Co. The NCDOT is using a particular type of rubber in the retreads. White Tire mixes its own rubber. The recapper has the capability of testing casings using phosphorescent gas to look for pin holes in the casing and also pressure testing of the casing is available about two dollars per tire casing. This helps to insure good quality casings. The NCDOT buys high quality tires so that they are capable of retreading the casings several times. The NCDOT sells some of the old casings to rubber manufactures. It is apparent the NCDOT has a fairly aggressive tire

maintenance program. The DOT purchases approximately 25 to 30 percent new tires a year and the remainder are retreads. They indicated most tire failures are due to sharp objects ripping the sidewalls of construction vehicles. They are beginning to use steel-belted tires having steel belts in the walls for a number of their construction vehicles.

AASHTO NETWORK SURVEY

Information regarding the utilization and cost effectiveness of retreaded tires was entered into the interactive forum network of the AASHTO VAN NETWORK. Three states responded to the survey (Missouri, Nebraska, and Louisiana). Louisiana and Nebraska do not use retreaded tires. Nebraska indicated there was not a sufficient amount of cost differential between retreads and new tires to justify using retreads. In addition, they were concerned about the safety factor. The Missouri Highway and Transportation Department is currently using retreads on dump trucks, graders, front-end loaders, and van freight trucks. They use only Bridgestone, Michelin, Goodyear and Yokohama tires.

LITERATURE SEARCH

The Transportation and Road Research Laboratory in England (1) conducted a study on the M5 motorway between September and November of 1971. The West Mercia Constabulary collected data from 310 tire failures. Retreaded tires were found to fail more often than original treaded tires and heavily loaded vehicles were found to suffer tire failures more frequently than private cars.

An article from Road and Track magazine (2) compared tire cost per one thousand miles of new steel-belted radial tires and retreaded steel-belted radial tires. Retreads are not appreciably cheaper to run and are sometimes more expensive than new tires. The lower minimal initial investment in purchasing retreads and consideration for use of retreads for winter driving (snow tires) only, were mentioned as possible justifications for buying retreads.

An article entitled "The Role of Tires in Vehicle Accidents", by A. H. White (3) indicated that one of the major problems of the retreading industry is securing acceptable tire casings for retreading. The article indicated several retreaders have used questionable worn-out tires in their retreading process in order to fill inventory gaps. The author also indicated that tires are, at times, subjected to storage conditions that can cause increased degradation to tire casings prior to the inspection stage at the retreading plant.

An article entitled "Lasting the Distance", by William Runyon (4) states retreaded off-the-road tires may have a cost savings of 20 to 60 percent when compared to new

tires. Runyon states that when the retreading job is done well, the rehabilitated tire may deliver about the same life expectancy as a new tire.

A survey reported in the October 1989 issue of "Equipment Management" (5) polled 1,400 equipment managers. Approximately 148 responded to the survey. Retreaded tires were used by 63 percent of the respondents, and almost 50 percent reported good or excellent experience with retreaded truck tires.

According to a survey conducted by Fleet Equipment, (6) 81 percent of the fleets polled indicated they retreaded used casings. Approximately 86 percent of the respondents indicated punctures are the most frequent cause of repair. In that same survey, a member of the Iowa's Dubuque School District was quoted as saying that retreading tires is a costly method in fleet operation since tough operating conditions may cause high mortality on low-quality retreads.

According to an article in "Public Works", (7) Derrick Taylor, the director of tire operations states the city of Chicago must maintain over 1,000 heavy duty trucks in operation. Included are refuse trucks, dump trucks, and tow trucks. Taylor has been able to reduce down time by one-third in two years. He believes a part of his success can be attributed to a sound tire maintenance program. Tire maintenance inspections have increased. More attention is placed on tire pressure, tread depth and alignment. The tires were retreaded when the tread depth reached 4/32 of an inch, but are now retreaded between 5/32 and 6/32 of an inch. As a result, more casings are now suitable for retreading. Sources indicate that 80 percent of the punctures occur in the last 10 percent of useable tread. Taylor and his assistant inspect truck tires in the city truck yard at least every other week. He intends to assign two employees to full-time tire inspection. Tires are inspected at least twice a year by Wentworth/Brads Tire Service, and the Bandag retreader. Chicago currently purchases 1,500 new tires and 1,500 retreads a year. They plan on reducing the number of new tires since retreads may be purchased for about 1/3 the cost.

