

Retreading of Tyres

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Abstract: Tyre is made up of natural rubber or synthetic rubber. Natural rubber is present as milky liquid or latex in the bark of rubber tree, *HEVEA BRASILIENSIS*. Natural rubber combines with carbon, oil, sulfur and the chemicals under goes a number of stages of processes. Synthetic rubber polymers found in crude oil by retreading tyre we are doing a good job which is in favor of Natural resources. We are also reducing our dependency on Natural rubber trees. It also gives good utility an opportunity for the growing of small scale and large scale retreading units or workshops. In India mostly commercial vehicles tyres are retreaded. State Govt., Delhi Govt., Central Govt. Bus services departments etc. also retreaded their vehicles tyres. Pvt. tour operators and commercial vehicles also retreaded tyres. If one wants to set his own retreading unit then it is also profitable business activity. This paper presents all these aspects.

Keywords: Retreading, buffing, vulcanization, curing

I. INTRODUCTION

Before starting the paper. It is very essential to know the meaning of 'tread'. The grooves which are cut on the tyre surface are called tread. These treads ensure the gripping action between the road surface and tyre. After the use of tyre the depth of treads becomes less and a slippery action takes place between road surface and tyre. The co-efficient of friction becomes less. A tyre is in no more condition to be used again. Now, here becomes the choice either to replace the tyre with a new one which is very expensive or to retread the tyre which is less expensive as compared to the cost of new tyre. Retreading process can also rectify minor cuts or defects on the side walls of tyre, beads and punctures in a single stage. A tyre can be retreaded or not this is entirely dependable on the type of use of tyre and condition of tyre for example car tyres, 2 or 3 times; Light truck tyres 4 to 5 times; Heavy truck tyres 8 to 9 times; Air craft tyres upto 14 times.

Retreading process is of two types:-

1. Hot retreading
2. Cold retreading

II. METHODOLOGY OF HOT RETREADING PROCESS

1. Tyre arrives in the workshop, it is cleaned thoroughly with water so, that dirt, dust and mud should all be removed effectively.
2. Tyre is left for some time so that it may dry or a drier can be used for this purpose.
3. Initial inspection is carried out to verify that casing is acceptable for retreading process or not. It is thoroughly examine inside and outside and marked with yellow coloured crayons.

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4. **Buffing** :- The primary objective of buffing is to prepare the worn out tread surface of tyre to receive a retread. The original tread design and the some of the under tread is also removed to provide the casing with required dimensions and surface texture. In other words it increases the co-efficient of friction of untread surface of tyre so that it can hold firmly the cushion and sole of new tread.
5. A tyre is continuously rotating and a painting brush depth in vulcanized rubber solvent is placed over the surface of tyre. In this way it spreads uniformly. Take another dip of solvent if required. After the application of sufficient solvent a cushioning strip is fixed and tyre is slowly rotated so that complete circumference of tyre is covered and uncured tread compound is extruded or applied as a strip of sufficient length directly to the casing.
6. The tyre is placed in a mould and air pressure is maintained so that it expands uncured material takes the position of the mould temperature of 150° C the tread and after some time the mould is opened and tyre is taken from the mould. These mould are used in the manufacture of new tyres. For every size of tyre a new mould is required so it is a expensive process and almost obsolete now a days.

A modern approach has been made in this section since last 20 - 25 years cold process retreading process has been becoming more popular and efficient due to its low cost, easy handling and more profit margins.

III. METHODOLOGY OF COLD RETREADING PROCESS

1. Tyre arrives in the workshop, it is cleaned thoroughly with water so, that dirt, dust and mud should all be removed effectively.
2. Tyre is left for some time so that it may dry or a drier can be used for this purpose.
3. Initial inspection is carried out to verify that casing is acceptable for retreading process or not. It is thoroughly examine inside and outside and marked with yellow colored crayons.
4. **Buffing** :- The primary objective of buffing is to prepare the worn out tread surface of a tyre to receive a retread. The original tread design and the some of the under tread is also removed to provide the casing with required dimensions and surface texture. In other words it increases the co-efficient of friction of untread surface of tyre so that it can hold firmly the cushion and sole of new tread.
5. A tyre is continuously rotating and a painting brush depth in vulcanized rubber solvent is placed over the surface of tyre. In this way it spreads uniformly. Take another dip of solvent if required.

