REDUCING COSTS IN ROAD TRANSPORTATION USING SELF-ADJUSTING COUNTERACT BALANCING BEADS

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ABSTRACT

This paper aims to describe a procedure for automatic rotational balance of tires used for transporting loads on highways. It describes the operation of balancing and tests to verify the performance of the process and the benefits that can be achieved with it.

Keywords: balancing, logistics, tires magazine, engineering

1 – INTRODUCTION

The subject: logistics of road transportation in Brazil is still very new and an unexplored area for a great many of the companies who operate in this segment of the market. This is due in part to the fact that the industry only really began to develop in the country in 1934.

The first railroad was built in 1946. Previous to this date we have records only of river transport, where the goods were shipped by boats and then the transport was carried out in an inefficient manner.

The concept of logistics began to develop because there was a rapid transformation in the Brazilian economy, where businessmen and government started to emphasize the transportation sector. The economical crisis of the 1980's and a new political direction took an expensive toll on the governmental budget for the transport sector. Mainly effected were the railroad, air and river sectors, transforming road transport into the most used in Brazil.
Even representing larger costs, road transportation is still responsible for 56 % of the distribution of goods in the country, against 21 % carried out through the railroads and 18 % for other modes of transportation.
We can calculate how much the transportation costs increased by observing and calculating the following variables:

- Devaluation of the vehicle
- Remuneration of capital
- Workers (employees, crew)
- Taxes and theft; consequently the companies have to insure their cargos.

- Administrative costs
-Fuel
- Maintenance

Other variables have to be considered such as conservation of the highways and roads in general, costs of tolls and maintenance, high fuel costs, emission of pollutant gases in the atmosphere, problems with maintenance of vehicles and etc. In the opinion of GUALDA (1996), more than the half of all cargo in the country is transported through highways. Due to the importance of transport, this study tries to join information, analysis and scattered data from several publications on this topic.

So, without intending to approach all issues in road transportation, we examined, specially, the situation of the industry and their impact on several included costs.

"Deterioration " is a recurrent word in the present text to describe the road conditions in the Brazilian transportation net, causing in general the increase in costs and the levels of accidents. To overcome the existing problems, a significant amount of effort and investments is required in recuperation, operational and maintenance of the network, supported by private capital. On the other hand, even though recognizing the importance of this segment for the cargo transport industry, the improvement of the efficiency of this sector in the country will only be reached inside a global vision, concentrating its efforts on logistics planning.

The high costs produced by transportation by land, principally road transportation, has as a consequence the increase of the final prices of the products, which are reflected in the final price for the consumer.

We notice that many companies are becoming more preoccupied with environmental issues, mainly because their clients are becoming environmental conscience, and therefore more demanding of environmentally friendly practices. In other words, customers are able to identify which companies are more responsible in relation to the environment and that these enterprises value their image to their customers. Today the preoccupation with the environment is viewed as a quality point of the companies. If the companies want to apply for a certification ISO, one of the points to be analysed is the proceedings used in the environmental area.

Presently, inspection in road transportation is stiffer; however regarding the destination of the residues produced by this activity, inspection is still insufficient and relatively in its first steps.

Transportation produces a series of residues (pollutants). Principally, when we speak of road transport, companies in this industry should be able to deal with this problem to avoid being fined.

As mentioned above, there are several residues produced by road transportation, from which stand out - tires, used lubricants and oil, batteries, mud originated from car washing, among others. All these quoted residues must be handled in an appropriate form, each one having its own proceedings and specific legislation, being controlled by several governmental institutions. Unfortunately in our country the ministries do not talk between themselves and frequently approve laws on the same issues. These separate laws could have totally different demands, which the companies must respect, the end result being companies lost amongst many different legislations and paperwork. It is not economically viable to recognize all of them. Many of them end up cheating the system and not respecting any laws.

As referred above, inspection of environmental pollution is becoming more rigorous; nevertheless, it is still in its preliminary stages. Knowing of the possibility of inspection, there are companies that specialize in residue (pollutant) treatment. However there are still obstacles and one of these is the high cost for residues treatment. Since this is a recent issue, many companies still do not act appropriately.

For these reasons, this study aims to present a procedure to rotationally balance all tires used by the transportation industry.

With the use of this system tests were carried out to prove the performance of this balancing method as follows:

1. Tire heating test
2. Tire wear test
3. Tire reusable test
4. Electrical interaction test

2.1. Heat

Counteract Test Measurements

Counteract													
0	6	12	19	25	31	37	43	50	56	62	68	75	m/hr
64	72	93.2	117	126	142	161	176	198	205	205	205	205	F

Competitor's Free Flowing Inertia Balancing Agent													
0	6	12	19	25	31	37	43	50	56	62	68	75	m/hr
64	79	100	120	140	167	181	205	216	239	254	268	268	F

Without Product													
0	6	12	19	25	31	37	43	50	56	62	68	75	m/hr
64	81	95	117	137	168	178	200	208	216	228	228	230	F

