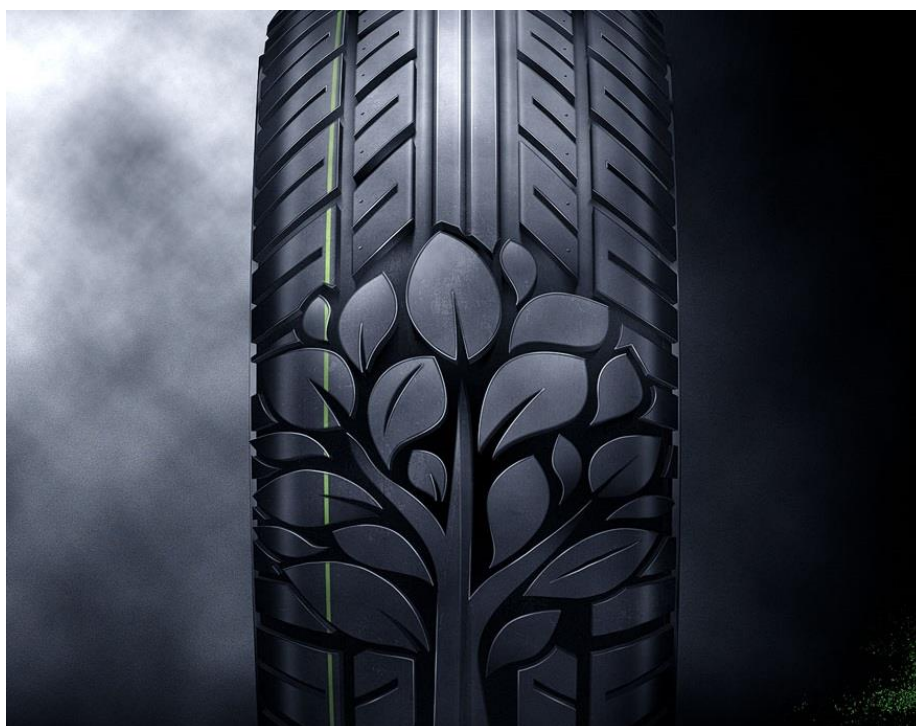


August 2013



SPECIAL ISSUE



INSIGHTS  
&  
ANALYSIS

# ROLLING RESISTANCE THRESHOLDS

An opportunity for Indian sustainable transportation

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# An overview of the Indian situation



India is a growing country still under development. Its characteristics and assets will help it become a major player in the world's financial, economic and commercial game. But this development relies heavily on the decisions the country will make between now and 2020. Its strong economic growth does not nonetheless absolve it from social and environmental responsibilities.

## ***Growing population and economy: issues that are arising***

India is the second most populous country in the world with over 1.2 billion people (2011 census) and is growing at 18 million per year. As per population projections, India will overtake China to become the most populated nation by the year 2030. Currently India has 50% of the population below the age of 25, 33% of the population below the age of 15 and more than 65% below the age of 35.

This booming and youthful population is presenting unprecedented economic opportunities. Moreover, this demographic growth is taking place in a positive and growing economy. India is the tenth-largest economy and is growing at an average of 8% per year even if the pace is slowing. It has established itself as one of the world's fastest growing economies in the world. India should become the 4th largest economy by 2015 going by the current trends. The country has the third biggest Purchasing Power Parity adjusted exchange rates (PPP) and is on its way to becoming a huge globally important consumer economy. As per McKinsey & Company and Deutsche Research, the Indian middle class is estimated to be 250- 300 million people and is expected to reach 600 million by 2030.

One of the major factors in the sustainability of India's development remains in its ability to ensure, in the long term and without sacrificing the environment, the transportation of people and freight. The evolution of India's transport must be supported correctly to make sure this development is controlled for positive results and to avoid negative impacts on the environment.

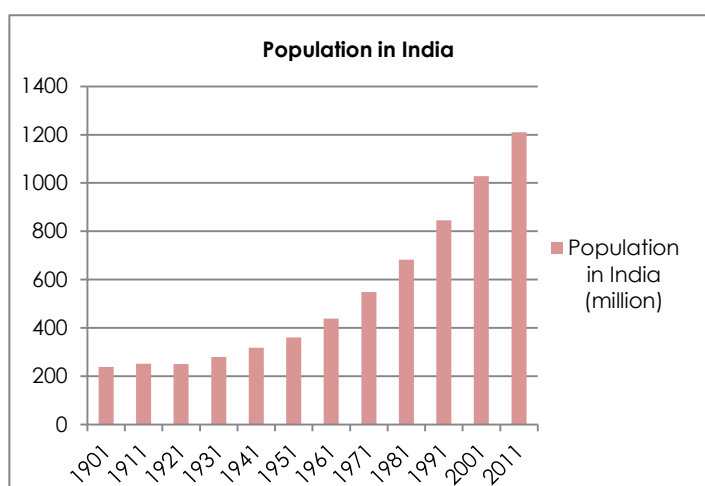


Figure 1 – Source: Census of India

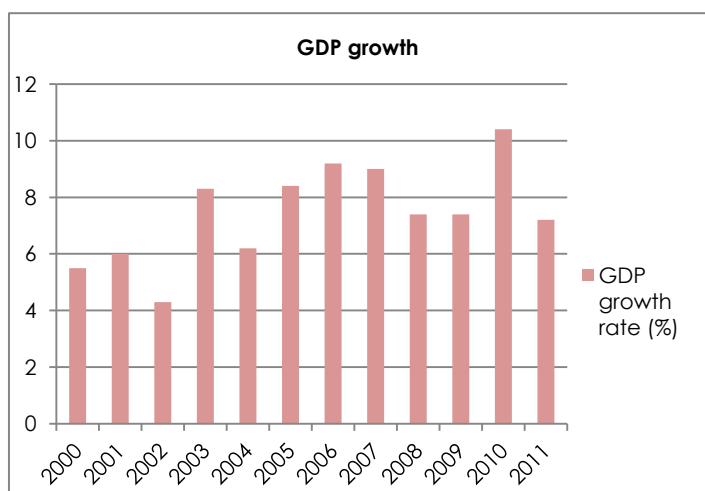


Figure 2 – Source: World Bank

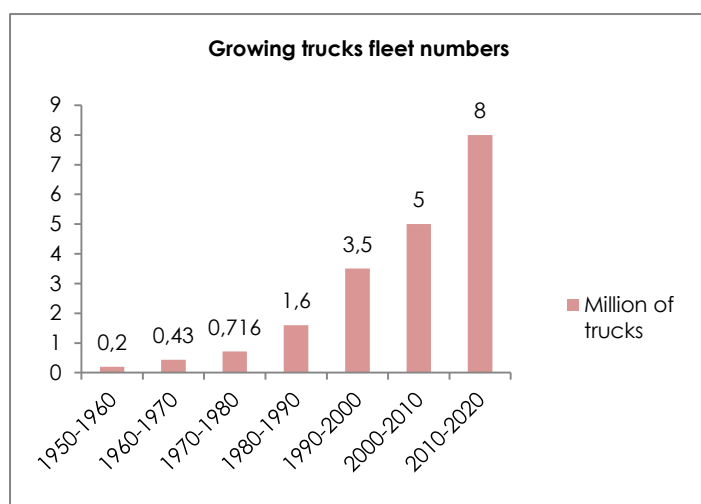


Figure 3 – Source: Ministry of Road Transport &amp; Highways

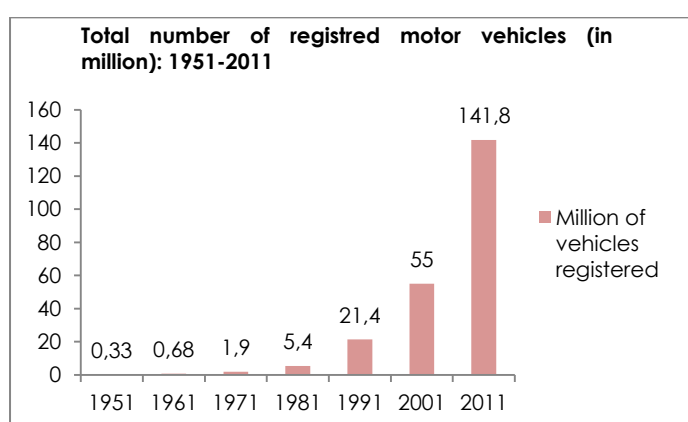


Figure 4 – Source: Ministry of Road Transport &amp; Highways

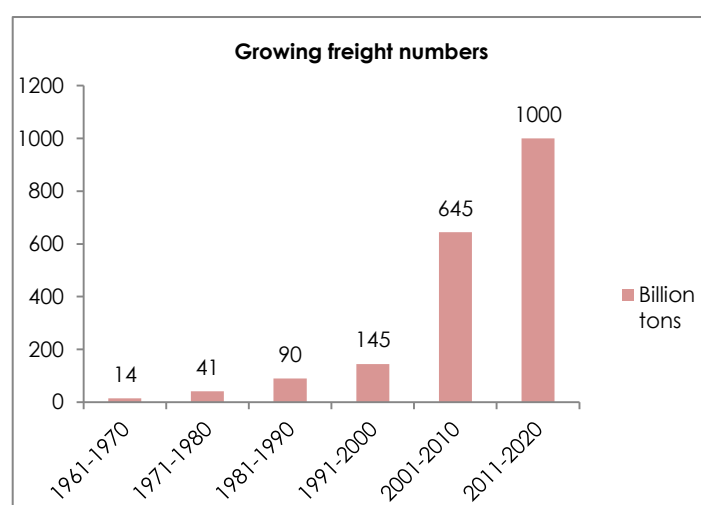


Figure 5 – Source: India Transport Portal

### **Increased purchasing power means increased number of vehicles on the roads**

The by-product of population growth and economic growth is that the spending power of people has increased astronomically. The growing middle class in India aspires to own a vehicle as a symbol of their buying power. This in turn has led to the increase in number of vehicles of all shapes and sizes on the road and the number of cars will double for the next decade. India's car and commercial vehicle manufacturing industry is the sixth largest in the world producing more than 3.9 million units in the year 2011 and emerged as Asia's fourth largest exporter of vehicles in the year 2010. Statistics in figure 3, 4 and 5 indicate that in the days ahead, the economy will demand more vehicles and transport. It is estimated that new truck sales will grow by an extra 60% (300,000 per year) for the next decade.

Even if the per capita car ownership is low, this means that a large part of India's almost 1.2 billion people would be able to purchase their first cars. This would help in increasing the current oil and fuel demand as so many vehicles begin filling the streets of this emerging nation rapidly.

Beyond the growing numbers of personal vehicles, it is the whole of India which is developing to satisfy the needs created by these various tremendous growths: economic, demographic and purchasing power.

### **Freight is one crux of transportation issues**

Road transport is vital to the economic development and social integration of the country. Transport sector accounts for a share of 6.4% in India's Gross Domestic Product (GDP) reflecting its significance. Road transport has emerged as the dominant segment in India's transportation sector with a share of 4.7% in India's GDP as per the data on National Accounts released by the Central Statistical Organisation (CSO). Today, freight needs to be moved safely and at a reasonable cost. It must also be moved in an environmentally sound and socially acceptable manner.

Goods vehicles constituted 5.3% of total registered vehicle population during 2008-09. During 2008-09, goods vehicles grew at 7.9%. As on March 31st, 2011, there were 6.041 million registered goods vehicles. From 2009-10 to 2010-11, the production of total commercial freight vehicles increased by 35.6%.