Public Works also interviewed the supervisor of vehicle supplies for the United States Postal Service's Vehicle Maintenance Facility in Minneapolis. The supervisor indicated a good tire maintenance program is vital to the success of a retread program. Vehicle operators are required to inspect the tires on a daily basis, and the vehicles are placed on a preventive maintenance schedule which varies from 6 to 26 weeks depending on the vehicle's size and mileage.

PERFORMANCE OF CURRENT RETREADED TIRES ON STATE TRUCKS

Three of the four state trucks that currently have retreaded tires were inspected. There was some slight cracking around a portion of some the retread, but it did not appear to be significant at present. Tread depths were measured on two of the newer

trucks (1991) that had a working odometer. The tread depths were extrapolated to a replacement depth of 5/32 of an inch. Tires on one of the trucks would have to be replaced after approximately 48,800 in-service miles. Tires on the other truck would have to be replaced after approximately 49,700 in-service miles.

The four trucks that currently have retreaded tires are located at four separate county maintenance garages (Fayette, Jessamine, Woodford, and Bourbon). All four foremen did not see any significant problem with the retreads at the time of this survey. The Bourbon County foreman indicated the tire chains used this winter had split the edges of the cap. The foremen were also questioned about how many tires are replaced as a result of tread wear. The response was that approximately 80 percent are replaced due to a puncture or rip type failure. The foreman at the main garage in Fayette County indicated that approximately 20 tires are destroyed as a result of puncture or other damage for every tire that is worn out. One of the retreads tires on the Wordford County truck had to be replaced due to metal object ripping a hole in the side wall. If a new tire was purchased to replace this one it would cost 204.26 dollars a retread would cost 97.85 dollars (if the casing was included it would cost 177.85 dollars).

PRICE COMPARISON

Table 1 list a cost comparison between new tire prices from the State Contract and retread prices supplied by Bluegrass Bandag, Inc. The complete number of tire units purchased and prices for such units were not available at the time of this study. As shown in Table 1, the total cost for new tires was a \$613,724, and the cost of the same number of retread tires was \$393,692; a savings of \$220,032. This appears to be a substantial savings if mileage is not taken into account. However, during the phone survey, most of the companies contacted indicated they average 25 to 30 percent less mileage using retreads. It is not known if this relationship would hold true with state vehicles since most vehicles would receive less annual mileage than a typical trucking company and operate under different conditions. Percent cost per mile is also shown in Table 1. An average tire life of 100,000 miles was assumed for a new tire. If a retread tire lasted 100,000 miles, the savings from buying retreads instead of new tires would be approximately 40 percent. However, the average mileage reported by local companies interviewed by the telephone survey was that retreads average approximately 25 to 30 percent less mileage. This would be a cost savings of approximately 19 percent at 25 percent less mileage, and only 14 percent at 30 percent less mileage. Retread prices listed in Table 1 do not included the price of casings. If the Kentucky DOH could not supply the recapper with old casing, then the cost for casings would be additional to the prices in Table 1. For example, casing prices for light trucks are approximately \$5.00 per unit, and single rear axle dump with tire sizes of 11R22.5 are approximately \$80.00 dollars per unit.

CONCLUSIONS AND RECOMMENDATION

Much of the data obtained in this limited survey appears to be conflicting. This is largely due to the diversity of the type of agencies and companies surveyed. The trucking companies are largely long-distance, high-speed haulers. The state DOT's run mostly short-haul, slow-speed trucks. Some of the companies and agencies surveyed obviously had aggressive tire maintenance programs, while others were not so efficient at maintenance. The quality of the local retread supplier would also have been a factor in the tire performance that was reported.

In spite of the limited nature of this survey, and in spite of the wide range of reported performance, some general conclusions and recommendations can be made. If it is assumed that the Kentucky Department of Highways buys retreaded tires and can get approximately 70 to 75 percent of the mileage of new tires, this would be a cost savings of 14 to 19 percent (assuming the DOH can supply the retreader with all of its old casings). This would be a point in favor of using retreaded tires. However, if the DOH cannot supply the old casings, then the 14 to 19 percent savings would be significantly reduced. Also, the cost of storing and transporting the old casings has not been subtracted from this savings, further reducing that percentage. It should be noted in Table 1 that retreads of some tire sizes actually cost more than new tires. These tire sizes have not been used in the savings analysis, but were simply eliminated from the calculations. If large numbers of these tire sizes were used, then savings might disappear entirely.