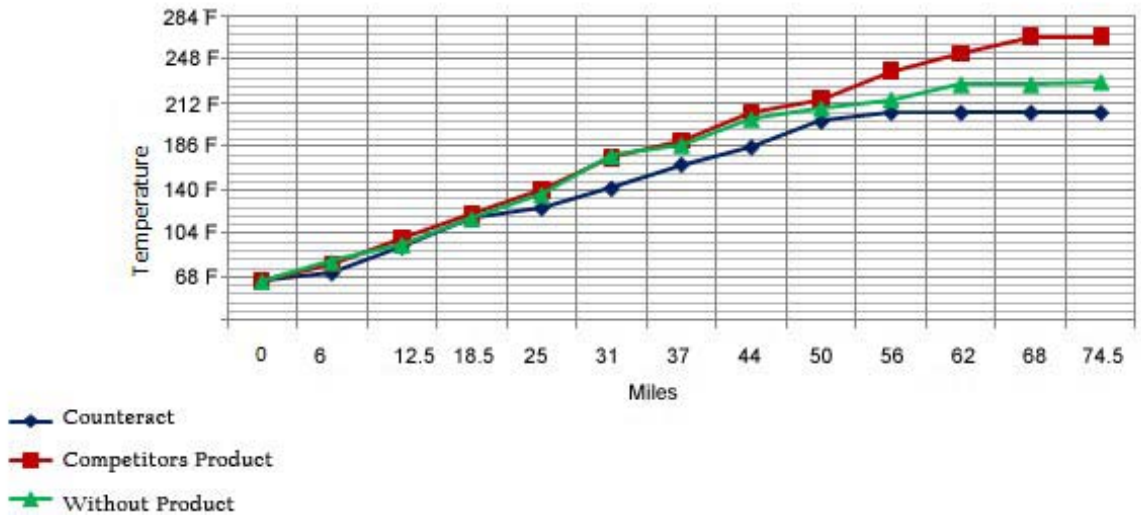

Figure2. Tire Heating Test

According to the information obtained in figure 2, we ascertain that the electric interaction between the beads and the tire results in less heating up of the tire, when exposed too significant adversities on the highway.

Knowing that a tire has its best performance when it maintains a temperature between 90ºC (195ºF) and 100ºC (212ºF), we can prove that the CBB system of automatic self-balancing helps in the maintenance of the constant temperature, avoiding unequal wear of the tire.

2.2. Wear Test

For the wear of tires, tests were carried out in laboratory and in practice on loaded trucks and trailers.

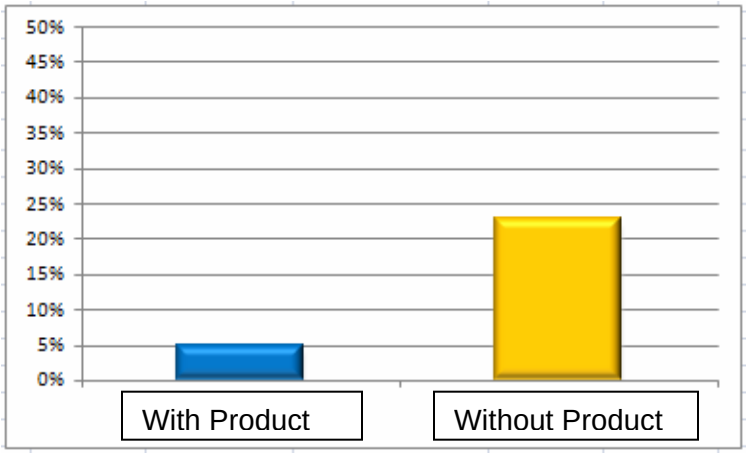

Figure3. Performance of the tires in laboratory

The performance of the wear of the tires in laboratory was measured every 1.000km in high temperature and great friction conditions; however, without deformations of the tread. In

this situation the result was 14.2% less wear of the tire with CBB than without the use of the product.

In the trial run (road test) the tires were checked after 100,000km (62,000 miles) and results verified that the tire wear was less 12.57 % when the tires had installed CBB than the one without the product.

2.3. Reusable test of Tires

Tests were carried out in laboratory on the structure of the tire (traction and compression), as well as trial runs in order to check the possibility of reuse the tire after the installation or not of the product. *explanation below