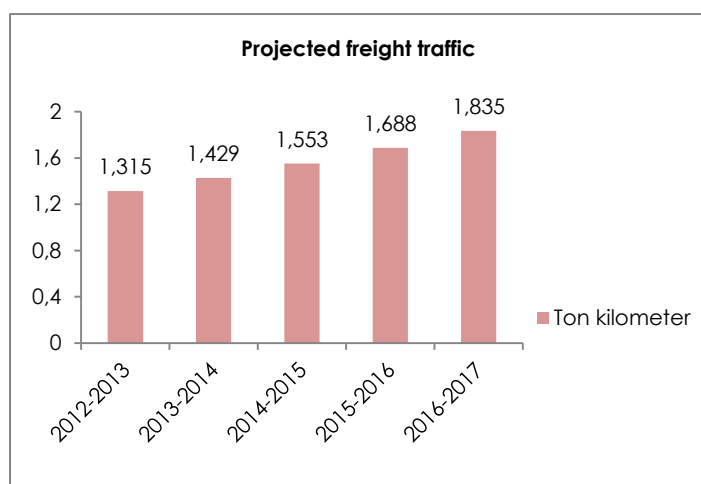


Figure 6 – Source: Ministry of Road Transport & Highways – Report of the Sub-Group on Passenger and Freight Traffic Assessment and Adequacy of Fleet and Data Collection and Use of IT in Transport Sector in the Twelfth Five Year Plan (2012 - 17)

Freight is measured for overall through-put by the road transport sector in tonne-kilometre or tkm; 1 tkm = 1,000 kgkm. The dimension of the measure for freight is the product of the quantity of payload mass and the distance that the freight is transported over.

With the above in mind, energy supply and the environmental fall-out of such development are crucial.

#### **Fuel consumption facts and figures**

Crude oil is the most 'wanted' commodity in the world. China and India together consumed 8.2% of global oil in 2000. Over the past ten years they contributed to half the global demand growth (2001-2010). Combined demand of China and India jumped by 92% over the last decade. On the crude oil, India is one of the world's top 10 oil-consuming nations. Indeed, the country consumes approximately 2.2 million barrels of oil every day and as a result, oil represents around 30% of India's total energy consumption.

Since it has only few reserves for crude oil India face a large supply deficit, as domestic oil production is unlikely to keep pace with the huge demand of the burgeoning population and the spending power of India's growing middle class. India's rough production was only 0.8 million barrels per day. Oil reserves can be found in Mumbai High, Upper Assam, Cambay, Krishna-Godavari and Cauvery basins and together, produce around 5.4 billion barrels. Sadly, these reserves are projected to last only for another 20 years.

India is highly dependent on the import for crude oil (70% of its total oil consumption). Oil import has been steadily rising over the years. However, the country has developed enough processing capacity to produce a number of petroleum products for domestic use and export.

Figure 7 shows the increase in crude oil imports by India from 2001 to 2012 showing more than 100% increase in imports in a decade.

All the possible means to ensure the sustainability of the development of Indian transport are to be studied. The technological advances have meant that there are now ways to support the growth of transport in the long term, and still reducing the use of fossil fuel, whilst being environmentally compatible. These technological factors have been adopted in various places worldwide and offer India the opportunity to support its economic development in a responsible manner.

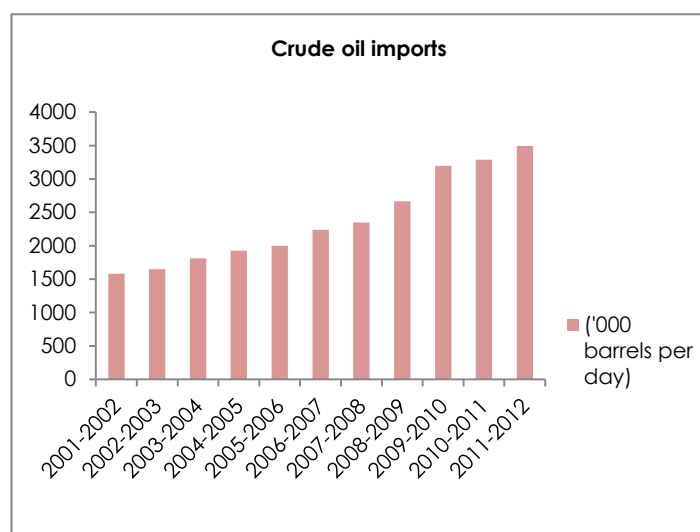


Figure 7 – Source: Reuters

### Fuel Economy

For transport, fuel economy is the energy efficiency of a particular vehicle and is defined as a ratio of distance travelled per unit volume of fuel consumed. For freight it may be stated as 'weight-specific efficiency' (efficiency per unit weight), and for consumer vehicles it is referred to as 'passenger-specific efficiency' (efficiency of the vehicle per passenger). How fuel-efficient a vehicle is, is a direct result of its specifications: from the engine's specs to the weight, aerodynamic drag and rolling resistance.

The amount of fuel consumed by a vehicle is dependent on several factors:

- Thermodynamic efficiency of the heat engine,
- Frictional forces within the mechanical system which deliver the engine output to the wheels (transmission and drive axle gear ratios),
- Engine-powered accessories such as the electrical generator, air conditioner, water pump, engine fan etc.
- Vehicles aerodynamic: external elements that cause resistance when in motion (wind, rain, etc.),
- Non-renewable braking force which turns motion energy into heat, rather than storing it in a useful form (electrical energy in hybrid vehicles),
- Frictional forces in the wheels and between the road and the wheels, in other words, **rolling friction or rolling resistance**.

It is important though to note that speed has a much greater effect on aerodynamic drag than on tyre drag. Gains in fuel economy can be made by either optimizing or reducing some of the factors affecting drag. As gross combination weight is increased, tyre rolling resistance increases, and vehicle kilometre per litre decreases, assuming speed is maintained constant.

There is a direct impact of the population growth, economic growth, increase in number of vehicles and consumption of fuel. Vehicles use tyres and green tyres with low rolling resistance will help in reducing fuel consumption and thereby help in development, especially for developing countries such as India.

Among all the factors that can be influenced to reduce fuel consumption etc. tyre rolling resistance offers many opportunities. The latest technological developments provide results that can be measured immediately, so much so that the majority of the world has jumped on the wagon. This reflects the European Union's rules and regulations on the matter. The study of these countries will enable onlookers to evaluate how India could benefit from other countries' implementations.

***“With the number of vehicles plying Indian roads increasingly, it is imperative for us to ensure that our environment is protected and, at the same time, educating our consumers about managing their tyres responsibly.”***

**Mr. Thom Clark, Managing Director, Michelin India**

# SOME ASPECTS OF THE ROLLING RESISTANCE ISSUE



Lowering rolling resistance contributes in a major way to reducing fuel consumption. Rolling resistance is defined as the energy consumed by a tyre per unit distance covered. It is also called rolling friction or rolling drag. It is one of the forces that act to oppose the motion of a driver. The main reason for this is when the tyres are in motion and touch the surface it changes shape and cause deformation of the tyre.

This results in loss of energy due to heat which is termed as hysteresis. To overcome this, more force is needed (fuel in case of vehicles) to push the tyre over the surface. Manufacturers have strived to increase fuel efficiency in the past few years by equipping automobiles with low rolling resistance tyres. Understanding the factors that affect fuel efficiency will help narrow the research and development required in the field of sustainable energy usage in the coming years.

## **Fuel Efficiency: tyres matter a lot**

Speaking to India Transport Portal, Dr. Joerg Strassburger, Managing Director & Country Representative, Lanxess India explains: "Tires contribute to 20 to 30% of the total fuel consumption by a vehicle, which is impacted by the rolling resistance of the tire." On highway, for passenger cars, for every 100 litres of fuel, 10 to 20 litres are consumed by the tyres as lost energy. For trucks, for every 100 litres of fuel, 33 litres are consumed by the tyres as lost energy.

The compression of the tyre on contact with the road will cause parts of the tyres, mainly the tube and the casing, to get hot. Treads on the outside of the tyre will also heat up when it moves on the road. When the tyre is compressed on the road the energy is stored but when the tyre comes off the road not much of this stored energy is returned since some of this energy is used to heat up the tyre. That is this phenomenon; the loss of stored energy due to the heating that is called hysteresis. The result is that more force or fuel will be needed to overcome this loss. Tyres with cross ply tread (bias) will have a lot more rolling resistance than a radial tyre since more rubber will be compressed hence there will be more heat generated.

**Rolling resistance definition**

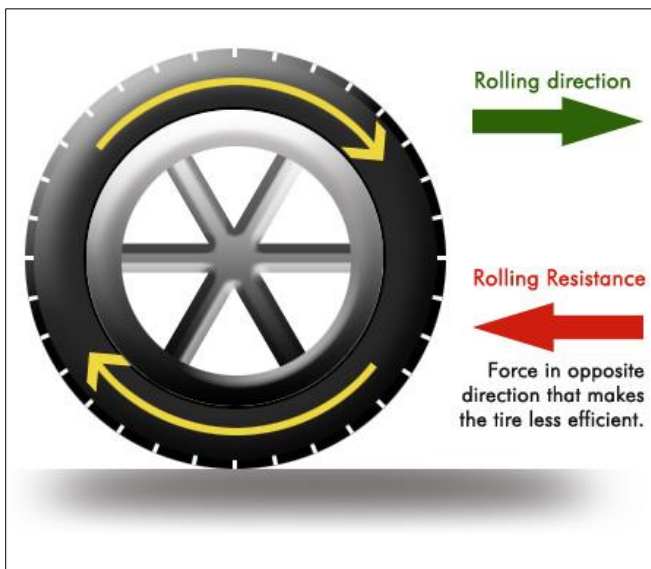


Figure 8 – Source: Maxxis

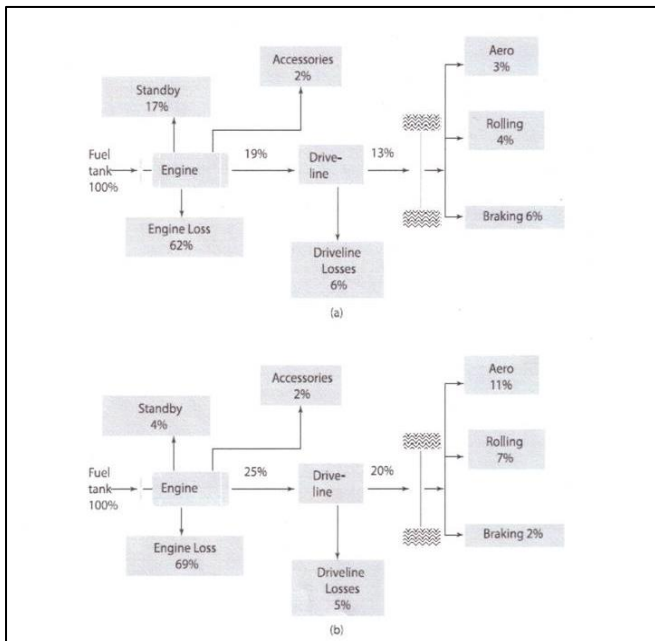
**Example of energy flows**

Figure 9 – Source: Fueleconomy.gov

While designing a tyre, one has to compromise more often than not on tread design and rolling resistance. Research shows that tyre tread is responsible for 65-70% of the total rolling resistance and the body accounts for the rest. Tests show that lower tread depth, optimal tyre inflation pressure, newer tyres, and a smooth road can all help lower rolling resistance which in turn increases fuel efficiency. Fuel consumption could be optimized by adjusting the tyre operating load/pressure conditions.

Since the tyre is filled it takes lot of force to compress the tyre when the front part of the tyre touches the road. This causes a backwards force on the wheel. When the rotating tyre comes back off the road, there is a force pushing forwards on the wheel, but this force is not as big. This is because of internal friction in the tyre.

If tyres could be designed with no internal friction and if there was no heat generated, then the force at the front part of the tyre touching the surface of the road would be same as the force on the back. Then there would be zero rolling resistance which would be ideal. Speed does not affect the force due to rolling resistance but the weight of the vehicle and the type of the tyre influence rolling resistance. Rolling resistance will also increase if the tyres are underinflated.

To improve the performance of tyres, and as a result increased fuel efficiency, lowering the rolling resistance means understanding the phenomenon in the first instance.

**Causes and factors affecting rolling resistance**

Tyre composition plays a major role in determining the loss due to rolling resistance chiefly the role of rubber compounds that can reduce rolling resistance. The choice of the tyre depends on many design requirements (wear, grip, cut resistance, tread pattern, radial or bias tyres).

Rolling resistance is primarily caused due to viscoelastic heat dissipation in the rubber. The factors that contribute to total rolling resistance are:

- Aerodynamic drag of the rotating tyre: 0-15%,
- Deformation in the contact patch (hysteretic losses): 80 - 95%,
- Micro slippage, compression and shearing including tyre/ground and tyre/rim friction: 0-5%.