Retreading of Tyres

After the application of sufficient solvent a cushioning strip is fixed and tyre is slowly rotated so that complete circumference of tyre is covered and uncured tread compound is extruded or applied as a strip of sufficient length directly to the casing.

6. Now tyres are unloaded from the machines and hanged over hangers. The tyre envelope under a cover so that in the premould process the uncured cushion has to be vulcanized while pre mould tread has to be kept in position. Tyres from hangers are moved by hoists and chains and placed in fixed position in horizontal Autoclave. (Autoclave is a type of furnace). The air pressure nozzle tip is connected to envelope air pressure is maintained and lid of furnace is closed. A push button is switched on. A temperature of 99°C is maintained for 3-4 hours. This action creates an adhesive action between vulcanized coating, cushion pad and sole of treads. After 4 hours the electric supply is switched off and allow to cool in the furnace for 1 to 2 hours. The tyre is removed from the furnace and allowed to cool till the operator become able to remove the envelope.

7. **Final inspection:-** To ensure that all the defects which were assigned before the process have been removed or not. If tyres pass the final inspection then; they are kept in warehouse for the requirement of supply.

If a person wants to set up his own tyre retreading plant of the capacity:

1. LCV tyre retreading size-700x15-2400 Nos.
2. Passenger car tyre retreading size 590x15-3600 Nos.
3. Truck tyre retreading size 300x20-3000, Value:- Rs. 367.2 Lakhs

IV. FINANCIAL ASPECTS

A. FIXED CAPAITAL

(i) Land and building

Covered area for workshop, office, Stores etc. and open area-1000 sq Feet (per month)

(ii) Machinery and Equipment

S.No	Particular	Qty./ Nos.	Rate(Rs.)	Total price
1	Buffing machine with dust collector tyer truck bonder	1	2400,000	2400,000
2	Work bench Envelop/tyre stand Gantry	1	140,000	140,000
3	Bilier cap. 300 kg/hrs.	1	900,000	900,000
4	100 IBS pressure Air working compressor	1	160,000	160,000
5	Air conditioner	1	200,000	20,000
	Total			3800,000

Electrification and installation at 10% above the cost Rs. 380,000

Office equipment furniture Rs. 200,000

Cost of auxiliary items i.e. pipe erection electric fitting retreading, tools, mechanical hoist with trolley etc. Rs. 600,000

Total : Rs. 4980,000

(iii) Pre-operative expenses Rs. 200,000

Total : Rs. 5180,000

B. WORKING CAPITAL (PER MONTH)

(i) Personnel

S.No	Description	Nos.	Salary (Rs)	Total (Rs)
1.	Manager	1	32,000	32,000
2.	Supervisor (Technical)	1	24,000	24,000
3.	Skilled worker	5	14,000	70,000
4.	Semi-skilled workers	6	12,000	72,000
5.	Un-skilled workers/helper	3	8000	24,000
6.	Clerk cum typist	1	10,000	10,000
7.	Salesman	1	10,000	10,000
8.	Office Assistant cum-peon	1	8000	8000
9.	Watchman	1	8000	8000
	Total			258,000

(ii) Raw Material (per month)

(a) For retreading 200 LCV tyre

S.No	Description	Qty	Rate (Rs)	Total (Rs.)
1.	Preured tread rubber	1000 kg	340	340,000
2.	Cushion compound	100 kg	336	33,600
3.	Vulcanizing solution	60 ltr	240	14,400
4.	Envelpoe	200 Nos.	20	4,000
5.	Curing Bag	200 Nos.	22	4,400
	Total			396,400

(b) For retreading 300 pessenger car tyre

S.No	Description	Qty	Rate (Rs)	Total (Rs.)
1.	Preured tread rubber	900 kg	340	306,000
2.	Cushion compound	105 kg	336	35,280
3.	Vulcanizing solution	75 kg	240	18,000
4.	Envelpoe	300 Nos.	20	6,000
5.	Curing Bag	300 Nos.	22	6,600
	Total			371,880

(c) For retreading 250 Nos. truck Tyre

S.No	Description	Qty	Rate (Rs)	Total (Rs.)
1.	Preured tread rubber	2375 kg	340	807,500

