TIRE RECAP PROGRAM

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Reasons for tire recap programs include reduced cost of fleet operation, conservation of natural resources and accommodation of environmental concerns. In the area of economy, a recapped tire costs North Carolina Department of Transportation (NCDOT) 50 to 70 percent less than a new tire. Such savings make it easier to afford the very best in tire casings with associated fuel savings. NCDOT rubber compound is "tough" with consequent longer tread life than that experienced with new tires. An example of one test among several that demonstrated this characteristic is found in table (1). Additionally, a recapped casing is one whose disposal can be deferred with consequent savings.

Safety considerations for recaps are equal to or greater than for new tires. Tires are subject to "infant mortality," where casing failures due to manufacture usually occur early in the tire's life. Recapped tires use proven casings and bypass these infrequent but predictable failures. Tread failures in recapped tires are essentially preventable. They are due to tread separation associated with leaking air from casing pinholes that can be found and repaired, given appropriate processing prior to recapping. Scrap rubber along highways is often attributed to recap process failures. The material is not there because of a peeled retread but rather from tire abuse whether new or recap. Overloading, under inflation, mismatch of dual tires (in diameter) all contribute to tire abuse which causes tires to come apart. Look for wire; if it is there, you are seeing part of the tire casing and the problem was misuse rather than associated with recapping.

A tire recap program supports conservation of natural resources. An average truck tire requires 22 gallons of petroleum and significant energy for its manufacture. A recap requires 7 gallons of petroleum for its manufacture. Recapping casings rather than replacing them saves 15 gallons of petroleum per recap.[1] From an environmental standpoint, a recapped tire is one where its disposal as solid waste is deferred with reduced requirement for landfill.

Fleets anticipating a new or significantly expanded tire recapping program will find there are prerequisites in the planning phase that will improve the success of its implementation. Essential to success is an education program. There is resistance to recaps that includes the impression that recaps are unsafe. Additionally, the adverse impact associated with "rubber on the road" must be overcome and the importance of a tire pressure maintenance program emphasized.

Introduction of an all steel belted tire program prior to a fleet-wide recapping program will maximize the program effectiveness. Though more expensive than bias ply tires, stronger casings allow more recaps per casing thereby reducing total cost. On and off road steel belted radial tires result in fuel savings. Decisions on customized tread design, such as bi-directional treads for motor graders, are necessary to allow proper preparation by recap suppliers. The mentioned example allows reduction in inventories.

Recappers are, unfortunately, not all created as equals. The success in seeking the best recap supplier available through tight specifications will make or break a recap program. NCDOT recapper, White's Tire Company of Wilson, North Carolina, is one of the largest in the world. Our program experiences less than one half of one percent returns for warranty adjustment. The national average for returns is three to four percent with up to six percent experienced in some geographic locations.

Continuing program improvement is necessary to stay with the state of the art. Improvements generally originate in Europe and are imported slowly. Evaluation of possible alternative processes and materials will result in the most effective program practical within available resources. After testing and costing against alternatives, intended changes must be incorporated in specifications. Thereby, the supplier remains competitive while improving product and subsequently, upon contract renewal a level bidding field for all suppliers is ensured. Most improvements in quality carry with them significant costs in capital equipment and a fast way to make an ideal supplier lose out to their competition is for them to cost a level of quality, that they understand is required from experience, that is not identified to all by specification.

Examples of evaluations that were subsequently included in NCDOT's specifications are reviewed in the following paragraph

A change to the rubber compound used in recapping was tested in a head to head evaluation. As a result a unique compound was specified that resulted in increased recap life. Inclusion of rubber dust resulting from casing preparation in rubber compounds was evaluated as a cost savings to the recapper that would be passed on to the customer. Tests showed that inclusion of eight percent rubber dust had no adverse impact on mileage. Specifications were made permissive on this point. A change from precured "top cap" to a mold cured process on radial casings resulted in this