Rolling resistance is affected by several factors:

- Tyre mass – Higher mass tyre gravity creates a stronger downward force on the road. As a result of this force the tyre compression increases and in turn, so does rolling resistance,

- Cornering – When a vehicle goes round a corner, it slows down, partly because cornering results in a greater downwards force on the road, which increases rolling resistance and also the rubber of the tyre twists sideways on the road causing it to heat up due to the friction,
- Design of tyres – Tyre materials and construction are important since one has to select tyres that don't heat up which will result in less rolling resistance,
- Road or track surface – Smooth roads have very low rolling resistance while rough-sealed roads have more rolling resistance. Grass and soft dirt surfaces have much greater rolling resistance. If the surface can be deformed, this increases rolling resistance markedly.

To quantify and understand the contribution of rolling resistance to fuel economy, Schurring (1988) proposed the concept of the return factor (also known as Energy Ratio): % Reduction in Fuel Consumption / % Reduction in Rolling Resistance.

Huge savings in fuel consumption can be achieved by using low resistance and therefore, it is not surprising that a lot of research has gone into it.

#### ***Academic potential of rolling resistance***

With the world moving towards a greener society, cutting back on greenhouse gases and improving fuel economy is a matter of great importance. A low-rolling-resistance tyre (LRR) provides the same level of performance in terms of braking, tread wear and traction as normal tyres but the advantage is that it generates less friction with the road surface than a normal tyre, reducing fuel consumption and creating a cleaner environment by reducing overall emissions. Tyre manufacturers need to meet the Corporate Average Fuel Economy (CAFE) requirements and equip new vehicles with tyres that boast lower resistance and therefore better fuel efficiency.

According to the International Energy Agency's report in 2005, a significant part of a vehicle's fuel is used to overcome the rolling resistance of the tyres. This depends on the tyre material and the inflation. Underinflated tyres contribute to higher fuel usage and hence an increase in the carbon dioxide emissions. Tyre pressure monitoring systems will help drivers know when the tyres need to be inflated. Lack of awareness and availability coupled with the cost may hinder the purchase of LRR tyres for replacement purposes. IEA had recommended that governments should adopt testing protocols for measuring the rolling resistance and propose tyre labelling schemes.

***“Michelin Tyres, the world leader in tyre technology, estimates that about 76 billion liters of fuel can be saved annually should all trucks running on bias tyres today switch to using Michelin radial tyres.”***

**Mr. B. Kumar, Country Head – Distribution, Michelin**

At the 2006 G8 summit in St. Petersburg, IEA's energy efficiency recommendations included setting maximum limits on rolling resistance that should be allowed for a fuel-efficient tyre in all categories and maintenance of adequate inflation in the tyres.

According to the US National Academy of Sciences (NAS), a reduction of 10% on the average rolling resistance of a tyre translates to about a 2% decrease in the consumption of fuel. Infinitesimal it may seem at first, but this decrease is equal to about 4 million vehicles on the roads. The 2006 NAS Report concluded that measurement of rolling resistance for new tyres can be useful to buyers when coupled with reliable data on traction, wear resistance, and other tyre characteristics.

As per an U.S. National Highway Traffic Safety Administration (NHTSA) study in 2009, if 2% of the replacement tyres would reduce their rolling resistance by 5%, there would be 7.9 million gallons of fuel and 76,000 metric tons of CO<sub>2</sub> saved annually. A California Energy Commission study found that nearly 300 million gallons of gasoline annually can be saved in the Sunshine state if tyres with lower rolling resistance were used.

Research and testing have shown that the installation of low resistance tyres on a tractor-trailer combination could give a potential fuel savings of 4 to 11% in heavy-duty trucking applications. Fuel costs form a huge chunk of the total operating costs of a fleet owner. Speaking to India Transport Portal, Mr B. Kumar, India Head Distribution, Michelin Tyres explains: *“It is estimated that about 76 billion liters of fuel can be saved annually should all trucks running on bias tyres today switch to using Michelin radial tyres that are characterized by a better rolling resistance.”*

Several studies have been conducted to better understand factors affecting vehicles fuel savings (dual tyres vs. new generation single wide-based tyres). Here are some other issues that have to be taken into account:

- Idling times,
- Effect of vehicle weight on fuel efficiency,
- Vehicle's payload,
- The road grade,
- Type of roadway,
- Weather conditions,
- Road conditions.

Results have shown that wide tyres have a positive impact on fuel economy and lower rolling resistance by nearly 12%. When a vehicle is fitted with wide-based single tyres (on all axes) as compared to equivalent dual tyres, there is fuel savings of 1-8%.

With countless advances in technology, the potential to improve fuel efficiency is enormous. There are new high-tech elements that can reduce rolling resistance, including energy-efficient tyres that are called green tyres.

***New technologies in rubber materials have contributed to lowering the rolling resistance of tyres.***

Mr. P K Mohamed, Chief Advisor, R&D, Apollo explains: *"New materials, technologies and better processes are helping tyre engineers now to overcome the problem of compromises. Identification of silica as a filler made possible by better processing capabilities enabled to achieve reduction in rolling resistance without compromising wet grip."*

Solution styrene-butadiene rubber (SSBR) is used in production of tyres. SSBR is a synthetic rubber copolymer consisting of styrene and butadiene.

Composition of tyres includes different rubbers that are both synthetic and natural. The tread of tyres is the key component that affects tyre performance: fuel efficiency, durability, road grip. These three characteristics can be achieved using SSBR in the compounds. SSBR limits the hysteretic energy loss using interactive polymer chains with silica or carbon black fillers in tyres hence reducing rolling resistance and heat build-up of tyres.

Hence synthetic rubber tyre regulations help immensely in the green drive and are a part of what should be used by India to increase fuel economy. *"Usage of bio oils such as sunflower oil can optimise the temperature range, helping to maintain tread compound property to effect better grip, leaving a better window for RR reduction. Better design capability helps to achieve optimal robustness from same structural components for minimal deformation and reduced energy losses."* adds Mr. P K Mohamed.

Green tyres have good elasticity, rolling resistance, low fuel consumption, low heat and abrasion resistance, high puncture resistance, large carrying capacity and give a comfort ride. At present, India does not have any tyre standard regulations and mandatory standards regarding rolling resistance although they have been identified.

***"New materials, technologies and better processes are helping tyre engineers now to overcome the problem of compromises."***

**Mr. P K Mohamed, Chief Advisor, R&D, Apollo**

***“Today, the idea of green tyres is no longer novel. Tyre manufacturers are all touting various versions of green tyres. A start in the right direction, but it also brings the question how does one measure how “green” a green tyre is?”***

New technological advances not only include new elements used in tyre belts and traction surfaces, but also different types of tyre tread and shoulder designs. Compared to tube type tyres, tubeless tyres have been found to be more fuel efficient and one of the most notable improvements in tyre technology has been the production of radial tyres. Bridgestone found that the conversion of bias-ply to radial tyres increased fuel efficiency by about 10%. Michelin hugely contributed to this by bringing low rolling resistance radial tyres into the market as early as 1946.

#### ***Michelin cutting edge technology regarding radial tyres***

Tyres that have a radial arrangement of plies are called radial tyres. Radial tyres have lower rolling resistance. The positive features of using radial tyres are that they provide grip, resilience, toughness, and wear.

Michelin introduced radial tyres in 1946 with lower rolling resistance as compared to other tyres at the time. Michelin also invented the first greener car tyre that offered higher fuel efficiency, greater safety and longer tread-life in a single product in the year 1992. This was achieved by adding silica to its rubber compounds. This was enhanced in the coming years for Michelin's Energy™ Green X tyres.

The target of the company is to reduce tyre rolling resistance by another 25% in the next ten years. According to Michelin, their fuel-efficient tyres sold since 1992 have saved more than 13 billion litres of fuel and prevented the emission of more than 34 million tonnes of CO<sub>2</sub> by the end of 2010.

Today, the idea of green tyres is no longer novel. Tyre manufacturers are all touting various versions of green tyres. A start in the right direction, but it also brings the question how does one measure how “green” a green tyre is?

Speaking to India Transport Portal, Mr. Thom Clark, Managing Director, Michelin India explains: “In 1895, tyres had a rolling resistance coefficient of 25 kilograms per tonne. While this figure has remained constant over the years, Michelin pioneered in launching the “green” tyre called Green X in 1992. Green X offers a rolling resistance coefficient of 8 kilograms per tonne without compromising on either grip or resistance to wear.”

With the global scene increasingly supporting the idea of sustainable development, improvements in fuel economy is a significant factor of the strategy. Thanks to the fast-growing economies worldwide, the transport industry is expanding like never before.

**Rolling resistance testing at the Continental facility in Korbach -Germany**



Figure 10 – Source: Continental

***“Using tyres with lower rolling resistance and by maintained with appropriate inflation pressure will result in saving of fuel by 6-8% and will also reduce impact on environment by reducing CO2 emission by vehicle”***

**Dr. Joerg Strassburger, MD, Lanxess India**

A lot of money has been invested in technology and innovation and with authorities and governments implementing more and more rules and regulations, the need to stay on top is crucial.

According to Mr. Thom Clark, their success towards greener tyres was achieved by introducing a new manufacturing process using silica compounds: “Our energy efficient tyres use technology including the Full Silica Compound, the Micro Adaptive Compound and the Alternating Bridging Technology to produce economical, durable and safe tyres. The use of silica helps in avoiding tyre heat build-up which subsequently reduces energy lost due to heat thereby leading to increasing fuel economy and reducing emissions. Additionally, addition of silica reduces the weight of tyre leading to the same result.”

It is quite evident that lowering rolling resistance is one of the key aspects in achieving better fuel economy. The European Union has been at the forefront of promoting increased fuel efficiency in the transport sector. Its new tyre labelling scheme came into force in November 2012, and many countries have initiated similar steps to achieve sustainable mobility. Dr. Joerg Strassburger, MD, Lanxess India concludes: “Using tyres with lower rolling resistance and by maintained with appropriate inflation pressure will result in saving of fuel by 6-8% and will also reduce impact on environment by reducing CO2 emission by vehicle.”

# REGULATION: EU SETTING UP THE BENCHMARK



On November 25, 2009, the European Commission adopted the Regulation (EC) No 1222/2009 for the labelling of tyres (amended by Regulation 228/2011). The labelling regulation came into effect on November 1<sup>st</sup>, 2012. The aim of this new regulation was to provide buyers with lucid, relevant information about the tyre's make-up and quality, enabling them to purchase products with better fuel efficiency, wet braking and lower noise pollution.

As part of this, tyre manufacturers are now required to 'publish' the fuel efficiency, wet grip and external rolling noise performances of C1, C2 and C3 tyres (tyres that are mostly used for standard passenger cars, as well as light and heavy duty vehicles). On this issue, "Legislation will make it mandatory on part of tire manufacturers to display their tyres with the specifications of the parameters such as rolling resistance." said to India Transport Portal Dr. Joerg Strassburger, MD, Lanxess India. "This will increase consumer awareness about the role of rolling resistance in fuel consumption by a vehicle. This will increase transparency and place the power of choice in the hands of the consumer. Given a choice, any consumer would like to save 6 to 8% of fuel".

Mr. P K Mohamed adds: "This regulation was intended to encourage the consumers to select fuel-efficient tyres to help reduce fuel usage and lower CO<sub>2</sub> emissions across the continent to result in fuel savings between 2.4 to 6.6 million tons of oil by 2020. Reducing oil consumption will also decrease CO<sub>2</sub> emissions between 1.5 million tons to 4 million tons per year."

The regulation states that tyre labels need to be exhibited at the point of sale/shop and on technical literature, which includes anything from online information and marketing to printed catalogues and leaflets etc. The aim is to encourage a shift of attitude from manufacturers and consumers alike towards more fuel-efficient, safer and low noise tyres, beyond the standards already achieved. The EU Commission's proposal in 2008 as a part of its Energy Efficiency Action Plan, was brought about to reduce energy consumption by 20% by 2020.