2.	Cushion compound	252 kg	336	84,672
3.	Vulcanizing solution	250 ltr	240	6,000
4.	Envelopoe	250 Nos.	20	5,000
5.	Curing Bag	250 Nos.	22	5,500
	Total			962,672
	Total Raw Material			1730,952
	Say	1731,200		

(iii) Utilities (per Month)	Rs.
Power	50,400
Fuel for boiler	80,000
Total	130,400

(iv) Other contingent Expenses

S.No.	Description	Rates
1.	Rent	40,000
2.	Postage and stationary	10,000
3.	Insurance and taxes	8,000
4.	Telephone	6,000
5.	Repair and maintenance	8,000
6.	Publicity and advertisement	10,000
7.	Travelling and transport	24,000
8.	Renewal and replacement	6,000
9.	Other Miscellaneous Expenses	20,000
	Total	132,000

(v) Total Recurring Expenses

S.No.	Description	Rates
1.	Staff and labour	258,000
2.	Raw Material	1731,200
3.	Utilities	130,400
4.	Other contingencies expenses	13,200
	Total	2251,600
	say	2252,000

(vi) Total working capital for 3 Months

Rs. 2252000 x 3 = 6756000

(C) TOTAL CAPITAL INVESTMENT

1.	Fixed Capital	Rs. 5180,000
2.	Working capital (for 3 Months)	Rs. 6756,000
	Total	Rs. 11936,000

V. FINANCIAL, ANALAYSIS

(I)	Cost of production (per month)	(In Rs.)
1.	Recurring Expenses	27024,000
2.	Depreciation on machinery@10%	380,000
3.	Depreciation on tools and fixtures@20%	12,000
4.	Depreciation on fixtures and office equipments@20%	4,000
5.	Interest on total capital investment@16%	1909,800
	Total	29473,800

(II) Turnover (per annum)

(a) Precured retreaded charge for LCV Tyre size-700x15, 2400 Nos. Rs.900x4=3600 = Rs. 864,000

(b) Passenger car tyre size- ,590x15 3600 BNos. X, Rs. 700x4= 2800=Rs. 10080,000

(c) For Truck tyre size-300x20 3000 Nos. x Rs.1500x4=6000= Rs. 18000,000 Total = Rs.36720,000

(III) Profit (per annum)

Sales cost of production = Rs. 367,200-29473,000 = Rs. 7246,200

(IV) Net Profit Ratio

= Profit (per annum) x 100 Sale (per annum)

= $\frac{7246200 \times 100}{367200} = 19.7\%$

367200

(V) Rate of Return

= Profit (per annum) x 100 Total capital investment

= $\frac{7246200 \times 100}{11436000} = 61\%$

11436000 x 4

(VI) Break-even point

	Fixed cost		(In Rs.)
1.	Rent		480,000
2.	Depreciation on machinery@10%		380,000
3.	Depreciation on tools and fixtures@20%		120,000
4.	Depreciation on fixtures and office equipments@20%		40,000
5.	Interest 16%		1909,800
6.	40% of salary and wages		1238,400
7.	40% of utilities and other contingent expenses		1067,520
	Total		5235,720
	B.E.P	=	Fixed Cost x 100
			Fixed cost + profit
		=	5235720 x 100
			5235720 + 7246200
		=	12481920
		=	41.91%
		=	42%

VI. CONCLUSION:

Tyre retreading saves raw material that is rubber. A tyre is made up of 100% rubber appox. as main ingredient 20% is only used in worn out tyres rest 80% is tyre carcass. It save 28 ltr of crude oil use in manufacture of a new tyre and 5.5 ltr. is used in retreading tyre. Small scale industries and large scale industries are profitable. thus retreading is a all round development process which creates job opportunities. Small enterprise can also start a business with Rs. 1028,000 for the production of 1680 Truck tyres.

REFERENCES

1. Chary.S.N., Production and operation management (III edition) chapter-4, pages-4.3, 4.4, Tata McGraw ill.
2. N.S.I.C Okhla Phase-III, New Delhi, consultation
3. Central Workshop-II, Okhla (DTC) apperentice ship Training
4. Revision of rates of preparation Small industries service Institute (Sikkim) December-2002.
5. www.aryanmachinery.com
6. www.madehow.com/volume