Other factors that should be considered in this decision were pointed out in the literature search. One of these factors is the sometimes poor quality of the casings that some retreaders use when their inventory of good casings runs low. The DOH may not be able to ascertain that it is receiving good quality retreads for this reason. The experience and ability of the local retread supplier is also a question that cannot be answered at this time. Apparently a good tire maintenance program is necessary to ensure good performance of retreads. It is not certain if the DOH presently has a good tire maintenance program or could initiate one if retreads were to be used.

From the information obtained in this limited survey, it is the authors' opinion there is presently little or no significant advantage in using retreaded tires over new tires. Consequently, it is recommended that new tires continue to be used on DOH vehicles unless other more detailed data become available that may indicate otherwise.

However, if there is continued interest or pressure to use retreaded tires, it is suggested that the DOH initiate a pilot program of using retreaded tires on a limited number of vehicles, and maintain detailed cost and performance data for Kentucky conditions and use. This type of information and analysis would provide more meaningful and useful cost data.

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TABLE NO. 1. COST COMPARISON, NEW TIRE PRICE VS. RE-TREAD PRICE (INCLUDING MILEAGE COMPARISON).

NEW TIRE SIZE	RETREAD TYPE	UNITS	NEW TIRE PRICE	RETREAD PRICE	TOTAL NEW TIRE	TOTAL RETREAD	NET DIFFERENCE USING RETREADS	NEW TIRE PRICE BASED ON 100,000 MILES (DOLLAR/MILE)	RETREAD PRICE BASED ON 100,000 MILES (DOLLAR/MILE)	RETREAD PRICE BASED ON 90,000 MILES (DOLLAR/MILE)	RETREAD PRICE BASED ON 80,000 MILES (DOLLAR/MILE)	RETREAD PRICE BASED ON 70,000 MILES (DOLLAR/MILE)
LT235/75R15 WRANGLER AT D	BRAWNY LUG	264	72.12	70.41	19,038.68	18,588.24	-451.44	0.190	0.185	0.206	0.232	0.265
700-15 LIGHT TRUCK C	BRAWNY RIB	46	45.57	64.33	2,060.22	2,990.18	+889.96					
700-15 LIGHT TRUCK M&S	COMM TRAC	47	47.80	61.96	2,246.60	2,912.12	+665.52					
750-15 LP TRAILER F	HI SPEED	5	105.95	62.35	529.75	311.75	-218.00	0.005	0.003	0.003	0.003	0.004
11L-15 BACKHOE (LABORER)	HI SPEED	12	74.47	69.85	893.64	838.20	-55.44	0.008	0.008	0.008	0.010	0.011
1000-15 LP TRAILER G	HI SPEED	54	158.64	70.91	8,577.36	3,829.14	-4,748.22	0.085	0.038	0.425	0.047	0.054
LT215/85R16 WRANGLER LT D	BRAWNY RIB	70	66.12	67.22	4,628.40	4,705.40	+77.00					
LT235/85R16 WRANGLER AT D	BRAWNY LUG	154	69.12	68.17	10,644.48	10,498.18	-146.30	0.106	0.104	0.116	0.131	0.149
750-18 LIGHT TRUCK D	BRAWNY RIB	70	49.96	65.36	3,497.20	4,575.20	+1078.00					
750-18 LIGHT TRUCK D M&S	BRAWNY LUG	114	53.88	66.97	6,142.32	7,634.58	+1492.26					
LT235/85R16 WRANGLER A T E	BRAWNY LUG	483	74.78	68.17	36,066.54	33,007.81	-3258.73	0.388	0.336	0.373	0.420	0.480
800-16.5	WHRIB	5	47.16	64.07	235.80	320.35	+84.55					
800-16.5 WH RIB	BRAWNY RIB	9	47.16	64.07	424.44	578.63	+152.19					
875-16.5 WH RIB	BRAWNY RIB	10	50.23	66.67	502.30	666.70	+164.40					
875-16.5 WH RIB	BRAWNY RIB	4	50.23	66.67	200.92	266.68	+65.76					
950-16.5 WH RIB	BRAWNY RIB	136	54.91	67.53	7,454.16	9,184.08	+1,729.92					