***"This regulation was intended to encourage the consumers to select fuel-efficient tyres to help reduce fuel usage and lower CO<sub>2</sub> emissions across the continent to result in fuel savings between 2.4 to 6.6 million tons of oil by 2020"***

Mr. P K Mohamed, Chief Advisor, R&D, Apollo

### EU tyre labelling tag

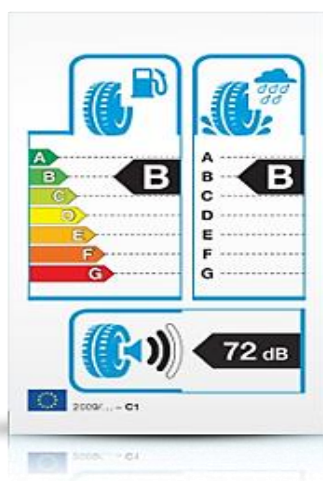
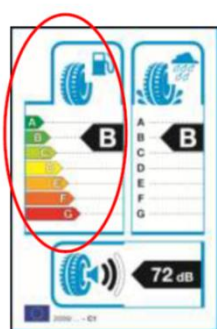


Figure 11 – Source: European Commission

### What are the values behind the rolling resistance grading? The values are obtained by applying a harmonized testing method



| Passenger car<br>C1 Tyres  |                               | Light Truck<br>C2 Tyres   |                               | Truck & Bus<br>C3 Tyres  |                               |
|----------------------------|-------------------------------|---------------------------|-------------------------------|--------------------------|-------------------------------|
| RR C in kg/t               | Energy<br>Efficiency<br>class | RR C in kg/t              | Energy<br>Efficiency<br>class | RR C in kg/t             | Energy<br>Efficiency<br>class |
| $RR C \leq 6,5$            | A                             | $RR C \leq 5,5$           | A                             | $RR C \leq 4,0$          | A                             |
| $6,6 \leq RR C \leq 7,7$   | B                             | $5,6 \leq RR C \leq 6,7$  | B                             | $4,1 \leq RR C \leq 5,0$ | B                             |
| $7,8 \leq RR C \leq 9,0$   | C                             | $6,8 \leq RR C \leq 8,0$  | C                             | $5,1 \leq RR C \leq 6,0$ | C                             |
| Empty                      | D                             | Empty                     | D                             | $6,1 \leq RR C \leq 7,0$ | D                             |
| $9,1 \leq RR C \leq 10,5$  | E                             | $8,1 \leq RR C \leq 9,2$  | E                             | $7,1 \leq RR C \leq 8,0$ | E                             |
| $10,6 \leq RR C \leq 12,0$ | F                             | $9,3 \leq RR C \leq 10,5$ | F                             | $RR C \geq 8,1$          | F                             |
| $RR C \geq 12,1$           | G                             | $RR C \geq 10,6$          | G                             | Empty                    | G                             |

Figure 12 – Source: European Tyre and Rubber Manufacturer Association

### EU Tyre Labelling Regulation

Since November 1<sup>st</sup>, 2012 the EU has introduced a new easy-to-read label that ranks tyres. The Green bar, A, is the best rank whilst the Red bar, G, is the worst class. The three parameters to look out for on the new label are fuel efficiency (rolling resistance), wet braking and external rolling noise. Prior to the EU proposing this new labelling scheme, all major stakeholders, which included national authorities, industry, environmental NGOs and consumer organisations, decided the labelling requirements.

With the new regulations in place individuals are expected to find ways to lower fuel consumption. The use of Low Rolling Resistance Tyres (LRRT) and the installation of Tyre Pressure Monitoring Systems (TPMS) will help to maximise this fuel efficiency. According to reports LRRT and TPMS also help reduce CO<sub>2</sub> by 3% and 2.5% respectively. As a result, the latest EU Regulation 661/2009/22 now states that all M1 class vehicles (vehicles with up to 9 passenger seats, including the driver's) must be fitted with LRRT and TPMS (since November 1<sup>st</sup> 2012). All vehicles manufactured after November 1<sup>st</sup> 2014 will have to come with TPMS.

As mentioned earlier, the new labelling system uses a lettering ranking. The difference in fuel consumption can be as much as 3 litres/100 km between two ratings, A and B. Moving forward the measurements of fuel consumption and CO<sub>2</sub> emissions will be determined through calibrated rolling equipment and machines. The ratings given are compatible to measured values. These ratings will range from A (up to 4 kg/t) to F (over 8 kg/t). The G rating will not be used. Even though different vehicles and varying driving conditions will automatically result in different values, fuel consumption could be reduced by up to 7.5 % and even more in the case of trucks for the difference by upgrading from a G ranking to an A class with a complete set of tyres. Fuel consumption will decrease by 1% for passenger cars when rolling resistance is reduced by 6%.

### Tyres that fall under the regulation

However at this stage, this new labelling scheme is only applicable to some vehicle segments and tyre types. This regulation is only relevant to passenger vehicle tyres (C1), light truck tyres (C2) and heavy duty vehicle tyres (C3). The following categories of tyres do not fall under the scope of the regulation:

- Retreaded tyres,
- Professional off-the-road tyres,
- Racing tyres,
- Studded tyres,

- Temporary-use tyres (spare tyres),
- Tyres designed to be fitted on vehicles initially registered prior October 1<sup>st</sup>, 1990,
- Tyres with a speed rating lower than 80 Km/h,
- Tyres with a nominal rim diameter of 254 mm or less, or 635 mm or more.

The decision of whether to include re-treaded tyres or not will be made by March 2016, once the Commission has made an impact assessment. This will be a self-certification process, meaning the manufacturer can choose its own procedure for certification. This has raised many eyebrows and remains a matter of concern at the moment. Class G as of November 1<sup>st</sup>, 2014 and F tyres by November 1<sup>st</sup>, 2018 will be phased out if fuel efficiency is taken under consideration. Tyre suppliers along with retailers and vehicle manufacturers will be responsible for ensuring customers are presented with all the necessary and relevant information.

***“As a result, green tyres are expected to reduce fuel consumption and consequently decrease the amount of carbon dioxide from 1.5 million tonnes–4 million tonnes per year in 2020 for EU alone. You can even say that it equals 0.5 million to 1.3 million passenger cars being removed from the EU every year.”***

The regulations, although not universally applicable across all types of vehicles and tyres, have implemented much-needed minimum requirements that must be adhered to by all parties. This is all a part of the overall sustainable development. On top of promoting a cleaner environment, energy labels also involve consumers by providing them with all the necessary information to make a 'greener' purchase.

#### **EURO Standards and EU's Sustainable Development Strategy**

EURO standards were introduced in 1992 with a view to regulate harmful emissions from vehicles. The level of particulates from vehicles had to be strictly controlled to mitigate health and environment hazards. EURO levels range from 1 - 6 for passenger cars and Light-Duty Vehicles (LDV). Arabic numerals (EURO 1 – 6) are usually used for cars and light duty vehicles. The current legal mandate standard is EURO 5 but the EURO 6 standard will come into effect in 2014/2015. Roman numerals are usually used (EURO I – VI) for heavy goods vehicles. The present requirement is the EURO V standard, and EURO VI will come into force in 2013/14. Limits are also different for diesel, petrol-run and natural gas cars.

The reduction of carbon footprint is the major goal of this sustainable development. As a result, green tyres are expected to reduce fuel consumption and consequently decrease the amount of carbon dioxide (CO<sub>2</sub>) produced. CO<sub>2</sub> savings from all vehicle types are expected to range from 1.5 million tonnes–4 million tonnes per year in 2020 for EU alone. You can even say that it equals 0.5 million to 1.3 million passenger cars being removed from the EU every year.

**Three examples on how much consumers can save with the new labelling system**

| Type of Vehicle              | #km travelled/year                        | Fuel Savings/yr (€) | Savings if using the best tyres (€)    |
|------------------------------|-------------------------------------------|---------------------|----------------------------------------|
| Typical passenger car        | 25,000 (10,000 urban, 15,000 inter-urban) | 170–230             | 100–140                                |
| Big passenger car            | 10,000 urban, 25,000 on highway           | 450                 | 130–210                                |
| Van (Transport and delivery) | 40,000 (20,000 urban, 20,000 inter-urban) | 290–360             | Break-even point within the first year |

Figure 13 – Source: European Commission

**Making an informed purchase decision**

The aim of the tyre labelling system is to ensure road users' safety, economic efficiency and environmental preservation. This enables the buyers to make an informed decision, weighing the pros and cons before making the final choice. A cleaner vehicle is a win-win situation for all concerned. The European Commission intends to post a harmonised fuel saving calculator manufacturers' websites that can be used to calculate fuel savings and compare products. The national market surveillance

authorities will assess if the grading values conform to the standards. The procedures for verification are detailed under Annex IV of the regulation.

Although the labelling scheme takes into consideration the above mentioned parameters, it does not provide customers with three other equally important factors: tyre longevity, road handling performance, and dry braking performance. These should still be borne in mind when making a purchase to further support safety, economic and environment performances.

A buyer who is better informed is expected to make a better choice. The buyer also needs to know the projected life expectancy in miles and the life of the tyre along with the tyre prices.

The main concern surrounding this scheme is the lack of enforcement when needed. Regular check-ups are imperative for this self-regulatory scheme to work properly and be taken seriously by all.

**Factors affecting purchase decision**

| Criteria (below) has an impact on issue (right) | Safety | Economy | Environment | Is measured by labelling system |
|-------------------------------------------------|--------|---------|-------------|---------------------------------|
| Longevity                                       | no     | yes     | yes         | <b>YES</b>                      |
| Rolling resistance                              | no     | yes     | yes         | no                              |
| Braking on dry pavement                         | yes    | no      | no          | no                              |
| Braking on wet pavement                         | yes    | no      | no          | <b>YES</b>                      |
| Wet grip while turning                          | yes    | no      | no          | no                              |
| Braking under winter condition                  | yes    | no      | no          | no                              |
| External noise                                  | no     | no      | yes         | <b>YES</b>                      |

Figure 14 – Source: ATS Euromaster

### **Tyres Labelling by the Expert Group on Tyres Labelling - Market Surveillance Administrative Cooperation (ADCO)**

Without proper enforcement, the label will lack credibility and not be an advantage for manufacturers. European Tyre and Rubber Manufacturers' Association (ETRMA) secretary general Fazilet Cinaralp said that, "as the label uses a system of self-regulation and self-declaration, there is a need for regular ex-post controls at point of sales". In June 2012, the EU created a committee solely for tyre labelling and its enforcement.

The committee is the Expert Group on Tyres Labelling - Market Surveillance Administrative Cooperation (or Tyres Labelling ADCO) is composed of the national authorities that enforce the label in 27 member countries. "It is responsible for optimising the implementation of Regulation (EC) 1222/2009 and for harmonising through the exchange of experience the various national surveillance practices across the European economic area for all the products that are covered by this regulation.", said Cinaralp about the objectives of the committee. "The committee should cooperate in the testing of products – they don't want to see the same product tested three or four times when a product can be tested once and the information shared – and discuss any matter related to market surveillance practices" she adds.

Since its introduction the tyre labelling scheme has evoked mixed response. The key players in the relevant markets have shared their differing opinions on the regulatory initiative. This is no surprise as new systems and regulations always lead to both positive and negative responses. Only the future will tell whether these reactions were justified or not.

#### **What tyre industry experts think and say about the labelling system**

Jean-Pierre Jeusette, Goodyear's director for the Luxembourg Innovation Centre, said: "The label has a huge potential impact—financially, environmentally and on road safety across Europe. Our analysis shows that if all European vehicles ran on A-graded tyres, it would save €84 billion in fuel and reduce CO2 emissions by 20 million tons. Choosing an A-graded passenger car tyre for wet braking compared to a G-rated one could mean a 30% shorter braking distance on a wet road—stopping up to 18 meters earlier."

Michael Staude of TÜV SÜD Automotive Staude is more lukewarm: "Many specific performance aspects are simply not reflected by the information displayed on the label". He believes that for winter tyres the label will prove to be ineffective.