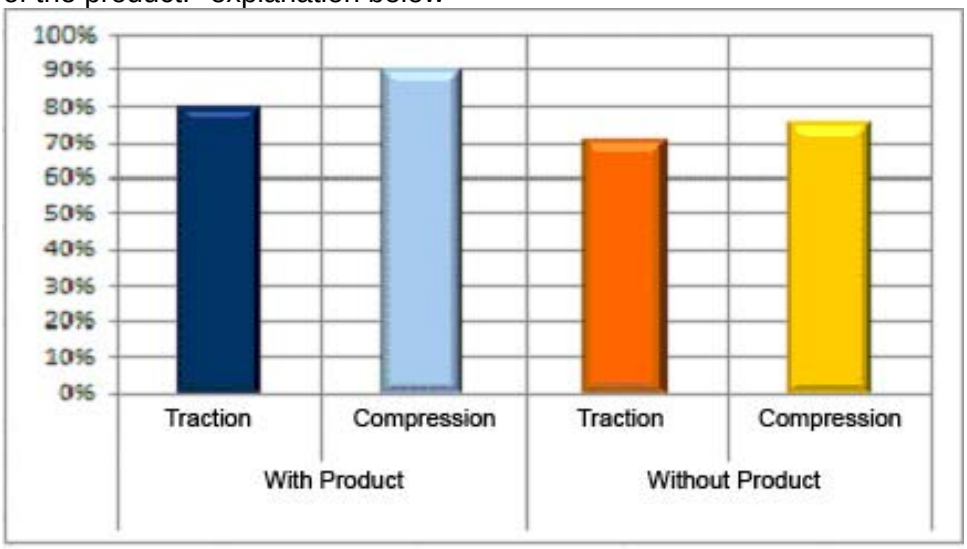

Figure 4. First trial

Based on figure 4, we can see that traction and compression in the structure of the tire after 40.000km (25,000 miles) are different when the product is installed, since there is a difference of almost 10 % in the obtained result.

After the second trial, the tire with the CBB product installed maintained its normal characteristics, allowing for a normal drive, obtaining the same performance as in the first trial; however, the tire without the product did not permit a second trial, because its characteristics were altered and the compression capacity reduced by 35 % in comparison to the original tire according to display of figure 5.

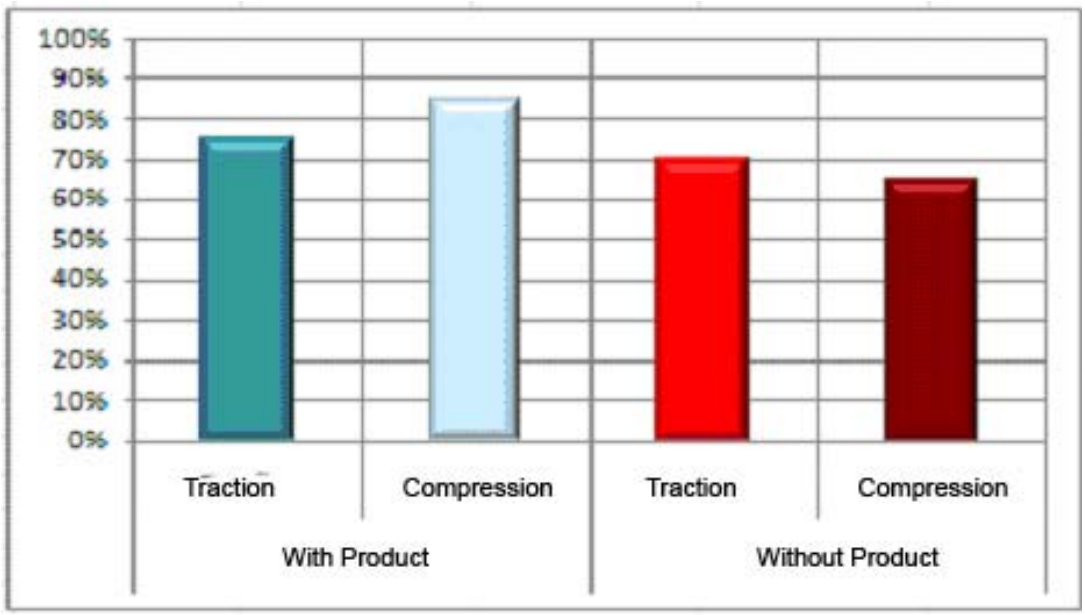

Figure5. Second Trial

During the tests of traction it was observed that with the use of CBB internal repairs of the tires weren't necessary to move forward with the trial run.

3 – CONCLUSION

With the help of this study, companies who work in the transportation industry in this country now have a solution to one of the biggest problems in the industry - tires.

Through the realization of these tests, we can conclude that the product here presented fulfilled all requirements made by transportation companies, as well as everything that is said about it, like the automatically self-readjustment and balancing, reducing significantly companies operational costs. It is environmentally friendly, reducing harmful wastes; prevents premature tire wear and consequently the frequency of changing tires, there by increasing tire life drastically.

This product was not only studied by us; there are other investigators who study this form of balancing tires in an effort to reduce companies' operation costs and to contribute to a more healthy and clean environment.

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**We accomplished mechanical tests in the structure of the tire, to verify which was the deformation that the structure of steel of the tire suffered when the product is used and when it is not used.*

During the traction tests and compression we verified that after the tire to turn 40.000km he loses part of the characteristics structural originals of the tire. Without the use of the product the tire starts to have only 75% of compression potential (that is the largest work than the tire suffers during his useful life), already with the use of the product the structure of the tire is with 90% of his compression potential. Calculating an average between the compression potential and traction of the tire with and without the use of the product, we arrived the conclusion that the structure of the tire with the use of the product if you maintain 10% on average larger than without the use of the same. Or be the internal wear and tear of the structure of the tire with the use of the product is smaller, that is one of the factors of the possibility to accomplishing a second life to the tire, doing with that the tire has his capacity almost equal the one of a new tire.

Results of Counteract’s Auburn University PAVE Test proving a 2.2% improvement in fuel economy available at http://www.counteractbalancing.com/report.pdf