TABLE 1 MILEAGE EXPERIENCE* FOR NEW TIRES VERSUS RECAPS

Tire Type	Tread Depth in 1/32 inch			Wear per 100 hrs.
	No. 1	No. 2	No. 3	
East Coast Division - 936 hrs. between March 23, 1993 and June 24, 1994				
New Tire	15	12	9	0.0641
Recap Tire	20	17	15	0.0470
Piedmont Division - 687 hrs. between April 2, 1993 and March 9, 1994.				
New Tires	20	18	18	0.0582
Recap Tires	25	25	24	0.0320
Mountain Division - 1,153 hrs. between April 6, 1993 and May 18, 1994.				
New Tires	6	8	8	0.0641
Recap Tires	9	10	10	0.0581
	Average Wear per 100 hrs.		New Tires	0.0621
			Recap Tires	0.0457
Conclusion: Recap tread life exceeds new tire tread life by approximately 25%				

* Motor Grader Tires 1400R x 24. Three new tires on one side and three recaps on the other with rotation every 200 operating hours. All tires started with one inch tread depth.

Reference

1. Tire Retread Information Bureau, 900 Weldon Grove, Pacific Grove, CA 93950.

becoming the preferred method of recapping. Specifications require capability for both on the part of the suppliers. New techniques for testing casing strength and identifying small air leaks were identified by the supplier. After evaluating the new processes against present methods, the increased expense was deemed the economic choice and specifications were changed.

The recap process that results in the high quality product enjoyed by NCDOT is outlined in the following:

- Casings are screened at shops generating casings to ensure that casings are not broken and that they are within warranty period.
- Casings are picked up on site by the recapper at least biweekly if required to support inventory. Casings in excess of local need are transferred to other shops or sold through closed bid. Recapper representative screens tires along with NCDOT representative to ensure that casings appropriate for recapping are transported.
- The first step in the process is provision of specified rubber compounds. Our recapper blends the compound required and produces precured material in necessary treads and uncured rubber in appropriate extrusion forms, rubber "roping," "tread belt" rolls, side wall veneer rolls and raw rubber void repair material.
- The first step for the casing is a high pressure casing strength test to eliminate those casings that have operated at very low pressures or otherwise suffered damage.
- The next step provides a visual internal and external expanded casing inspection.
- Nail hole detection is performed by two methods. High voltage is applied to the inside of the casing. If an irregularity (hole or breakdown in rubber) is present, it will be evidenced by an arc jumping to the outside "ground." The second method involves introducing a fluorescent gas under pressure into the tire casing. Under ultraviolet light the escaping gas is visible and the hole is marked.
- After additional internal and external examination and repair of nail holes, the tires go to the buffing stations.
- Buffing removes old tread and prepares a buffed and balanced tire casing. Buffing proceeds from bead to bead for tires receiving new side wall veneer.
- After buffing, rock drilled or cut casings are prepared by grinding out damaged areas. An adhesive is sprayed on at this station.
- The next station rechecks for damaged areas requiring grinding, and then fills grinding and ground out voids with raw rubber. The material is smoothed with a "hot knife."
- A second application of adhesive is sprayed on at the next station and then the casing is passed to the recap operation.
- Extruded tread belt material and side wall veneer (for bead to bead) is applied to the casing. The built up casing is passed to the molds.
- Casings are placed in the molds and pressurized. The heat curing results in a molded tread and side casing embossing (if bead to bead recapping).
- The final production line station includes trimming, a high pressure test and a spreader inspection of the casing inside and outside.

The completed casings are staged for delivery. Pickup and delivery is scheduled to all equipment shops every two weeks

Financial benefits of the NCDOT tire recapping program are significant and growing. In fiscal year 1994-95 the program saved $816,800 by use of recapped tires instead of new tires in the same application. Experience has shown that tires recapped with NCDOT's rubber compound out wear new tires by approximately 25 percent, all else being equal. A spin off benefit is that a recapped tire is a tire whose disposal has been deferred with associated savings in handling, landfill tipping fees and expense of casing disposal through other alternatives. These reductions in operating expense are not included in the specific dollar savings addressed above.

From a conservation standpoint, 7,493 tires recapped saved 112,395 gallons of petroleum had they all been truck tires. Actually, almost 1,000 tires were motor grader, loader, and tractor tires with significantly higher petroleum savings.

In sum, the NCDOT tire recapping program has been a resounding success story and emphasis on a specific tire maintenance program, that includes heavy dependence on recapping, is recommended to all large fleet owners.

REFERENCE

1. Tire Retread Information Bureau, 900 Weldon Grove, Pacific Grove, CA 93950.