***"The label has a huge potential impact—financially, environmentally and on road safety across Europe. Our analysis shows that if all European vehicles ran on A-graded tyres, it would save €84 billion in fuel and reduce CO2 emissions by 20 million tons."***

**Mr. Jean-Pierre Jeusette, Goodyear's director for the Luxembourg Innovation Centre**

Stauder said that it is a limitation that purchasers need to be aware of and they need to ask further questions of their tyre dealer and not expect the label to tell them everything they need to know.

Even if the labelling is not the panacea, it provides relevant information. Paul Everitt, Society of Motor Manufacturers and Traders chief executive, said: *"Before this label, customers only had price and brand to distinguish between more than 300 different types of tyres; now motorists have a set of comparable factors to make buying decisions easier."*

Peter Robb, Continental's brand manager, said that there are trade-offs that need to be understood. According to him, producing low rolling resistance tyres with the best wet grip will be something of an *"engineering conflict"*. Robb believes that for a double A-rating label, a tyre manufacturer will need to compromise in other areas even if enormous progresses are made in order to mitigate such compromises.

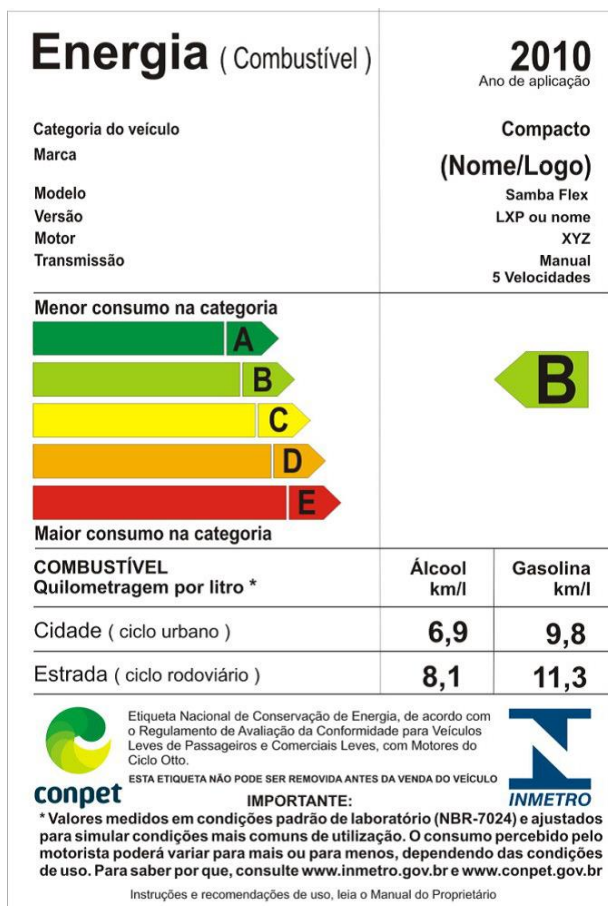
Mr. P K Mohamed, Chief Advisor, R&D, Apollo, agrees: *"On the part of tyre industry, serious research is being done to optimise the performance envelop of a tyre inspite of the fact that the improvement in one performance aspect might be at a substantial cost of another. For example, reduction in rolling resistance of tyres might be possible only with a notable expense of wet grip responsible for safety."*

Though the industry response has been positive, importing budget tyres will face obstacles as these tyres will not have to meet the stringent standards proposed by the EU. With stricter controls to be enforced by 2016, the manufacturers might have to go through a difficult phase. On the whole, an encouraging option, one has to wait and see how mid-range tyre manufacturers and importers will handle the situation.

The new labelling scheme is expected to save lives, money and ultimately the future of the planet. Holding so much promise, the label is an attractive and judicious move by the EU and the idea has spread worldwide. Countries such as Brazil, China, Japan, USA, Russia, and South Korea have initiated labelling plans that mirror the EU's norms.

# HOW THE WORLD IS TACKLING THE REGULATION OPPORTUNITY

## Brazilian labelling tag



With the industry response being mostly positive, other nations are looking to enforce similar legislation. The return on investment will far outweigh the costs. A smaller annual fuel bill for a customer, reduction in billions of litres of fuel, reduced fuel consumption, safety in the form of reduced braking distance, lesser noise and a significant reduction in CO<sub>2</sub> emissions are extremely attractive reasons to go for green tyres. Some countries such as Brazil, Japan, South Korea, China and the US have their own proposals and mandates in place.

Speaking to India Transport Portal, Mr. Thom Clark, MD, Michelin India explains: "The global tyre labeling system is intended to guide consumers in choosing tyres that are the most environmentally friendly and respectful of safety. The aim is to inform and help consumers in their choice of tyres by assessing key performance characteristics. Elements such as rolling resistance now come under tyre labeling which has become a key factor, highlighting the green initiatives taken around the world."

## Brazil

Plans for a tyre labelling system similar to the one recently put into force by the European Union are being worked on since 2005, by PETROBRAS (the Brazilian Petroleum Company), INMETRO (Brazilian Government Institute for Metrology, Standardization and Industrial Quality), Brazilian Government Programs for energy and fuel conservation and the vehicle manufacturers. Protocols are being tested and standardized keeping various factors in mind, including the use of flex fuel that is used in most new cars in Brazil.

The Brazilian label mirrors the EU label and the Brazilian version also grades wet grip, noise and rolling resistance. According to the proposal, an introductory period of four years has been suggested and the importers and tyre manufacturers will be given four years to comply with the guidelines once it is enforced. The Programa Brasileiro de Etiquetagem Veicular (PBEV) wants to make people aware of myriad choices they can make in terms of vehicular fuel efficiency and how they can contribute to sustainable development.

Figure 15 – Source: InMetro

## USA labelling tag

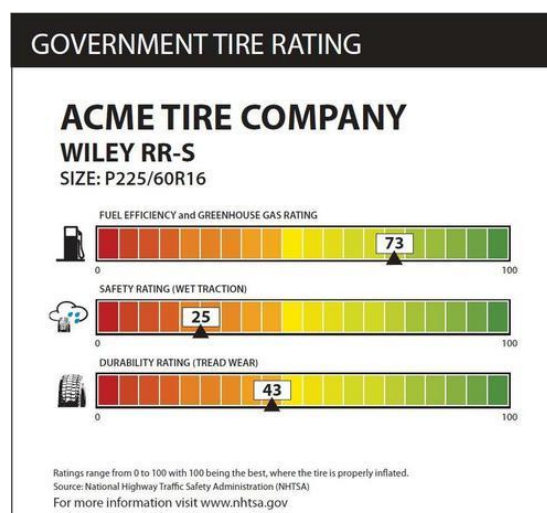


Figure 16 – Source: National Highway Traffic Safety Administration

As a result of this program, some technical snafus have been uncovered in the testing procedures that need to be straightened out before setting up the emission standards.

## United States of America

As per the U.S. Department of Energy (DOE) reports, using low rolling-resistance tyres can bring about fuel savings of 1.5 to 4.5%. The need for a new tyre labelling system had been mandated by the Congress in 1994 and then again in 2007. But this is yet to be a reality. In 2003, California passed the world's first fuel-efficient tyres law. The state of California was the first one to make a move in this direction and propose a tyre labelling system based on energy consumption while driving.

The replacement tyre label helps the consumer make an informed decision by being able to compare the overall performances of different tyres. The 2007 Energy Independence and Security Act required the Department of Transportation (DOT) to come up with a tyre labelling system that gave information about the tyre's durability, traction and rolling resistance. The first two parameters are quite at odds with the third criterion.

## CAFE targets (miles per gallon)

| Model year | Passenger cars                                           |                    |                                                            |                    | Light trucks                                          |                    |                                                   |                    |
|------------|----------------------------------------------------------|--------------------|------------------------------------------------------------|--------------------|-------------------------------------------------------|--------------------|---------------------------------------------------|--------------------|
|            | Footprint: 3,8m <sup>2</sup> or smaller (2011 Honda fit) |                    | Footprint: 5,1 m <sup>2</sup> or bigger (Mercedes S Class) |                    | Footprint: 3,8m <sup>2</sup> or smaller (Nissan Juke) |                    | Footprint: 7m <sup>2</sup> or bigger (Ford F-150) |                    |
|            | CAFE                                                     | EPA Window Sticker | CAFE                                                       | EPA Window Sticker | CAFE                                                  | EPA Window Sticker | CAFE                                              | EPA Window Sticker |
| 2012       | 36                                                       | 27                 | 28                                                         | 21                 | 30                                                    | 23                 | 22                                                | 17                 |
| 2013       | 37                                                       | 28                 | 28,5                                                       | 22                 | 31                                                    | 24                 | 22,5                                              | 17                 |
| 2014       | 38                                                       | 28                 | 29                                                         | 22                 | 32                                                    | 24                 | 23                                                | 18                 |
| 2015       | 39                                                       | 29                 | 30                                                         | 23                 | 33                                                    | 25                 | 23,5                                              | 18                 |
| 2016       | 41                                                       | 31                 | 31                                                         | 24                 | 34                                                    | 26                 | 24,5                                              | 19                 |
| 2017       | 44                                                       | 33                 | 33                                                         | 25                 | 36                                                    | 27                 | 25                                                | 19                 |
| 2018       | 45                                                       | 34                 | 34                                                         | 26                 | 37                                                    | 28                 | 25                                                | 19                 |
| 2019       | 47                                                       | 35                 | 35                                                         | 26                 | 38                                                    | 28                 | 25                                                | 19                 |
| 2020       | 49                                                       | 36                 | 36                                                         | 27                 | 39                                                    | 29                 | 25                                                | 19                 |
| 2021       | 51                                                       | 37                 | 38                                                         | 28                 | 42                                                    | 31                 | 25                                                | 19                 |
| 2022       | 53                                                       | 38                 | 40                                                         | 30                 | 44                                                    | 33                 | 26                                                | 20                 |
| 2023       | 56                                                       | 40                 | 42                                                         | 31                 | 46                                                    | 34                 | 27                                                | 21                 |
| 2024       | 58                                                       | 41                 | 44                                                         | 33                 | 48                                                    | 36                 | 28,5                                              | 22                 |
| 2025       | 61                                                       | 43                 | 46                                                         | 34                 | 50                                                    | 37                 | 30                                                | 23                 |

Figure 17 – Source: United States Environmental Protection Agency

In 2009, National Highway Traffic Safety Administration (NHTSA), proposed a tyre label which would give information about the fuel efficiency (rolling resistance), tread wear and wet traction.

With a view to maximize fuel economy, tyre manufacturers fit new vehicles with low rolling resistance tyres to meet the Corporate Average Fuel Economy (CAFE) standards. But the replacement tyres that a consumer usually buys have a higher rolling resistance and are hence cheaper when compared to original equipment tyres. For the U.S. society, if a system of low rolling resistance tyres had been initiated in 2012, it would have resulted in the cumulative savings of about USD 62.5 billion from 2012 to 2025.

The Obama administration proposed a plan in 2011 to double the fuel economy of passenger cars by 2025. CAFE standards have been finalized in 2012 for 2017-2025.

