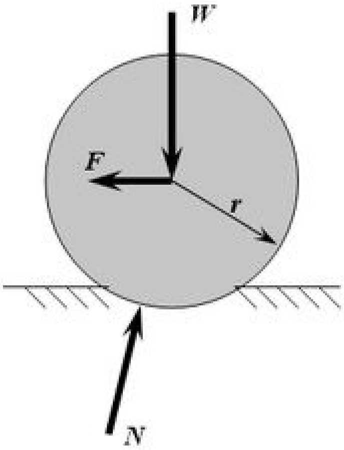
Rolling resistance:

There are some purely physical parameters that cannot be manipulated. The **rolling resistance** is one such parameter sometimes called **rolling friction.**



Roll resistance The force can be calculated by the equation below.

$$F = C_r N_f$$

F Is the resilience

C_r Is dimensionless roller resistance coefficient

N_f Is the normal force

Rolling resistance for transporting on steel rail has a factor size of 0.0002 to 0.0010 Rolling resistance for transporting on rubber wheels (truck) and on road has a factor size of 0.010 to 0.015 and corresponds to car tires on concrete road.

The fact that the rolling resistance on the road is considerably greater is also due to the fact that criteria have been set for eg. a how long a braking distance may be for a vehicle. The ratio of rubber material to concrete / asphalt / gravel also varies, but there is still a very large factor if you divide the numbers with each other.

Taking the highest values in both cases and dividing between rolling resistance road / rolling resistance steel rail 0.015 / 0.001 = 15.

This means that you can say that it takes 15 times more energy to move the load factor = 1, with a truck in relation to the railroad. Now it is not the whole truth, but one must also look at the efficiency of the different modes of transport.

The efficiency of an electric locomotive, and a synchronous locomotive, the efficiency is about 94%. an estimate of what remains after all losses before the power is in the wheels is and we assume about 85% ie 0.85 and not 0.94.

The efficiency of a truck with a diesel engine (the efficiency of the diesel engine 0.45 ie 45%), which remains after all losses before the power is in the wheels (gearbox / transmission efficiency etc ..) is about 0.20 ie 20%.

To get the real energy consumption, we must divide the efficiency by the respective value for each vehicle type. The energy consumption for the electric lid will then be 1 / 0.85 = 1.18 energy units.

The energy consumption of the truck will then be 15 / 0.2 = 75 energy units.

What you see here is that 75-1.18 = 73.82 more energy units for transport by truck in relation to rail. Simple expression so everyone can understand; it takes 1.18 horses to move factor 1 on the railroad, it takes 75 horses to move factor 1 on the road.

Now this is a purely mathematical figure and must be modified to adapt to reality. But the purely theoretical difference obviously has a strong impact on the actual end result.

There are also some verified calculations around the truck's figures. At 80 km constant speed, the truck uses 40% of its fuel to overcome the rolling resistance.

The air resistance accounts for about 20 - 25% of the truck's total consumption.

A more accurate calculation of truck efficiency gives the following;
Transmission 0.8924 efficiency Diesel engine 0.45 efficiency sum of the above = 0.40158 Roll resistance (full equipage) 0.6 Sum of the above = 0.240948 Air resistance (1-0.2) 0.8 Sum of the above = 0.192758

We have used 0.2 above which is in line with the calculation.

It can simply be said that 0.8 liters of fuel is used to overcome rolling resistance and air resistance.

Only 0.2 liters were used to move the truck with or without cargo.

A very large waste of energy resources if transported by truck in relation to other types of transport. (Railway and Shipping). Just this high difference should be daunting to transfer more goods on truck transport even if it gets its electrical energy from a contact line.

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