S. Kravchenko, Master student
Ye. Opanasiuk, PhD in Engr., As. Prof., research advisor
L. Mohelnytska, PhD in Phil., As. Prof., language advisor
Zhytomyr State Technological University

METHOD OF PHYSICAL SIMULATION IN DETERMINING AN AUTOMOBILE AERODYNAMIC INDICATORS

Fuel economy of an automobile is one of the priorities in development of the world automotive industry. This feature is of prior importance because it contributes both to fuel saving and reducing engine pollutants into the environment. Fuel consumption decrease allows drivers to save filling expenses.

There are numerous methods to reduce fuel consumption. One of them is improvement of aerodynamic features of a car. This method was adopted from aviation, when it became clear that aerodynamic drag renders considerable influence on a car at high speed of motion. Its essence consists in research of influence of vehicle geometric parameters on fuel consumption and traction-speed characteristics.

To describe the structural perfection of a car body shape the drag coefficient (c_d) was introduced, that is determined experimentally. The lower the coefficient is, the lower the aerodynamic drag is. By means of cowlings of different constructions it is possible to change the form of a car, and thus to influence on the drag coefficient.

The method of physical design consists in experimental research of the physical phenomena recreated in laboratory conditions. For this purpose the model of the phenomenon is usually copied scaled-down or, if it is necessary, scaled-up. The advantages of physical simulation are:

- study of the phenomenon without its mathematical description;
- visualization of the phenomenon that is simulated;
- reduction of financial expenses on experiments compared to the model of a standard of object under investigation;
- wide change of the parameters under investigation.

When preparing, realizing and treating the results of tests using the method of physical simulation it is important to adhere to the values of transitional coefficients of the theory of dimension and similarity that is basic for realization of physical simulation. It means that if variable values that characterize the phenomenon in certain moment of time and space are proportional to other variable values of corresponding time and space, such phenomena are equivalent. Thus, the coefficients of proportion are named the coefficients of similarity.

For two models to correspond it is necessary to meet the criteria of geometric, kinematics and dynamic similarity.

It is offered to create the experimental setting that consists of the horizontally located transparent pipe of round cut. An electric motor with a ventilator, that creates a

blast, is set at one side of the pipe. In addition a blast rectifier is set for creating an even air stream.

A scaled car model is set on a platform. The platform is fastened to the pipe through 4 pendants joint. The pointer is fastened to one of the pendants. When the ventilator is turned on, under the influence of air flow the car model will deviate together with a platform, and the pointer will show the value on a measuring scale. Testing is carried out on a scaled model and the values of forces, obtained during the experiment, must be calculated in accordance with the theory of dimension and similarities.

Directions of air flows can be determined, if to paint the air flow with the stream of smoke. Another method is sticking thin threads to the car model. They will take the position in the air flow that shows local streamline. The obtained data will allow to select the cowlings of optimal construction for a scaled model and to find the most effective location for them on a car.

As a result of such research it is possible to attain reduction of drag (streamlining) coefficient that will reduce aerodynamic drag, and in its turn, will allow economizing on fuel consumption.

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