### Fuel economy label for a gasoline vehicle

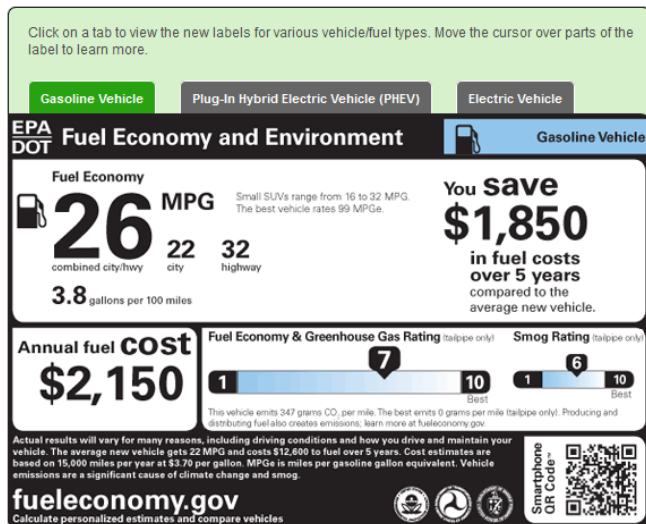


Figure 18 – Source: US Department of Energy

### South Korea tyre labelling tag

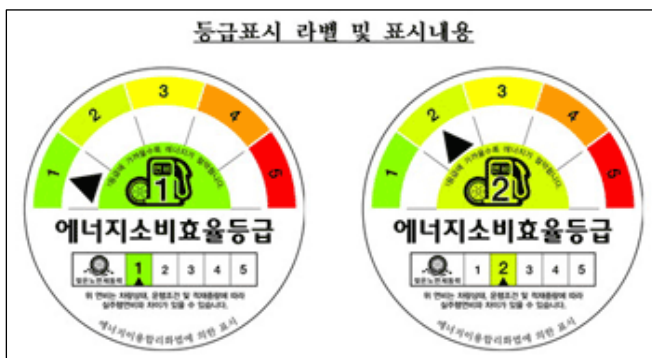


Figure 19 – Source: Ministry of knowledge economy

### Japan changes in the tyre and automobile production

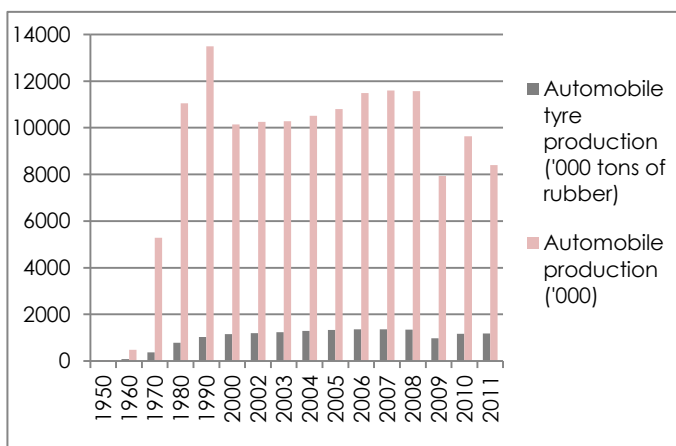


Figure 20 – Source: Japan Automobile Tyre Manufacturer Association

The U.S. Department of Transportation and the U.S. Environmental Protection Agency brought out new fuel economy labels meant to help consumers in 2011. From 2013, all new passenger trucks and cars will have to carry the new label irrespective of whether they run on gasoline, or are electric.

The new labelling system will quickly replace the Uniform Tyre Quality Grading or UTQG system, along with a rolling resistance grade.

### South Korea

The introduction of a tyre labelling scheme in Korea is expected to decrease the consumption of fuel by 231 million liters each year. This is equal to korean won (KRW) 438 billion (USD 400 million) and 184,802 Tons of Oil Equivalent (TOE), and will also bring down CO<sub>2</sub> emissions by 490,774 tCO<sub>2</sub>.

The Ministry of Knowledge Economy enforced the voluntary labelling in November 2011. The government's future plan entails making this mandatory from December 2012. Moving towards a greener society, savings in terms of energy for the country to the amount of 350,000 TOEs/year is expected. It is also looking forward to reducing the emission of greenhouse gases such by around 1 million tons of CO<sub>2</sub> emissions/ year.

Label shows grading in five levels for wet grip and fuel efficiency. Legislation will be first applicable to passenger car tyres and light truck segments, and then truck and bus tyres.

South Korea's Hankook Tyre, was awarded the Blue Angel, for its new all-season tyre Optimo 4S. The Blue angel is an eco-label and seal of approval given by the German Institute for Quality Assurance and Certification. "Consumers are becoming increasingly environmentally conscious, particularly in Europe," said Seung-Do Jin, executive vice president of Hankook Tyre and COO in Europe. "The certification gives them confidence that they are purchasing a product that reduces the environmental impact of driving and saves fuel without compromising on performance and safety." The label is applicable to original equipment and replacement tyres.

### Japan

The Japanese economy has been in a recovery mode since its recent calamities. The tyre production has increased by a small extent for the last two years.

## Japanese Grading system

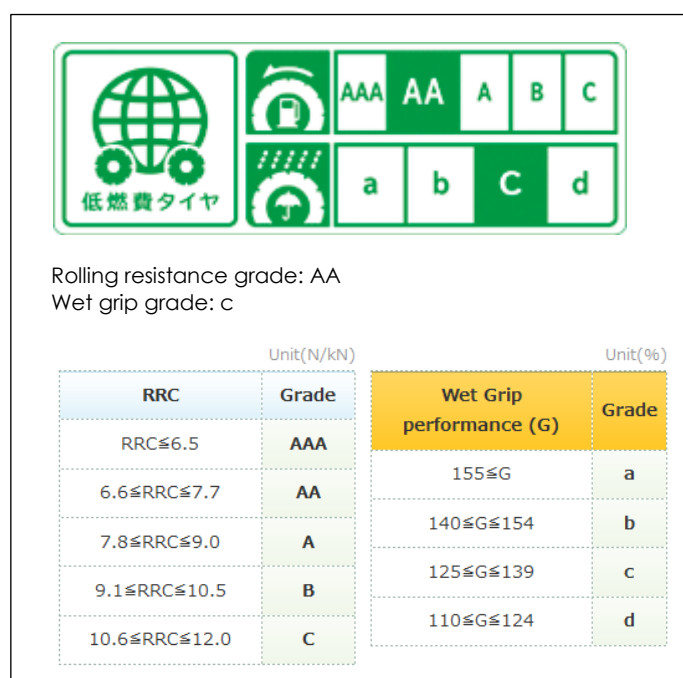


Figure 21 – Source: Japan Automobile Tyre Manufacturer Association

***“According to the CRIA, tests have shown that almost 30% of Chinese truck tyres did not meet the first stage requirements of the EU while 70% failed to meet those of the second stage. As of now, nearly 40% of EU’s tyre exports come from China. China will have to upgrade its tyres in order to mitigate the negative impact of EU’s new labelling scheme on its tyre industry.”***

Rubber consumption touched 1,180,000 tons in 2011. Domestic demand increased while exports saw a decrease.

With the International Energy Agency's (IEA) initiative to improve energy efficiency in the G8 summit, Japan formed the Fuel-Efficient Tyre Promotion Council. Japan has had a voluntary tyre labelling scheme in place since July 2010. A fuel efficient tyre is the name of the game, and the Japanese Government decided to apply to all tyres gradually. Standards are the same that those used in EU labelling standards.

## China

With China's tyre industry highly dependent on exports it is but expected that the tyres will have to meet the global obligations such as EU standards. Last October 2012, Cai Weimin, Secretary-General of the Tyre Branch of The China Rubber Industry Association (CRIA) said, “The examination and approval of the first draft of China’s Tyre-Labelling Laws being formulated by CRIA and various tyre enterprises at present can be expected to be finished by the end of the year, and it can be enacted in next April or May.”

Lanxess will work with CRIA to lead China into an era of green tyres. As of now, tyres meet only E or F standards of the EU and will hence make the first stage, but with stricter controls to be put in place by 2016, China will have to work hard at improving the performance of its tyres in relevant parameters. Martin Kraemer, CEO of Lanxess Greater China, said: “Lanxess believes in using its international experience, innovative technologies and principles of sustainable development to help meet the most serious challenges affecting green mobility in China. We believe that through this cooperation, we can learn from each other and contribute to the development of the tyre industry in China.”

According to the CRIA, tests have shown that almost 30% of Chinese truck tyres did not meet first stage requirements of the EU while 70% failed to meet those of the second stage. As of now, nearly 40% of EU's tyre exports come from China. China will have to upgrade its tyres in order to mitigate the negative impact of EU's new labelling scheme on its tyre industry. The Government is working as quickly as it can on the introduction of a labelling scheme.

The green tyre development scheme is to be modelled along the lines of those put in place by South Korea. They will introduce a voluntary system and then a mandatory one. The limits will be comparable to those set by the EU. The CRIA wants half of the tyre manufacturers in China to make fuel efficient tyres by 2015 and 25% of passenger cars to be fitted by green tyres also by 2015.

# WHICH DIRECTION FOR THE INDIAN CASE?

***“It is a well-recognized fact that India’s one of highest import deficits is due to crude oil. This makes saving fuel one of our top priorities and tire labelling will only help in this direction as high performance tires have a potential of saving about 8-10%.”***

**Dr. Joerg Strassburger, MD Lanxess India**



Eyes of the world are on India at the moment and the country is now committed to addressing these environmental issues to achieve better long-term growth in terms of sustainability. India's transport sector is huge and diverse catering to the needs of more than a billion people.

On Indian highways, rolling resistance of tyres contributes greatly to the fuel economy issues. Trucks are the most common vehicles on these national and interstate roads. Aerodynamics is the main factor affecting fuel economy above 60 kmph; rolling resistance comes into play at a lower speed. Most heavy vehicles on Indian roads do not exceed this speed and hence it is imperative that the Indian tyre industry focus research and develop standards that lower the rolling resistance of tyres and implement strict norms for the auto industry to adhere to in the near future.

1% gain in fuel economy can be achieved if the rolling resistance is reduced by 3%. Speaking to India Transport Portal, Dr. Joerg Strassburger, MD Lanxess India explains *“It is a well-recognized fact that India's one of highest import deficits is due to crude oil. This makes saving fuel one of our top priorities and tire labelling will only help in this direction as high performance tires have a potential of saving about 8-10%.”*

Mr. P K Mohamed, Chief Advisor, R&D, Apollo, comments: *“Reducing rolling resistance of tyres for fuel saving, is an identified need applicable for every market, and the same is applicable for the market in India. But the question is that how long it will take for the Indian market to be ready for this challenge and to realize the potential benefits.”*

According to him, *“Nonetheless, India being a vibrant and fast developing market, the poor quality of infrastructure, inefficient practices in transportation industry & automobile operations and lack of proper knowledge about the right application, makes it very difficult for tyres to operate in and realize their potential.”*

**Truck Fuel Economy and the Indian Truck Industry**

As with all businesses, the trucking business too, seeks to maximize profits and productivity while keeping costs at a minimum. With spiraling fuel costs, any measure to improve fuel economy will go a long way in improving profitability. Old and worn tyres, shallow original tread and rib tyres have lower resistance. Radialisation of tyres has had a significant impact on the rolling resistance of tyres, i.e, by lowering it and improving fuel efficiency. That is why the Indian tyre market offers plenty of latitude regarding fuel savings issues.

According to Mr. Thom Clark, MD, Michelin India: "Another key issue that needs to be addressed in India specifically in the commercial vehicle segment is the adoption of radialisation." He adds: This sector in 2012 had a radialisation of approximately 17% and the figure is expected to reach 25% by 2013 and Michelin is committed to contributing to this growth and providing momentum to this movement of improving mobility on Indian roads."

Asia is now the largest market for commercial vehicles. Several foreign truck companies are considering India as a great market such as Volvo AB, Volvo, Daimler, Scania. Though largely consolidated, the Indian truck industry has a predominance of low-cost trucks. Indian truck manufacturer, Tata, is the fourth largest maker of heavy trucks in the world. If the current trends continue, the truck market will grow to 33 million units by 2015. Mahindra and Ashok Leyland are second to Tata in the LCV and HCV segments.

Speaking to India Transport Portal, Mr. Anders Grundströmer, Managing Director, Scania Commercial Vehicles India explains: "With the country's highway infrastructure improving and the hub-and-spoke model gaining increasing acceptance, the domestic truck industry is witnessing polarization, with growth in the HCV segments outperforming the overall industry growth rate". He adds: "The Heavy duty truck business will have a growth of more than 8% by year 2020. With the infrastructure spend targeted to double to USD 1 Trillion by 2017." But even this forecast seems underestimated according Mr. Pradeep G. S. Head of Sales and Marketing, Jost. He comments: "If you look at the Indian demography, close to 75% of the population live in villages or under-developed cities. I reckon there should be a constant increase in demand as and when urbanization takes place. "

And he goes further: "Besides, consider the fact that the villages need good roads, electrification, drinking water etc. With "Govt. Will" in place and announcement of infrastructure projects, there won't be a recession for the next 15-20 years.