NEW TIRE SIZE	RETREAD TYPE	UNITS	NEW TIRE PRICE	RETREAD PRICE	TOTAL NEW TIRE	TOTAL RETREAD	NET DIFFERENCE USING RETREADS	NEW TIRE PRICE BASED ON 100,000 MILES (DOLLAR/MILE)	RETREAD PRICE BASED ON 100,000 MILES (DOLLAR/MILE)	RETREAD PRICE BASED ON 80,000 MILES (DOLLAR/MILE)	RETREAD PRICE BASED ON 80,000 MILES (DOLLAR/MILE)	RETREAD PRICE BASED ON 70,000 MILES (DOLLAR/MILE)
950-18.5 WH TRACTION	BRAWNY LUG	128	58.49	78.38	7,495.74	10,001.88	+2,508.14					
950R-18.5 WRANGLER AT	BRAWNY LUG	84	74.78	68.85	4,785.92	4,470.40	-315.52	0.0478	0.044	0.049	0.055	0.0638
825-20 SUPER HI-MILER	BRAWNY RIB	6	92.98	71.17	557.78	427.02	-130.74	0.005	0.004	0.004	0.005	0.008
825-20 CUSTOM XG	COMM TRAC D	2	108.56	78.22	218.12	158.44	-62.88	0.002	0.001	0.001	0.001	0.002
900-20 SUPER HI-MILER E	BRAWNY RIB	24	108.91	73.19	2,613.84	1,758.56	-857.28	0.028	0.017	0.019	0.002	0.025
900-20 CUSTOM XG E	COMM TRAC D	37	125.94	82.93	4,658.78	3,088.41	-1,591.37	0.048	0.030	0.034	0.0383	0.043
1390R20 G188	RTP	8	224.85	101.44	1,798.80	811.52	-987.28	0.017	0.008	0.008	0.010	0.011
1000-20 SUPER HI-MILER F	BRAWNY RIB	571	144.72	78.05	82,832.12	44,566.55	-38,065.57	0.828	0.445	0.485	0.557	0.638
1000-20 CUSTOM XTRA GRIP F	COMM TRAC D	1289	158.08	88.02	200,578.14	111,897.38	-88,880.76	2.005	1.118	1.241	1.368	1.595
1000R20 UNISTEEL II	RADIAL PLUS	---	180.40	91.93	---	---	---					
1000R20 UNISTEEL TD	LOT	---	184.85	100.29	---	---	---					
1100-20 SUPER HI-MILER	BRAWNY RIB	31	170.14	82.82	5,274.34	2,561.22	-2,713.12	0.052	0.025	0.028	0.032	0.038
1100-20 CUSTOM EXTRA GRIP	COMM TRAC D	18	178.31	93.70	3,227.58	1,688.60	-1,540.98	0.032	0.018	0.018	0.021	0.024
15-22.5 CUSTOM HI-MILER H	WIDE BASE RIB	150	318.80	115.07	47,790.00	17,280.50	-30,529.50	0.477	0.172	0.191	0.215	0.248
11R22.5 UNISTEEL II	RADIAL PLUS	45	197.73	91.78	8,897.65	4,130.10	-4,767.75	0.088	0.041	0.045	0.051	0.059
11R22.5 UNISTEEL TD	LOT	50	204.28	97.85	10,213.00	4,892.50	-5,320.50	0.102	0.048	0.054	0.061	0.069
1400-24 GRADER TL F	L-2 MOLD CAP	182	304.29	198.67	55,380.78	36,157.94	-19,222.84	0.598	0.381	0.401	0.451	0.518
15.5-25 LOADER L-2 F	L-2 MOLD CAP	45	328.28	198.67	14,817.80	8,940.15	-5,877.45	0.148	0.089	0.089	0.111	0.127

NEW TIRE PRICE	RETREAD TYPE	UNITS	NEW TIRE PRICE	RETREAD PRICE	TOTAL NEW TIRE	TOTAL RETREAD	NET DIFFERENCE USING RETREADS	NEW TIRE PRICE BASED ON 100,000 MILES (DOLLAR/MILE)	RETREAD PRICE BASED ON 100,000 MILES (DOLLAR/MILE)	RETREAD PRICE BASED ON 90,000 MILES (DOLLAR/MILE)	RETREAD PRICE BASED ON 80,000 MILES (DOLLAR/MILE)	RETREAD PRICE BASED ON 70,000 MILES (DOLLAR/MILE)
17.5-25 LOADER L-2 F	L-2 MOLD CAP	145	405.72	273.33	58,828.40	39,832.85	-19,196.55	0.588	0.398	0.440	0.495	0.588
TOTAL COST					\$613,724.58	\$393,662.28	\$-220,032.32	\$5.788	\$3.498	\$3.887	\$4.373	\$4.988
TOTAL COST (BASED ON 100,000 MILES)								\$579,830.5	\$348,888.5	\$388,788.1	\$437,361.8	\$499,842.1
COST SAVINGS									\$228,941.0	\$180,064.4	\$141,468.7	\$79,988.4
PERCENT COST SAVINGS									39.55	32.83	24.44	13.64