ENGINES AND CARS BY 2020 - TRADITION OR REVOLUTION

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Summary. By year 2020 number of RMV (road motor vehicles) could increase to 1 bill. units. In Central and Eastern Europe a substantial development of auto-mobilisation is expected; by the year 2010 it will increase production by 125 % (which will increase the proportion of the zone from 5 % to 12 % of the world production).
So the countries of this zone will take larger share in production and utilisation of cars, and in their power units.
In the next years the substantial part of engines production will be provided by injection of easily vapourised fuel into the manifold. However, towards the end of the coming decennium, the fuel cells and hybrid drives will play a more important role. The result: in 2008 only 140 g CO2/km (cca 5,7 l/100km) and in 2012 - to reach the goal - 120 g CO2/km emitted by a modern automobile.
All the development trends by mobility and their effects in the Central Europe in consequence of automotive industry production are tradition by revolution.

1. Introduction

Tab. 1: Some parameters of automobilisation [Source: L6]

<table>
<thead>
<tr>
<th>Year</th>
<th>Year production [mil.units]</th>
<th>Fleet of PSC's [mil. units]</th>
<th>World car density [car / 1000 inh.]</th>
<th>Developed countries [car / 1000 inh.]</th>
<th>Transport [distance/inh./day]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1930</td>
<td>Up to 3</td>
<td>30</td>
<td>15</td>
<td>45</td>
<td>~ 3 km</td>
</tr>
<tr>
<td>1950</td>
<td>~ 10</td>
<td>60</td>
<td>25</td>
<td>70</td>
<td>~ 4 km</td>
</tr>
<tr>
<td>1970</td>
<td>~ 30</td>
<td>240</td>
<td>65</td>
<td>180</td>
<td>~ 20 km</td>
</tr>
<tr>
<td>1990</td>
<td>~ 50</td>
<td>590</td>
<td>105</td>
<td>315</td>
<td>~ 35 km</td>
</tr>
<tr>
<td>1999</td>
<td>56,54</td>
<td>700</td>
<td>110</td>
<td>340</td>
<td>~ 40 km</td>
</tr>
<tr>
<td>2005</td>
<td>~ 70</td>
<td>802</td>
<td>120</td>
<td>350</td>
<td>~ 41 km</td>
</tr>
</tbody>
</table>

In Table 1 there are some parameters of automobilisation degree, which show that:
- the car production per annum in 50 years has increased 5 times
- the fleet of road vehicles in the world has grown 11 times since 1950
- car density per 1000 inhabitants in the world in the period of 1930 - 2000 was increased 8 times
- growing car number in the above period enabled the growing number of people to increase their mobility, i.e. daily distance traveled per inhabitant of the planet, 10 times.

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319
The car growth rate in the second half of this century, when in industrial countries the car density increased by 3% per year (the same rate of growth can be seen in the gross domestic product and the transport of persons given in person-kilometers) caused:
- significant increase in construction of roads called today motorways
- building of garages and parking areas
- growth in emission from burnt fuel
- increase in noise in places with intensive traffic
- increase in dust nuisance.

Since 1970, when the public interest initiated formulation of technical standards for design and operation of automobiles, many things have changed. Emission of individual vehicles were decreased, due to radical technological innovations by 98% compared with the time 30 years ago, the noise has been reduced by minimum 80%. Fuel consumption of the new modern car is lower by 35% contrasted with 1975 and in spite of three times higher traffic density, the accident rate has been diminished by 35%.

However, today
a) designers of combustion engines still find new solutions how to further lower fuel consumption (and so emission production) - GDI in petrol engines and TDI in diesel engines, which are at present the top efficiency thermal machines
b) application new materials (aluminum, magnesium, plastics, composites and special kinds of steel) allows the vehicle weight to be reduced substantially (in 1970 it was on average about 2000 kg, today 1300 kg and in less than twenty years it will be 900 kg),
c) using new technologies enables the manufacturers to apply new systems of production (without material storing and losses), transition to platform systems and wide use of modules due to high precision production, high quality and reliability, and realization of the product in a very short time,
d) research and development departments’ look more intensively than ever before for possibility of using different sources of fuel than fossils - mainly natural gases, hydrogen, but they also investigate alternative drives - combinations of combustion engine and electrical motor. The energy source for the motor is the combustion engine itself or so called fuel cells.

2. Cars and their production

A characteristic feature of the car manufacture is the mass production, interdisciplinary approach and large (not equally distributed capacities). In 1990, 423 car factories with total capacity 57 mil. of RMV’s produced 45.7 mil. of vehicles. The capacity efficiency was 80% (on average virtual number of cars per factory was 108 000. In 1999, 573 car factories with the total capacity of 76.8 mil. units produced 56.5 mil. vehicles (73% of the capacity). We can say that hypothetically nearly 150 factories were redundant. In spite of that further "21st century plants" are being built, rapidly changing materials make it possible to use new technologies, a rapid change of conditions on the market requires a new concept of the relation producer - customer. These facts are reflected in locating production plants, flow of the components, parts and aggregates on their way up to assembly lines. By 2006 we expect dislocation of 70% of production and assembly capacities out of North America and Western Europe.
3. Transport and conditions

Car traffic is forecast to grow under central scenario by 50% by 2020 and lorry traffic by 70% during the same period with an increasing proportion of goods being moved by the largest vehicles. Light van traffic is also expected to grow rapidly, with growth of 120% by 2020 forecast. Lower growth, of 30% to 2020, is expected in bus traffic. But ... the impact of vehicles on the environment need not be uncontrolled. Industry, some research institutions, national and international organisations has already done much to reduce the environmental impact of motor vehicles, by cleaning up fuels and optimising of vehicles. For next two decades it is possible to expect in Central European countries

- increase in quality of life
- management of living resources
- increase in using of products for information society
- fulfilling of conditions for sustainable growth

and from branch site

- wider use of alternative power – hybrids, fuel cells vehicles, and alternative fuels,
- early adoption of reformulated petrol,
- new incentives might be found to encourage public service vehicles – buses, taxis – to use cleaner fuels,

and fast car fleet innovation trend. We expect more urban – zone works for planning of areas, to local phenomenon – air pollution from traffic - solved.

4. Conclusions

Road transport has transformed people’s lives in the twentieth century. It has brought greater freedom, convenience and mobility to hundreds millions. In the developed countries two thirds of households own a car. Traffic is forecast to increase, principally because people are expected to become richer and enjoy longer lives, economic activity to increase, and households to become more numerous. In Central European countries next 10 – 15 years are maturity question in this matter. To be able together with all Europeans to prepare better economic environment, infrastructure and reap the benefit of mobility.
Fig. 1. Share of zone by 1999 production of PsC's [L6]

Fig. 2. PsC's production by selected countries to 2005

5. References


[L6] Reports of FISITA, JAMA, VDA, AIA SR, OICA & Automobile Revue, JA.