***"The Heavy duty truck business will have a growth of more than 8% by year 2020. With the infrastructure spend targeted to double to USD 1 Trillion by 2017."***

**Anders Grundströmer, Managing Director, Scania Commercial Vehicles India**

*The recession in India is more due to the negative sentiments and wrong/unfriendly govt. policies. [A Heavy duty truck business growth by] 8% by 2020 from my point of view looks absolutely realistic; would dare to say even pessimistic."*

Temporary due to macroeconomic situation, India saw a decline in the production and sales of heavy trucks but this is not representative of long terms forecasts. Light trucks are a common sight in India and were at an all-time high in 2010 as the economy showed a stupendous growth in many sectors. The Indian truck market is set to grow, with the construction sector, infrastructural plans, economy and population on the rise.

With high levels of growth expected in passenger and freight traffic in India, CO<sub>2</sub> emissions will sky rocket along with the demand for fuel. Although India has emission standards in place, it is yet to introduce a holistic energy policy or a labelling scheme for tyres. With this in mind, India is making efforts towards harmonizing its regulations with those of the EU.

#### **The Star Rating Cars system lesson**

As per a 2009 McKinsey report, if India an improvement in fuel economy by 15% by 2015 will translate into a savings of 29 million tons of CO<sub>2</sub> by the year 2030. That roughly equals 10.3 million Tons of Oil Equivalent which will amount to 7.8 billion dollars of savings in 2030 at 100 dollars/ barrel. To maintain status quo in crucial environmental issues, India has to employ cost-effective, energy-efficient options sooner than later.

About 18% of total CO<sub>2</sub> emissions in the country can be accounted for by India's vehicle sector. There are no standards for CO<sub>2</sub> emission limits for pollution from vehicles at present but India, with the Bureau of Energy Efficiency (BEE) is enforcing a star rating system for cars. Passenger cars have to declare their fuel efficiency from April 2013 in a star rated system. Consumers will have a definite idea about the mileage of the car just by looking at the stars displayed – the more stars, the higher the mileage the car offers.

An important thing regarding is that the BEE had allowed car manufacturers to apply the appropriate labels on a voluntary basis from June 2012 but the auto industry blatantly refused to agree to the norms proposed by the government citing them to be too strict and almost impractical to implement within the timeline.

The Society of Indian Automobile Manufacturers (SIAM) blames the quality of fuel and Indian road conditions for the lower-than-expected fuel efficiency of cars in India.

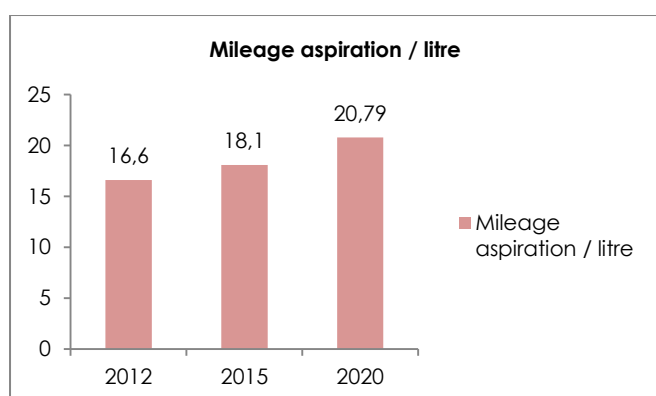


Figure 22 – Source: Hindustan Times

It has to be noted that even though some foreign car makers are members of the SIAM in India, globally they are an entity in their own right. As premiere car manufacturers, each one of these foreign players invests heavily into research and development. All of them are highly competitive when it comes to capturing automobile markets across the world.

While India still struggles to implement emission control standards adopted by the rest of the world, foreign car manufacturers are constantly working to reinvent their technology to stay in tune with the world that is working towards reducing greenhouse gas emissions. As the world shifts gears to radically reduce emission rates, the Indian automobile industry, to compete with their foreign counterparts who are definitely far ahead in the race, needs to follow suit to avoid falling behind in terms of both emission norms and sales. Issues are similar to China challenges. India will have to upgrade its tyres in order to mitigate the negative impact of EU's new labelling scheme on its tyre industry in order to stay in the game.

***“The Indian government has set emission standards corresponding to a fuel economy of 128 g/km to be achieved by 2015 while the automobile industry has set a more realistic target of 142g/km to be achieved by 2017.”***

Despite objections, if the proposed norms for fuel efficiency in cars come into force, then Indians could save INR 88, 544 crore per year on fuel by 2030. All these elements should be taken into account when coming to implement rolling regulation thresholds with domestic and foreign tyre manufacturers.

#### **Emission Standards and Tyre Labelling**

Bharat Stage Emission Standards have been put in place since 2000 for motor vehicles by the Indian Government. It has emission standards for all vehicle categories comparable to the EU standards for gasoline and diesel engines. India has its own standards for 2- and 3- wheeled vehicles.

China and Russia plan to enforce strict emission standards comparable to EURO V by 2012 and 2014, respectively. India too will have to follow suit and this requirement will up the technological needs. The EURO IV equivalent has been introduced in the National Capital Region and 11 metropolitan cities. The stringent Bharat stage IV has not been implemented nation-wide as yet and is concentrated in the NCR and metros. “In 2010, we saw many cities moving from Euro III to Euro IV and the rest of the country going from Euro II to Euro III. Emissions standards are an area where we clearly have to advance and be better prepared”, said Ravi Pisharody, President (Commercial Vehicle Business Unit), Tata Motors Ltd. (India).

**Quick comparison between EU and India**

|                                         | EU                | India                                     |
|-----------------------------------------|-------------------|-------------------------------------------|
| Current average weight of the car fleet | 1300 kgs          | 1050 kgs                                  |
| Average Co2 emissions                   | 145 g/km          | 141 g/km                                  |
| Proposed target                         | 95 g/km (in 2020) | 125 g/km (government, 142 g/km (industry) |
| Doable target                           |                   | 105 - 109 g/km (in 2020)                  |

Figure 23 – Source: International Council of Clean Transportation

The Indian government has set emission standards corresponding to a fuel economy of 128 g/km to be achieved by 2015 while the automobile industry has set a more realistic target of 142g/km to be achieved by 2017.

With the rise in sales in the European markets, India will have to introduce environmental standards to keep pace. With the increase in pollution restrictions in mature markets, emerging markets have to invest in developing technology that minimizes noxious emissions and fuel consumption. Technological innovations and investment are the needs of the hour. Research shows that for the best cost-benefit ratio in the long run, diesel engines have to be optimized. Alternative fuels, green tyres, hybrid and electric vehicles are effective in reducing emissions and cutting down on fuel usage.

India will soon have to tackle the issue to compete in the global market. According to a report in Hindu Business Line, on a recent visit to India, Mr Christoph Kalla, Vice-President, Marketing (BU Performance Butadiene Rubbers) of Lanxess said, *"It is my personal belief that India should embrace tyre labelling especially when raw material prices are going through the roof. There will be enormous competitive pressure on Indian tyre makers"*. In the wake of the labelling developments, India will be forced to use more sophisticated technology.

#### **Possible Strategies to reduce fuel consumption and emission by India**

Speaking to India Transport Portal, P K Mohamed, Chief Advisor, Research & Development, Apollo, explains: *"Legislation to improve the fuel economy of vehicle through rolling resistance reduction is necessary because the same will help in reducing the emission of greenhouse gases."* At present India lacks a national tyre policy that regulates the market. With the advent of green tyres and the increased demand for energy-efficient technology in the automobile sector, India will have to strengthen legislation governing factors such as low rolling resistance tyres, safety measure and standards relating fuel consumption and greenhouse gases. Mr. P K Mohamed comments: *"It is very difficult to predict the influence of tyre labeling in tackling the fuel economy issue of vehicle at this stage"*

A 109 g/km target can be quite easily achieved even with a 2.5% improvement every year. Also the data for 2010-11 shows an improvement of 138-139g/km as per the International Energy Agency. The Indian government can modify material technology by recycling and using eco-friendly materials such as natural fillers and functionalised elastomers.

The selection of the tyre type (size, speed rating, tyre construction) should be according to the application (road, load, vehicle, speed, environment, driving style). The industry can implement fuel saving radialisation in all segments and reduce running cost per kilometre continually—durability, retreadability, and lower rolling resistance. It can work towards reducing cycle development time. Consumer awareness campaigns and market incentives should be an integral part of promoting a greener way of living.

Emerging technology includes run flat technology; tyre pressure monitoring system; intelligent tyre; C3M, IMPACT, BIRD and other innovative technological processes that are energy saving; TPM, Six Sigma, TQM and other quality management technology; educating drivers about tyres and fuel economy; and, development of skilled personnel for the rubber industry. The Indian government needs to formulate a national tyre policy; improve the infrastructure of roads; implement stringent laws pertaining to fuel efficiency and safety comparable to global standards; set up a nodal agency like the American NHTSA and DOT, and include world-class tyre testing and evaluating facilities if wants to be a major player in the global arena.

According to T.Chakravarty, former Secretary General of the Indian Tyre Technical Advisory Committee (ITTAC), “Tyre labelling ultimately benefits everyone — the consumer who saves fuel and is assured of increased safety, the manufacturer who gets better price for a better product (which is even more important in the Indian context where the expensive raw materials are mainly imported) and the society as a whole, since utilisation of petroleum resources is improved and pollution goes down.” Department of Industrial policy and Promotion decided that the Bureau of Indian Standards or BIS certification should be compulsory for all automotive tyres and tubes in India. Manufacturers had to comply with IS 15627, IS 15633, IS15636 and IS 13098. In 2011, after delays aplenty, it became a mandate for all pneumatic tubes and tyres. The Indian government drew up the Automotive Industry Standards (AIS) comparable to the global standards.

But to begin with, and as a first step, India does not have to begin with labelling implementation. Mandatory thresholds are prerequisites that are simpler to monitor and enforce in order to avoid European troubles such as testing. Lessons from the star rating cars system should also be learned. Labelling regulation is not easy to enforce because there is no one standard and that it is difficult, if not impossible, to ensure conformity, which may lead to consumer confusion, potential fraud, and a loss of credibility of the labelling system if introduced too soon.

***“As a first step, Indian does not have to begin with labelling implementation. Mandatory thresholds are prerequisites that are simpler to monitor and enforce. Labelling regulation is not easy to enforce because there is no one standard and that it is difficult to ensure conformity.”***

So India will have to pull up her socks and encourage the use of eco-friendly tyres as the world is moving towards a cleaner way of life. A reduction of fuel consumption of 0.25 l/100 km and 6.5g CO<sub>2</sub>/km is expected if one switches to a green tyre.

Raw material manufacturers, tyre makers, vehicle giants and the Government need to coordinate their activities through a nodal agency. Academicians need to collaborate with the Government and help standardize protocols, conduct testing, accumulate relevant data and thus help in the implementation of stringent measures to optimize fuel consumption and reduce emission of pollutants.

Consumer awareness is paramount and relevant proven data is required to educate them about fuel economy. In the long-term interest of the country, a concerted effort of all stakeholders will help enforce legislation that is comparable to the global regulations. R&D centres have to be set up to focus on high-performance tyres that are cost-effective and possess energy-saving qualities. The petroleum industry will have to ensure that the rubber companies can avail of low PAH oil and this too requires a huge investment. There is no doubt that innovative, high-performance tyres can reduce the visits to gas station. Raw material availability concerns continue to plague India.

Mr Christoph Kalla, Vice-President, Marketing, Lanxess told Business Line that *"Our experience is that when it comes to tyre regulations, it is applicable to all especially when it involves exports to Europe. The market is globalising and that is why tyre labelling is as important in regions like India"*. Dr. Joerg Strassburger, MD, Lanxess India, adds for India Transport Portal: *"Over and above, it would curb CO<sub>2</sub> emissions. All leading tyre manufacturers can come together to form a common opinion on the labeling requirements befitting for Indian conditions."*

According to Mr. P. K. Mohamend, Chief Advisor, R&D, Apollo, *"It will be quite some time before India is ready for imposing regulatory obligations on tyre industry for compliance to stipulated tyre RR levels in their products for Indian markets"*. To build public support and prevent conflict of interests, while formulating legislation that satisfies all criteria and segments, the Government and the Bureau of Energy Efficiency must hold talks with all relevant stakeholders.

In order to avoid labelling negative effects, it must not allow the industry to dilute the baseline. Getting it right in terms of enforcement, effective controls, structure and value is crucial and all angles must be concerned inviting a variety of viewpoints before settling on the best possible mandatory standards.

