OPTIMIZATION OF FUEL CONSUMPTION AND DECREASE OF TRANSPORT VEHICLES EMISSIONS

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Solving the task of decrease of toxic emissions of auto-transport complex (ATC) it is necessary to take into consideration that the most significant reserves for decrease of fuel consumption and toxic emissions are established in the rational organization of transportation and stimulating driving transport vehicles that have low toxic level. Unlike organization-technical tasks, when technological problems of distribution of transport flows are analyzed, developing economic methods of regulation it is necessary to incorporate correlation between demand and supply for transport services. Development of transport policy the basis for prognostication of different strategies efficiency is searching of conditions for equilibrium situations in which the cost of transport services match demand. In general this equilibrium situation is described by demand for transport services and cost functions

$$D(P) = S(P) \qquad (1)$$

where D – demand for transportation;
S – supply on transport services market;
P – price of transport services

Solution of the equation can be obtained during the iteration calculations, through finding consequent values P0, P1, P2, ...,
P_{k-1} for the next expression:

$$D(P) = S(P) \qquad (2)$$

Concerning the task of defining the volumes of transportation at minimal consumption of fuel and value of toxic emissions there is a need for demand function elaboration. Firs of all, there is a need to consider that transportation are exercised on different kinds of transport. For huge cities there can be a n assumption that the main volume of transportation is due to necessity to satisfy the needs for population mobility. That is why for characteristic of the level of emissions especially in the centre of the city one can consider only passenger automobiles and route taxes. It is grounded by the assessment of the transport vehicles park structure in big cities and intensity of traffic on high ways. Passenger cars and route taxes in the majority of cities hold 87 % of the park. On high ways especially in the centre of the city there are 95% of passenger cars and route taxes. That is why it is well grounded to reduce this optimization task to two-product task meaning transportation on passenger cars and route taxes.
Besides, there is a need to consider constraints linked to budget subsidizing of city passenger transport and allowable costs for driving passenger cars. Taking into account these additions the cost of transport services can be presented in the following equation:

$$P_x = \sum_{i=1}^{n} P_i x_i \le R \qquad (3)$$

where x – the volume of transportation and traffic;
R – budget constraints.

For two-dimensional case we can apply the following variant for finding optimal solution. This optimal solution refers to the tangent dot of budget constraint indifference curve (Fig. 1).

Different variants for assessment of trip costs $x \in R(P) \subset R^{n+1}$ have various utility on satisfying demand in mobility of population. That is why utility function can be interpreted as associated with fuel use and emissions. Since the utility function is usually maximized it is rational to express it as the level of decrease of fuel consumption and emissions on basic variant

$$U(x) \to \max \qquad (4)$$

$$x \in R(P)$$

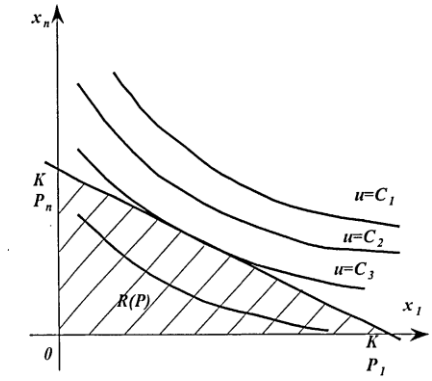

Fig. 1 Economic interpretation of equilibrium price finding process

So, optimization task is in defining the conditions for satisfaction of demand for transportation in such a way that to provide maximal decrease of fuel use concerning the existing situation.