#### Comparing CO<sub>2</sub> objectives for the main areas

| Country        | Fleet average Co <sub>2</sub> emissions (g/km) in 2010 | Fleet average Co <sub>2</sub> emissions (g/km) proposed for 2020 |
|----------------|--------------------------------------------------------|------------------------------------------------------------------|
| European Union | 145                                                    | 95                                                               |
| United States  | 187                                                    | 121                                                              |
| China          | 179                                                    | 117                                                              |
| Japan          | 130                                                    | 125 (in 2015)                                                    |
| India          | 141                                                    | ?                                                                |

Figure 24 – Source: International Council of Clean Transportation

# INDIA ALONE IS ABLE TO CHOOSE A BRIGHT FUTURE



With the growing awareness about the need for sustainable development and environmental protection, the world is looking to use 'green' ways of doing things in every sphere possible. India has a huge population and its energy demands have not yet been met. How India will meet future energy demand, in a sustainable fashion, is key in deciding which strategy to adopt. India needs to be self-sufficient, minimize risks, and reduce CO<sub>2</sub> emissions while ensuring energy access for all. Understanding the contributions of the major components of India's transport sector, such as the trucking segment, will help in assessing their impact and come up with sustainable alternatives. Even if, according to Mr. P K Mohamed *"It will take a while before the awareness is spread sufficiently to every part of the large Indian market where large differences exist from region to region."*

Road transport contributes significantly, almost 26% of the total energy consumption, about 24% of all carbon dioxide of all emissions from the EU. Regarding this issue, the EU labelling scheme came into force on November 1<sup>st</sup>, 2012. Its main aim is to push the community into adopting a 'cleaner' way of life and reinforcing the need for sustainable development. Earlier, greener tyres held less appeal due to the higher manufacturing costs; but this is no longer a concern. The market is definitely moving towards environmental friendly and energy efficient vehicles. The legislation is aimed at making this move easier. Alternative fuel, gear shift indicators, stringent legal measures; the objective is the same: a cleaner sustainable way of life.

The tyre industry has been constantly trying to develop cost-effective environmental friendly options. Major Indian companies—JK Tyres and MRF have introduced eco-friendly tyres. Michelin, Goodyear, Bridgestone, and Continental have rolled out green tyres of sorts to the country. Michelin placed low resistance tyres, i.e. green energy saving tyres on the market, way back in 1992. The tyres are available for all classes of vehicles.

With its green tyres, the company was able to achieve fuel savings of 0.06 gal/1000 miles. Michelin's Green X tyres, Bridgestone Ecopia, Hankook Kontrol technology tyres, Pirelli's Scorpion Verde, Goodyear's Assurance Fuel Max tyres and those produced by Yokohama are all good options.

In Europe, "Adding the new label was also intended to provide a level playing field for tyre manufacturers in the European market by encouraging fair competition based on characteristics, rather than price," explains Mr. P. K Mohamed, Chief Advisor, R&D, Apollo. "The stringent regulatory requirements are posing great challenges for tyre manufactures inviting constant focus and necessitating serious research to improve fuel efficiency in tyres without compromising on safety aspects for sustainable business in such markets."

The lack of a unified standard across all areas is an issue that needs to be quickly dealt with. Safety tests must be done on tyres sold prior the AIS. Currently there is no national policy that controls the Indian tyre industry. Industry experts say that there needs to be a comprehensive study done before the introduction of a mandate. In the Indian case, mandatory thresholds that are standardized are simpler to monitor and to set up at the beginning.

Compliance with EU and other market regulations and appealing to buyers in these regions will require the Indian exporters to these markets to upgrade themselves accordingly. Mr. Thom Clark, MD, Michelin India, comments: "In India, we introduced the Michelin ENERGY™ XM2 with an objective to improve and enhance customer experience. This new energy efficient tyre offers a true balance of performance—consumes less fuel due to a considerable reduction in rolling resistance when compared to a previous generation tyre."

Low rolling resistance is no doubt vital to improving fuel economy, but the tyre's inflation pressure, weight and properties of the rubber are factors to be looked into before blindly making purchase decisions. P.K Mohamed adds "Many surveys and studies have pointed towards the stark reality that the majority of the vehicles in markets such as India, are running on tyres in under-inflated conditions, resulting in increased fuel consumption and emissions" Tyre manufacturers specify tyres with low rolling resistance as original equipment in government fuel-economy tests to better vehicle performance.

***"The lack of a unified standard across all areas is an issue that needs to be quickly dealt with. Safety tests must be done on tyres sold prior the AIS. Currently there is no national policy that controls the Indian tyre industry. Industry experts say that there needs to be a comprehensive study done before the introduction of a mandate."***

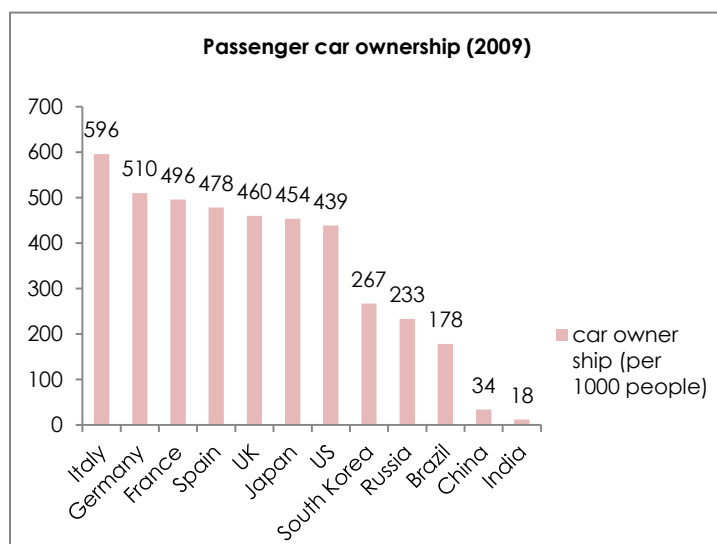


Figure 25 – Source: World Bank

If India does not want to take an abominable last place by 2020, the Government of India will have to hasten the process and put strict control measures for environmental protection and sustainable development.

There is no reason why India starting with a satisfactory and lower baseline must work only towards marginal improvement when much more can be achieved. It is time for India to go further, as witnessed by Thom Clark, MD, Michelin India: "Since the last decade we in India have witnessed an exceptional rise in consumer demand for quality services." Mr. P K Mohamed agrees "Serious efforts are needed for spreading awareness among customers and dealers about the right application and usage of tyres and maintenance of vehicles."

Improving fuel economy becomes vital in the face of rising crude oil prices where consumers have to spend astronomical amounts. For Mr. Thom Clark, it is very clear: "It is reasonable to expect that if the Government introduced threshold limits for rolling resistance for tyres to be sold in India, it would generate huge savings in fuel consumption which would help the economy in cutting down unnecessary costs and also reduction in pollution." Tread life and resistance to bad road conditions are today important performance indicators for tyres in India but tomorrow is also today and India will have to be ready to face rolling resistance issues.

#### Exhaust limits for commercial vehicles by region







|                                                                                                      | 1999                                      | 2000                                             | 2001                               | 2002 | 2003                                                     | 2004                                 | 2005                | 2006                                                        | 2007 | 2008                                                         | 2009                                | 2010                                                               | 2011 | 2012                                  | 2013                               | 2014                    | 2015 | 2020 |
|------------------------------------------------------------------------------------------------------|-------------------------------------------|--------------------------------------------------|------------------------------------|------|----------------------------------------------------------|--------------------------------------|---------------------|-------------------------------------------------------------|------|--------------------------------------------------------------|-------------------------------------|--------------------------------------------------------------------|------|---------------------------------------|------------------------------------|-------------------------|------|------|
|  EU <sup>1)</sup> | Euro II<br>7.0 g/kWh<br>0.15 g/kWh        |                                                  | Euro III<br>5.0 g/kWh<br>0.1 g/kWh |      |                                                          |                                      |                     | Euro IV<br>3.5 g/kWh<br>0.02 g/kWh                          |      |                                                              | Euro V<br>2.0 g/kWh<br>0.02 g/kWh   |                                                                    |      |                                       | Euro VI<br>0.4 g/kWh<br>0.01 g/kWh |                         |      |      |
|  US               | EPA 98<br>5.4 g/kWh<br>0.13 g/kWh         |                                                  |                                    |      | EPA 04<br>2.5 g/kWh<br>0.13 g/kWh                        |                                      |                     | EPA 07<br>1.5 g/kWh <sup>a)</sup><br>0.013 g/kWh            |      |                                                              | EPA 10<br>0.27 g/kWh<br>0.013 g/kWh |                                                                    |      |                                       |                                    |                         |      |      |
|                                                                                                      |                                           |                                                  |                                    |      |                                                          |                                      | New short term reg. |                                                             |      |                                                              |                                     |                                                                    |      |                                       |                                    |                         |      |      |
|  JP <sup>2)</sup> | Long term reg.<br>4.5 g/kWh<br>0.25 g/kWh |                                                  |                                    |      |                                                          | 3.33 g/kWh<br>0.18 g/kWh             | New long term reg.  | 2.0 g/kWh<br>0.027 g/kWh                                    |      | Postnew long term reg.                                       |                                     | 0.7 g/kWh<br>0.01 g/kWh                                            |      | Postnew long term reg.                |                                    | 0.4 g/kWh<br>0.01 g/kWh |      |      |
|                                                                                                      |                                           |                                                  |                                    |      |                                                          |                                      |                     |                                                             |      |                                                              |                                     |                                                                    |      |                                       |                                    |                         |      |      |
|  CN               | = Euro I<br>>8.0 g/kWh<br>>0.36 g/kWh     | China I <sup>a)</sup><br>8.0 g/kWh<br>0.36 g/kWh |                                    |      |                                                          | China II<br>7.0 g/kWh<br>0.15 g/kWh  |                     | = Euro II China III <sup>a)</sup><br>5.0 g/kWh<br>0.1 g/kWh |      | = Euro III China IV <sup>a)</sup><br>3.5 g/kWh<br>0.02 g/kWh |                                     | = Euro IV<br>2.0 g/kWh<br>0.02 g/kWh                               |      | = Euro V<br><2.0 g/kWh<br><0.02 g/kWh |                                    |                         |      |      |
|                                                                                                      |                                           |                                                  |                                    |      |                                                          |                                      |                     |                                                             |      |                                                              |                                     |                                                                    |      |                                       |                                    |                         |      |      |
|  IND              | >8.0 g/kWh<br>>0.36 g/kWh                 | India 2000<br>8.0 g/kWh<br>0.36 g/kWh            |                                    |      | Bharat Stage II <sup>a)</sup><br>7.0 g/kWh<br>0.15 g/kWh |                                      |                     | Bharat Stage II <sup>a)</sup><br>7.0 g/kWh<br>0.15 g/kWh    |      | Bharat Stage III <sup>a)</sup><br>5.0 g/kWh<br>0.1 g/kWh     |                                     | = Euro IV Bharat Stage IV <sup>a)</sup><br>3.5 g/kWh<br>0.02 g/kWh |      |                                       |                                    |                         |      |      |
|                                                                                                      |                                           |                                                  |                                    |      |                                                          |                                      |                     |                                                             |      |                                                              |                                     |                                                                    |      |                                       |                                    |                         |      |      |
|  RU               | = Euro I<br>8.0 g/kWh<br>0.36 g/kWh       |                                                  |                                    |      |                                                          | = Euro II<br>7.0 g/kWh<br>0.15 g/kWh |                     | Euro III<br>5.0 g/kWh<br>0.1 g/kWh                          |      |                                                              | Euro IV<br>3.5 g/kWh<br>0.02 g/kWh  |                                                                    |      |                                       | Euro V<br>2.0 g/kWh<br>0.02 g/kWh  |                         |      |      |

Figure 26 – Source: KPMG



Founded in 2010 as a leading independent information and analysis hub on Indian transportation, ITP covers critical issues that India faces such as road safety, fuel savings, carbon emissions, transportation infrastructure, sustainable transportation etc.

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Edited by Digital Bizzline Ltd.,  
registered at the Companies House  
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